Utilizing Local Capacity to Supplement Government Health Programs: Cautionary Evidence from a Malaria Prevention RCT in India

Ashis Kumar Das, Jed Friedman, and Eeshani Kandpal*

adas8@worldbank.org jfriedman@worldbank.orgekandpal@worldbank.org

The World Bank Group

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013

*This study was conceived, implemented, and evaluated in collaboration with the NVBDCP and DoHFW, Government of Odisha, who also provided necessary approval. Ethical approval was obtained from an independent ethical committee in Bhubaneswar, India that follows guidelines issued by the Indian Council of Medical Research.

Abstract

Using data from a experimental supportive intervention to India's malaria control program, we study the impact of local capacity on mosquito net usage and fever care seeking patterns. The intervention was conducted simultaneously by three NGOs in two endemic districts in the state of Orissa, and we find that program impact varies significantly by district. Examining three potential sources of this variation (differential population characteristics, differential health worker characteristics, and differential implementer characteristics), we provide evidence that the implementing agency can significantly affect both the success of a program and the external validity of RCT results.

Keywords: Impact evaluation; malaria; India

1 Introduction

Governments and development agencies have increasingly attempted to involve existing local capacity in government program implementation, especially in resource-scare settings. However, the literature has a limited understanding of the challenges of doing so, and many questions remain about how to implement such a policy. This paper utilizes a recent experimental evaluation of a supportive intervention to India's malaria control program to examine whether local capacity significantly influences individual health outcomes targeted by the intervention. This intervention was conducted simultaneously by three NGOs in two endemic districts[1] in the state of Orissa. We find that the program's impact on mosquito net usage and fever care seeking patterns vary significantly by district. Using a Blinder-Oaxaca decomposition, we then examine three potential causes for such different outcomes across districts: (1) differential population characteristics, (2) differential health worker characteristics, and (3) differential implementer characteristics. This paper also touches on external validity concerns of experimental evaluations, especially those implemented by non-state actors or under increased state or researcher monitoring.

The literature on leveraging existing local capacity usually highlights the potential gains from non-state provision of basic services, while striking a cautionary note about its pitfalls. While non-state provision can expand the reach of basic services, the collaboration between governments and non-state actors need not be easy to achieve. Batley [2006] finds that non-state provision of basic services can often be hindered by unsupportive, mistrustful relationships between governments and non-state actors. However, the paper suggests that, if successful, such partnerships can lead to improved service standards, particularly when large NGOs support smaller local actors. Awortwi and Helmsing [2007] study the decentralization of the provision of basic services in sub-Saharan Africa from central governments to non-state actors. They find that the coverage of and access to primary education, primary health care, sanitation, and drinking water improved from this decentralization, although the quality of services continued to vary and geographic inequalities persisted.

But what distinguishes a successful government-NGO collaboration from a troubled one? WBP [2011] is an detailed comparative study on the systematic collaborations between African governments and private health sectors. The report finds significantly greater collaboration with NGOs that are better organized, have been established for a long period of time . The report also highlight the importance of a policy of engagement and information exchange between the government and the private sector. Through a combination of infrastructural support and using government-sourced finances for non-state provision, governments can effectively collaborate with the private health sector. Evidence also points to particularly successful

[1] The National Vector Borne Disease Control Programme defines an area with an Annual Parasite Incidence— confirmed malaria cases in a thousand population— of over five as endemic.

collaborations on disease and immunization programs. Finally, the report notes that government's ability to regulate the private health sector must be accompanied by adequate enforcement capacity and consistent oversight.

Studying the Indian health care context, Berman [1998] documents the low quality of government-provided care and the financial burden of unregulated fee-for-service medicine. The study thus recommends tapping the extensive network of domestic NGOs to enhance the quality and scope of basic services provided, while simultaneously curtailing implementation costs. Discussing the financing of preventive and promotive health care services that require subsidies to be produced or demanded at optimal levels, Bishai et al. [2008] suggest that governments may finance the non-state actors to act as intermediate agents to subsidize network providers. In addition to expanding the reach of basic services, leveraging adequate local capacity can also improve the outcomes of social interventions by targeting them to areas which with well-organized non-state actors [Maluccio, 2010, de Renzio, 2005]. The Nicaraguan CCT program, *Red de Proteccíon* targets areas with significant local institutional capacity. As Rawlings and Rubio [2005] point out, CCTs often take into account local supply capacity constraints in deciding which areas or populations to target; hence, incorporating local private capacity might increase the reach of such CCTs.

The external validity of results from randomized control trials has been questioned by Rodrik [2008] and Deaton [2009], among in others. The impact of local institutional capacity on program outcomes can also have ramifications for the external validity of such results. Indeed, as Bold et al. [2012] demonstrate, whether a program is implemented by government agencies or NGOs can significantly affect its success. The authors study a Kenyan contract teacher intervention to find a significant, positive effect on students' math and English scores in schools randomly assigned to NGO implementation, but no effect in schools assigned to government intervention. Hammer and Spears [2009] highlight the implementation constraints with relying on local capacity, particularly in India: they study a unique experiment where the government had, in agreement with external donors, intended to implement a village-level sanitation program in three districts in Maharashtra, but ultimately only implemented it in one district. Further, Allcott and Mullainathan [2011] examine fourteen experiments run by a power company in different cities across the U.S to find economically and statistically significant variation in treatment effect, despite controlling for several individual-level controls. Our paper joins this literature in raising questions about the external validity of results from RCTs, particularly when the RCT has various implementers. As our results show, different implementing agencies (even if they are all NGOs) can succeed at varying levels, so conclusions based on RCTs should also attempt to account for the impact of the implementer.

2 Intervention Description

Malaria causes eleven percent of all rural deaths in India, with over a million cases of malaria diagnosed annually; however, government efforts to stem the pandemic, increase bed net usage, or improve care-seeking behavior have thus far seen limited success [Sharma et al., 2011]. The east-central states of Orissa, Chhattisgarh, Madhya Pradesh, Jharkhand and West Bengal alone account for 60 percent of all Indian malaria cases [WMR, 2009], with a high incidence of the troublesome chloroquine-resistant malaria. Under the roll out of its National Vector Borne Disease Control Programme (NVBDCP), the government has begun using Rapid Diagnostic Tests (RDT) and Artemisinin-based Antimalarial Combination Therapy (ACT) for Plasmodium falciparum (Pf) malaria, which is resistant to chloroquine. The government has also shifted case management from hospitals and health centers to community health workers known as Accredited Social Health Activists (ASHA). ASHA have been trained to in ACT in fifty endemic districts. Since each village has at least one ASHA, enabling them to diagnose and treat malaria should reduce the time it takes an individual to receive treatment, thereby decreasing morbidity and mortality from malaria. This intervention was designed to reinforce the rollout of the NDBVCP via supportive supervision of ASHA and community mobilization on appropriate care-seeking behavior, such as bed net use and timely care-seeking from a trained provider for febrile illnesses. Although ASHAs tend to have limited schooling or training, evidence suggests that regular and systematic supervision with clearly defined objectives can be a cost-effective way of improving the performance of primary health care volunteers [Das et al., 2008].

2.1 Study area, design and participants

The intervention had two treatment arms: supportive supervision of ASHAs and community mobilization in arm A; and community mobilization alone in arm B. The control arm received the routine activities of the governments malaria control program, i.e. case management by CHWs without any additional supervision or community mobilization. All sample villages are in Sundargarh or Mayurbhanj districts, both of which are on the national list of fifty highly malaria endemic districts identified by the Indian government. Both districts also have a significant scheduled tribe (indigenous) populations as well as populations living in hilly and forested areas. The intervention was conducted in eighty endemic villages (identified from official endemicity data) in both districts. Forty villages, with an average population of about 900, were randomly assigned to each of the two treatment and control arms. Each village had one ASHA, who had been previously recruited by the government. The intervention was divided into two phases planning (September to December of 2009) that included formative research, recruitment and training of project staff; and implementation (January to December 2010). Local NGOs, selected on the basis of experience in community-based project implementation and government recommendations, implemented the intervention. Community-level meetings and participatory social mapping exercises introduced the interventions in treatment villages and allowed project staff to familiarize themselves with the community.

Under supportive supervision, the NGOs provided intensified training, supervision, and support to ASHA. Each ASHA was visited at least twice a month by an NGO worker, and each NGO worker was responsible for 10 ASHA. In the community mobilization component, NGOs were assisted by village health and sanitation committees (VHSC) and womens self-help groups (SHG) in changing preventive and care-seeking behavior. Door-to-door visits by the NGO and SHG attempted to motivate the consistent use of bed nets and timely care seeking from the ASHA for fever. Each SHG member monitored nighttime bed net usage at ten-to-fifteen households. Information campaigns also delivered the following messages: (1) whenever you have fever, visit the ASHA as soon as possible; (2) have your blood tested and take medication from the ASHA if you test positive for malaria; (3) always consume the full course of medication given to you by the ASHA; (4) use bed nets every night; and (5) prioritize net use by pregnant women and young children if you do not have enough bed nets for everyone. The activities were intensified before the malaria transmission season. Following standard government practice all three intervention arms received Long Lasting Insecticide Treated Nets (LLIN) and ASHA in all three arms received training in RDT and ACT.

2.2 Data

Endline data were collected from November 2010 to January 2011 via a household questionnaire and an individual-level questionnaire administered to recent (up to two-weeks preceding the survey) fever cases. The household-level questionnaire recorded household level demographic, socioeconomic and health characteristics, health seeking behavior, knowledge on malaria, and the utilization of bed nets. The individual fever questionnaire collected information on treatment-seeking behavior from recent fever cases. Ten randomly selected households were interviewed for household information in each village. An additional ten respondents were then randomly chosen from the complete list of fever cases in the villages. These respondents were also tested for malaria using RDT.

The sample size calculations focused on two main outcomes of interest: the percentage of households correctly utilizing at least one LLIN and the percentage of fever cases tested for Pf malaria within 24 hours. For the power calculations, we assumed the rate of fever cases tested within 24 hours of onset of symptoms would be 35 percent in control areas and adopted a conservative intra-cluster correlation (ICC) estimate of 0.15. With 40 clusters in each arm, the study is sufficiently powered (significance of 0.05 and power of 0.8) to identify an increase in the prompt fever testing rate of 15 percentage points between either of the treatment arms and the control. Similarly, with 40 clusters in each arm, the study is sufficiently powered (significance of 0.01, power of 0.9, and ICC 0.1) to identify an increase in bed net utilization rate from 35 percent in control areas to an increase of 15 percentage points between either of the treatment arms and the control.

As tables 1 and 2 show, the randomization was largely successful. In both districts, households in arm B are slightly more likely to own a bank account and to own a non-farm enterprise than control households. Household heads in arm A are significantly older than those in arm B or in the control arm. The difference in age between heads in arm B and controls is not significant. In Sundargarh, household heads in arm B are also less likely to be married than those in control villages. Households in Mayurbhanj are significantly smaller than those in Sundargarh, are more likely to be Hindu and less likely to be Scheduled Tribe (table 1 in appendix). They are also more likely to have a bank account and engage in non-farm enterprises, and own a larger number of livestock and poultry. The balance in the fever sample is similar to that in the overall sample (table 2). The Sundargarh fever sample is even more balanced than the general sample, with no significant differences between treatment and control arms, except that households in treatment arm B own one more livestock animal than households in arm A.

3 Results by District

Estimated treatment effects of the intervention on net usage show significant improvements in net usage in Mayurbhanj, but not in Sundargarh. Table 3 shows that net usage is fairly high in both district, with 86 percent of all controls sleeping under a net in Mayurbhanj, and 73 percent in Sundargarh. In Mayurbhanj, compared to controls, a greater fraction of the household sleeps under mosquito nets in each treatment arm. Treatment arm A has a significantly greater impact on net usage than arm B, highlighting the importance of the supportive supervision provided to ASHA. Children under the age five, a subpopulation that is particularly vulnerable to malaria-related morbidity and mortality, also sees significant improvements in net usage. Relative to controls, seven percent more of the children younger than five in arm A sleep under nets. The impact of arm B on net usage among children under five is not significant. The impact of A is again significantly greater than that of arm B. While net usage among pregnant women— another vulnerable subpopulation— is significantly higher in both treatment arms, particularly in arm A, the differences are not significant at the ten percent level, perhaps due to the small sub-sample of pregnant women.

Households from both treatment arms and controls own several mosquito nets— 2.51 on average in Mayurbhanj and 2.72 in Sundargarh; program impact on net ownership is not significant, perhaps because all households in the study received LLINs. Significantly more of, both, the entire household as well as children under five sleep under a net in Mayurbhanj than in Sundargarh, although mosquito net ownership is higher in Sundargarh than in Mayurbhanj. Pooling the data tells us that not examining the results by district would have caused us to overlook the divergence in the outcomes, and that all results, except for net usage by pregnant women, are significantly different in Mayurbhanj than in Sundargarh. We also find, overall, that arm A was more successful than arm B in increasing mosquito net usage.

Table 4 suggests that the intervention, arm A in particular, was successful in making fever patients switch from seeking care from an unskilled provider or even a doctor with an MD to an ASHA. Since care from a skilled doctor can be harder to access than from an ASHA, this shift may proxy for shorter times to treatment. However, Mayurbhanj again drives the significance of program impact. In control villages, only 17 percent of all sampled fever patients saw an ASHA worker. Relative to controls, the likelihood of contacting ASHA upon the onset of fever is 19 percent higher for arm A households and 15 percent higher for arm B households. In arm B, the switch to ASHA comes largely from patients substituting away from doctors with an MD, while in arm A, patients are less likely to see an unskilled provider. In control villages, only 67 percent of the sample reported seeing a skilled healthcare provider in under 24 hours from the onset of fever. In arm A, a patient is 17 percent more likely than controls to receive prompt treatment. None of these impacts are significant for Sundargarh, although there too patients were significantly less likely to contact an unskilled provider on onset of fever.

Indeed, as table 4 highlights, several of these differences are significant across districts. First, patients from both treatment arms in Mayurbhanj are far more likely than patients in Sundargarh to contact an ASHA on onset of fever. Second, all patients, and women of child bearing age in particular, are more likely to receive prompt treatment from a skilled provider in Mayurbhanj than in Sundargarh. Third, children younger than five in arm B are more likely to receive prompt treatment from a skilled provider in Mayurbhanj than in Sundargarh. Fourth, arm A significantly reduces the number of days of work or school lost in Mayurbhanj but not in Sundargarh.[2] Across all arms, however, the loss of school/work days to malaria is significantly higher in Mayurbhanj than in Sundargarh.

Finally, we examine whether fever incidence systematically varies across these districts. Results presented in table 5 suggest that, relative to fever incidence of 19 percent in control villages, treatment arms in Mayurbhanj have a four percent lower fever incidence, significant at the ten percent level. The control fever incidence is 16 percent in Sundargarh, but the rate of incidence in treatment arms is only 0.2 percent lower, and the difference is not significant. Similarly, while arm A in Mayurbhanj lowers fever incidence by four percent (significant at the ten percent level), the impact in Sundargarh is again only -0.2 percent, and not significant. Arm B by itself does not appear to have reduced fever incidence in either district, emphasizing

[2] Note that the control number of days of work or school lost to a recent bout of malaria is higher in Mayurbhanj than in Sundargarh.

the importance of the supportive supervision of ASHA in effecting the likely behavioral changes underlying fever incidence.

The results discussed above demonstrate that whether considering net usage, fever care seeking, or fever incidence, Mayurbhanj experienced much stronger program impacts than Sundargarh, which begs the question: why do we observe such divergent results between the two districts, at least for some key indicators?

4 Discussion of Divergence Using a Blinder-Oaxaca Decomposition

We discuss three potential causes for the divergent results: (1) differential population characteristics, (2) differential system characteristics, and (3) differential implementer characteristics.

The first reason we consider for the divergence in program impacts is systematic differences in population characteristics between Mayurbhanj and Sundargarh. If Mayurbhanj has population characteristics that are conducive to better care seeking behavior, the divergences we observed in the previous section may simply stem from these characteristics and not local capacity. As discussed above, for the most part, randomization was successful across treatment arms. However, the results presented in table 7 indicate that the sub-populations are less balanced across districts: we find significant differences in the religious, caste, and economic composition of the samples. The sample in Mayurbhanj appears to be richer and is more likely to be Hindu than the population in Sundargarh, which may be correlated with the program's divergent outcomes in the two districts.

Another cause of the divergent program outcomes might be differential health system characteristics. Since the bulk of service delivery under this intervention is done by the ASHA, their demographic characteristics may influence program outcomes. Are the ASHA in Mayurbhanj older, and do they have significantly greater experience or training? Table 1 tells us that this is not the case: ASHA in both districts are similarly trained and have similar levels of experience, with the sole significant difference being that ASHA in Mayurbhanj have slightly more initial training (to the tune of half a day more, although the variable is well-balanced within each arm. However, when we consider ASHA motivation, as presented in table 6, we find, again, that Mayurbhanj far outperforms Sundargarh, with significant differences in many outcomes, particularly for arm A. All differences are significant across districts, suggesting that the intervention had a much stronger impact on ASHA motivation in Mayurbhanj than those in Sundargarh. Thus, even though the pre-determined characteristics of ASHA, including age and experience, are very similar across districts, the intervention was much more successful in increasing their motivation levels in Mayurbhanj.

The final cause of divergence in results that we consider is differential implementer characteristics. Comparing the NGO that implemented the intervention in Mayurbhanj (LEPRA) to the two that implemented it in Sundargarh (ANGNA and RRDC), we see in 8 that LEPRA had existed in the state prior to this intervention for significantly longer than the two implementers in Sundargarh (21 years, as opposed to 15 for ANGNA and 15 for RRDC). Although LEPRA had less experience in malaria control than ANGNA or RRDC, they had significantly more staff-level technical expertise. LEPRA's prior malaria control experience also lined up well with the intervention, with its focus on capacity building, informational campaigns and direct service, including street plays and community awareness. ANGNA also participated in informational campaigns and direct service, but also spent time on DDT spraying, which was not relevant for this intervention. RRDC's malaria control activities were restricted to net distribution and DDT spraying, so they had no experience in the supportive supervision or community mobilization aspects of the intervention.

A key component of implementer characteristics is the budget allocated to the project by each NGO. We examine the average monthly budget dedicated to this project as reported by the NGOs to find few significant differences across the three implementers.[3] Since LEPRA implemented the project in two blocks in Mayurbhanj, while ANGNA and RRDC implemented it in one block each in Sundargarh, we report the average monthly per-village budget. As the breakdown of the budget in table 9 shows, the different items receive similar levels of funding from the three NGOs, with a few exceptions where LEPRA spent significantly less than the other two implementers. LEPRA's average monthly per-village budget for field workers (INR INR 282.5) is significantly lower than those of ANGNA and RRDC (INR 800 each); further, LEPRA spent INR 220 on paid volunteers, while ANGNA and RRDC spent INR 420. LEPRA also only spent 519.45 per month per village on community mobilization, while ANGNA and RRDC each spent 1645.83. The only instance where LEPRA spent more is on training: INR 27.75 per month per village versus INR 20.83 for the other two. Hence, the average monthly budget dedicated to the project does not vary much across the three implementers, and where it does, LEPRA spent less than RRDC or ANGNA and yet implementation by the former yielded stronger results. As such is unlikely to explain the significant divergence in results by implementer.

To determine the extent to which the differences in outcomes represent differences in implementation, we construct Blinder-Oaxaca decompositions. We estimate the impact of being in a block treated by LEPRA as compared to in a block treated by ANGNA or RRDC, while controlling for village-level characteristics that might affect malaria outcomes. The Blinder-Oaxaca decomposition [Oaxaca, 1973, Blinder, 1973] explains

[3] The LEPRA budget data are for the periods January 2010 to September 2010 and October 2010 to March 2011. Since January 2011 to March 2011 was not included in the intervention, we assume that the share of different budget items in LEPRA's October 2010 to March 2011 budget was similar to their share in the budget from January 2010 to September 2010, and calculate the average monthly budget based on the data for January 2010 to September 2010.

the gap in the mean values of an outcome between two groups (e.g., LEPRA villages versus ANGNA or RRDC villages) as a function of (1) the "explained" variation arising from average differences in background characteristics and (2) the "unexplained" group differences arising from differences in returns to similar characteristics between the two groups. In other words, villages in Sundargarh outperform the others not only because they are wealthier, but also because LEPRA is a better implementer of the intervention. This decomposition can be written as follows:

$$Y_{1it} = \beta_{1t} X_{1it} + \mu_{1it} \tag{1}$$

$$Y_{2it} = \beta_{2t} X_{1jt} + \mu_{1jt} \tag{2}$$

$$(Y_{1it} - Y_{2it}) = \beta_{1t}(X_{1t} - X_{2t}) + (\beta_{1t} - \beta_{2t}) X_{2t} \tag{3}$$

where the term $\beta_{1t}(X_{1t} - X_{2t})$ is the explained component, while $(\beta_{1t} - \beta_{2t})X_{2t}$ is the unexplained component.

We implemented this decomposition using "oaxaca' command in Stata [Jann, 2008]. This command implements a threefold decomposition, dividing the outcome difference into (1) an *endowment* component, that is the differential due to group differences in the magnitude of predictors, (2) a component that accounts for differences in *coefficients*, including the intercepts, and (3) an *interaction* effect that accounts for simultaneous differences in endowments and coefficients. Thus, the threefold decomposition further refines the "unexplained component" described in equation 3 above into the coefficients and interactions components. The decomposition we implement is formulated from the point-of-view of LEPRA, hence the endowment component tell us the expected change in the mean outcome in LEPRA villages if these villages had the other villages' predictor levels. The coefficients component measures the expected change in LEPRA villages' mean outcome if they had the other villages' coefficients.

For the Blinder-Oaxaca decomposition, we control for the unbalanced characteristics used in the analysis above. However, since isolating the impact of the implementer requires controlling for other village-level characteristics that might affect malaria infection rates, we also add controls for the distance to the nearest paved road, village ASHA worker motivation characteristics, whether the village has obstructed sewers or canals, and whether there are standing stagnant pools of water (excluding marshes, lakes, or ponds) in the village. The results, presented in table 10, considerably vary across outcomes. In general, the endowment effects tell us that if LEPRA villages had the same magnitudes of the predictors as ANGNA and RRDC villages, the outcomes would be worse. For instance, the significant negative endowment effects on First Contact with skilled providers (ANMs, etc. and MDs) and the significant positive endowment effects on Unskilled Provider and No Treatment suggest that had LEPRA villages had the characteristics of the other villages, the care seeking outcomes would have been lower. Similarly, Prompt Treatment by a Skilled Provider would also have been lower in LEPRA villages if they had the characteristics of the other villages. These results are consistent with our overall finding that LEPRA villages (i.e. villages in Mayurbhanj) outperform ANGNA or RRDC villages (i.e. villages in Sundargarh). However, net usage by children under the age of five would have been higher if LEPRA villages had the endowments of ANGNA or RRDC villages.

The interaction effects, on the other hand, tell us that, when accounting simultaneously for endowments and coefficients, overall net usage as well as by children under give would have been lower in LEPRA villages. Care-seeking patterns are also affected by the interaction component: first contact with an MD would have been higher, while first contact with an unskilled provider would have been lower. The prompt treatment of women by skilled providers would have been lower, and the magnitude more than offsets the positive endowments effect. Since the differences between LEPRA villages and ANGNA or RRDC villages was along income and demographic lines (table 7), this raises the question of whether implementers vary effort levels by population characteristics.

The diversity of results from the Blinder-Oaxaca decomposition highlights the differences in the data-generating processes for the various outcomes we consider in this analysis. The results also emphasize the importance of considering implementer characteristics when evaluating programs that were implemented by external organizations. We find, in particular, that while endowments are important, the interaction of the endowments with the coefficients, i.e. the interaction of village characteristics and implementer characteristics, can more than offset the impact of the initial endowments. The results discussed here are robust to choice of specification, and also do not change if we do not pool the villages of treatment arms A and B, as shown in table 11.

5 Conclusion

In this paper, we estimate the impact of a three-pronged RCT to reduce malaria incidence in rural Orissa, India. The first arm received Long Lasting Insecticide-treated Nets (LLINs), community mobilization and intensive supervision of community health workers who are known as ASHA; the second arm received LLINs and community mobilization. The third arm received only LLINs. While overall we find that the program significantly reduced malaria incidence as well as improving care-seeking behavior, we found considerable divergence in the outcomes between the two districts in our sample. In Mayurbhanj district, the intervention appears to have increased net usage from an already high base, particularly for the vulnerable children under five population and pregnant women. In Mayurbhanj, the program has also induced some shift in fever care seeking to ASHA, away from unskilled providers and doctors with MD degrees. We find that the first arm was more successful at getting patients to substitute away from unskilled providers to ASHA, while in the second arm, much of the switch was from MD doctors to ASHA. Recent evidence raises significant questions about the quality of care provided by trained MD doctors in rural India Das et al. [2012]; since the ASHA were intensively trained in testing for and diagnosing malaria, seeking care from an ASHA instead of an MD doctor could lead to a decline in malaria morbidity. In Sundargarh district, however, the intervention appears to have had little significant effect, whether on net usage or care-seeking behavior. In Mayurbhanj, fever incidence in treated villages is significantly lower than in control villages, but there is no such difference between the treated and control villages in Sundargarh.

Next, we attempt to decompose these divergent results into three potential causes: (1) differential population characteristics, (2) differential system characteristics, and (3) differential implementer characteristics, since the intervention was implemented by three separate NGOs (one in Mayurbhanj and two in Sundargarh). If the Mayurbhanj population has certain characteristics (for instance, high average educational attainment or wealth) that make it more receptive to such an intervention, the divergent program outcomes may simply stem from these characteristics. However, we show that the randomization was successful and the sub-populations of Mayurbhanj and Sundargarh are balanced on observables. Next, we examine health system characteristics, as proxied by ASHA characteristics to find that ASHA in both districts have similar levels of experience and training, although ASHA in Mayurbhanj received half a day's more initial training. However, when considering ASHA motivation, an outcome of the intensive supervision, we find that again the program fared much better in Mayurbhanj than in Sundargarh, and the ASHA in the former district are significantly more motivated. Finally, we use a Blinder-Oaxaca decomposition to consider implementer characteristics and find that based on its initial endowments, Mayurbhanj would fare worse than Sundargarh, but that the interaction of the implementer and the endowments make it outperform Sundargarh. In other words, poor areas may benefit more externally-sourced investments. Thus, we highlight the role of implementer characteristics in determining program impact, particularly for programs that are externally implemented.

References

World malaria report 2009. Technical report, World Health Organization, 2009.

How Governments Can Engage the Private Sector to Improve Health in Africa: Healthy Partnerships. Technical report, World Bank, June 2011. URL https://www.wbginvestmentclimate.org/advisory-services/health/upload/Healthy-Partnerships_Full-Rpt-bkmarks-2.pdf.

H. Allcott and S. Mullainathan. External validity and partner selection bias, 2011. Working paper. Available at: http://www.econ.yale.edu/conference/neudc11/papers/paper_437.pdf.

N. Awortwi and A.H.J. Helmsing. Governance of basic services provision in sub-Saharan Africa and the need to shift gear. Technical report, July 2007. URL http://hdl.handle.net/1765/2157.

R. Batley. Engaged or divorced? Cross-service findings on government relations with non-state service-providers. *Public Administration and Development*, 26(3):241–251, 2006.

P.A. Berman. Rethinking health care systems: Private health care provision in India. *World Development*, 26(8):1463 – 1479, 1998.

D.M. Bishai, N.M. Shah, D.G. Walker D.G., W.R. Brieger, and D.H. Peters. Social franchising to improve quality and access in private health care in developing countries. *Harvard Health Policy Review*, 9(1): 184–197, Spring 2008.

A.S. Blinder. Wage discrimination: reduced form and structural estimates. *Journal of Human Resources*, pages 436–455, 1973.

T. Bold, M. Kimenyi, G. Mwabu, A. Ng'ang'a, and J. Sandefur. Interventions & institutions: Experimental evidence on scaling up education reforms in kenya, 2012. Working paper. Available at: http://www.cgdev.org/doc/kenya_rct_webdraft.pdf.

J. Das, A. Holla, V. Das, M. Mohanan, D. Tabak, and B. Chan. In urban and rural india, a standardized patient study showed low levels of provider training and huge quality gaps. *Health Affairs*, 31(12):2774–2784, 2012.

L.K. Das, P. Jambulingam, and C. Sadanandane. Impact of community-based presumptive chloroquine treatment of fever cases on malaria morbidity and mortality in a tribal area in orissa state, india. *Malaria Journal*, 5:7–75, May 2008.

Paolo de Renzio. Increased aid vs absorptive capacity: Challenges and opportunities towards 2015. *IDS Bulletin*, 36(3):20–27, 2005.

A. Deaton. Instruments of development: Randomization in the tropics, and the search for the elusive keys to economic development, 2009. Working paper. Available at: `http://www.nber.org/papers/w14690`.

J. Hammer and D. Spears. Effects of a village sanitation intervention on children's human capital: Evidence from a randomized experiment by the Maharashtra government. Technical report, 2009.

B. Jann. The blinder-oaxaca decomposition for linear regression models. *The Stata Journal*, 8(4):453–479, 2008.

J. A. Maluccio. The impact of conditional cash transfers on consumption and investment in nicaragua. *Journal of Development Studies*, 46(1):14–38, 2010.

R. Oaxaca. Male-female wage differentials in urban labor markets. *International Economic Review*, 14(3): 693–709, 1973.

L. B. Rawlings and G. M. Rubio. Evaluating the impact of conditional cash transfer programs. *The World Bank Research Observer*, 20(1):29–55, Spring 2005.

D. Rodrik. The new development economics: we shall experiment, but how shall we learn?, 2008. Working paper. Available at: `http://ksghome.harvard.edu/~drodrik/The%20New%20Development%20Economics.pdf`.

V. P. Sharma, P. Jha, N. Dhingra, R.M. Jotkar, and R. Peto. Malaria-attributed death rates in india–authors' reply. *The Lancet*, 377(9770):994–995, 2011.

6 Tables

Table 1: Balance between Treatment and Control Arms Across Districts

Mayurbhanj	$\bar{K}$	$\bar{A}$	$\bar{B}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
# Livestock	1.79	1.65	1.60	0.14	0.42	0.19	0.64	0.05	0.78
# Poultry	5.96	5.12	5.55	0.84	0.35	0.41	0.76	−0.44	0.55
Asset Index‡	0.29	0.38	0.32	−0.09	0.31	−0.03	0.77	0.06	0.46
Hindu	0.93	0.95	0.95	−0.02	0.43	−0.02	0.52	0.00	0.85
Scheduled Tribe	0.62	0.56	0.61	0.07	0.52	0.01	0.84	−0.05	0.65
Crop Prev. Season	1.00	0.99	0.98	0.00	0.51	0.01	0.42	0.01	0.84
Bank Account	0.70	0.75	0.80	−0.05	0.27	-0.10^{**}	0.01	−0.05	0.17
Cattle Shed	0.70	0.69	0.63	0.01	0.95	0.07	0.48	0.06	0.56
Head's Gender	0.91	0.91	0.91	0.01	0.65	0.00	0.71	0.00	0.93
Head's Age	45.71	48.94	46.03	-3.23^{*}	0.03	−0.31	0.51	2.92^{*}	0.02
Head Is Married	0.84	0.88	0.87	−0.04	0.28	−0.03	0.35	0.01	0.77
Head Has $< 1°$ Ed.	0.60	0.65	0.60	−0.05	0.27	0.00	0.49	0.05	0.61
Males in W. Labor	0.79	0.69	0.80	0.09	0.06	−0.01	0.76	−0.10	0.11
Females in W. Lab.	0.51	0.42	0.47	0.09	0.17	0.03	0.40	−0.06	0.44
Non-farm Ent.	0.21	0.20	0.33	0.01	0.51	-0.12^{**}	0.01	−0.12	0.07
Fraction of HH < 5	0.11	0.08	0.10	0.03	0.17	0.01	0.94	−0.02	0.23
HH Size	5.20	5.14	5.30	0.06	0.48	−0.10	0.86	−0.16	0.40
ASHA Age	31.42	30.85	31.45	0.57	0.67	−0.03	0.98	−0.60	0.63
ASHA Malaria Exp.	16.32	14.25	22.30	2.07	0.61	−5.98	0.38	−8.05	0.23
ASHA Malaria Train.	3.28	3.00	3.53	0.28	0.32	−0.25	0.42	−0.53	0.05
Sundargarh	$\bar{K}$	$\bar{A}$	$\bar{B}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Livestock	2.92	2.56	3.30	0.36	0.42	−0.38	0.64	−0.74	0.78
Poultry	4.11	4.30	3.89	−0.20	0.35	0.22	0.76	0.41	0.55
Asset Index‡	0.40	0.48	0.43	−0.09	0.31	−0.04	0.77	0.05	0.46
Hindu	0.59	0.63	0.50	−0.04	0.43	0.09	0.52	0.13	0.85
Scheduled Tribe	0.87	0.81	0.86	0.07	0.52	0.01	0.84	−0.05	0.65
Crop Prev. Season	0.97	0.96	0.97	0.01	0.51	0.00	0.42	−0.01	0.84
Bank Account	0.86	0.86	0.83	0.01	0.27	0.03^{**}	0.01	0.02	0.17
Cattle Shed	0.70	0.63	0.69	0.07	0.95	0.01	0.48	−0.06	0.56
Head's Gender	0.94	0.92	0.92	0.02	0.65	0.01	0.71	0.00	0.93
Head's Age	46.16	46.23	46.63	-0.08^{*}	0.03	−0.47	0.51	-0.40^{*}	0.02
Head Is Married	0.91	0.89	0.85	0.02	0.54	0.06^{*}	0.03	0.04	0.15
Head Has $< 1°$ Ed.	0.62	0.65	0.60	−0.03	0.27	0.02	0.49	0.04	0.61
Males in W. Labor	0.79	0.79	0.76	0.01	0.06	0.03	0.76	0.02	0.11
Females in W. Lab.	0.55	0.41	0.46	0.14	0.17	0.09	0.40	−0.05	0.44
Non-farm Ent.	0.15	0.19	0.18	−0.04	0.51	-0.03^{**}	0.01	0.01	0.07
Fraction of HH < 5	0.12	0.12	0.11	0.00	0.17	0.00	0.94	0.00	0.23
HH Size	5.62	5.85	5.84	−0.23	0.48	−0.22	0.86	0.01	0.40
ASHA Age	30.28	33.74	34.63	−3.46	0.07	−4.35	0.02	−0.89	0.66
ASHA Malaria Exp.	12.94	16.53	17.74	−3.58	0.23	−4.79	0.20	−1.21	0.77
ASHA Malaria Train.	2.78	2.95	2.84	−0.17	0.61	−0.06	0.84	0.11	0.76

There are 120 villages in the sample; 40 in treatment arm A, 40 in treatment arm B, and 40 are internal controls
There are 2344 households in the sample; 788 in arm A, 781 in arm B, and 775 internal controls.
* $p < 0.05$, ** $p < 0.01$. All p-values correspond to standard errors clustered at the village level.
‡The asset index used in this paper uses the weights from the principal component analysis conducted by Filmer and Pritchett (2001) on the nationally representative data from the 1998-99 wave of the National Family Health Survey.

Table 2: Balance between Treatment and Control Arms in Fever Sample

Mayurbhanj	$\bar{K}$	$\bar{A}$	$\bar{B}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Livestock	1.77	1.68	1.47	0.10	0.69	0.30	0.22	0.20	0.37
Poultry	5.64	4.92	5.14	0.73	0.57	0.50	0.69	−0.23	0.84
Asset Index‡	0.27	0.34	0.30	−0.07	0.45	−0.03	0.77	0.05	0.60
Hindu	0.92	0.94	0.94	−0.03	0.55	−0.02	0.50	0.00	0.97
Scheduled Tribe	0.58	0.50	0.58	0.08	0.42	0.00	0.97	−0.07	0.41
Crop Prev. Season	1.00	1.00	0.98	0.00		0.02	0.17	0.02	0.17
Bank Account	0.71	0.76	0.80	−0.05	0.35	−0.09	0.15	−0.04	0.49
Cattle Shed	0.72	0.71	0.61	0.02	0.81	0.11	0.13	0.10	0.22
Head's Gender	0.93	0.90	0.91	0.03	0.28	0.02	0.50	−0.01	0.62
Head's Age	47.12	50.79	46.59	-3.68^{*}	0.03	0.53	0.75	4.20^{**}	0.01
Head Is Married	0.85	0.85	0.89	0.00	0.88	−0.04	0.22	−0.04	0.33
Head Has $< 1^{\circ}$ Ed.	0.65	0.69	0.60	−0.03	0.52	0.06	0.33	0.09	0.12
Males in W. Labor	0.76	0.69	0.81	0.07	0.26	−0.05	0.37	-0.12^{*}	0.04
Females in W. Lab.	0.49	0.40	0.48	0.10	0.11	0.02	0.77	−0.08	0.21
Non-farm Ent.	0.22	0.15	0.29	0.07	0.22	−0.07	0.17	-0.14^{**}	0.01
Fraction of HH < 5	0.11	0.07	0.10	0.04^{**}	0.00	0.01	0.34	-0.03^{*}	0.04
HH Size	5.16	5.26	5.36	−0.10	0.69	−0.20	0.42	−0.10	0.65
Sundargarh	$\bar{K}$	$\bar{A}$	$\bar{B}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Livestock	2.93	2.46	3.51	0.47	0.25	−0.58	0.27	-1.05^{*}	0.04
Poultry	4.28	4.10	3.94	0.18	0.78	0.34	0.59	0.16	0.81
Asset Index‡	0.42	0.47	0.46	−0.05	0.55	−0.04	0.68	0.01	0.92
Hindu	0.61	0.68	0.50	−0.07	0.46	0.11	0.27	0.18	0.06
Scheduled Tribe	0.84	0.76	0.84	0.08	0.24	0.01	0.91	−0.07	0.29
Crop Prev. Season	0.97	0.95	0.97	0.02	0.50	0.00	0.98	−0.02	0.48
Bank Account	0.85	0.83	0.87	0.03	0.66	−0.01	0.84	−0.04	0.42
Cattle Shed	0.68	0.62	0.72	0.06	0.33	−0.04	0.56	−0.10	0.08
Head's Gender	0.93	0.93	0.94	0.00	0.99	−0.01	0.75	−0.01	0.68
Head's Age	46.70	45.90	45.97	0.80	0.59	0.73	0.64	−0.07	0.96
Head Is Married	0.91	0.91	0.92	0.00	0.89	0.01	0.89	−0.01	0.78
Head Has $< 1^{\circ}$ Ed.	0.59	0.64	0.59	−0.05	0.41	0.00	0.94	0.05	0.34
Males in W. Labor	0.78	0.80	0.77	−0.02	0.72	0.02	0.80	0.04	0.55
Females in W. Lab.	0.54	0.43	0.44	0.12	0.16	0.10	0.26	−0.02	0.84
Non-farm Ent.	0.18	0.22	0.20	−0.04	0.28	−0.02	0.68	0.02	0.69
Fraction of HH < 5	0.12	0.12	0.12	0.00	0.87	0.00	0.93	0.00	0.80
HH Size	5.77	5.72	6.02	0.05	0.86	−0.25	0.36	−0.30	0.25

There are 120 villages in the sample; 40 in treatment arm A, 40 in treatment arm B, and 40 are internal controls
There are 2344 households in the sample; 788 in arm A, 781 in arm B, and 775 internal controls.
* $p < 0.05$, ** $p < 0.01$. All p-values correspond to standard errors clustered at the village level.
‡The asset index used in this paper uses the weights from the principal component analysis conducted by Filmer and Pritchett (2001) on the nationally representative data from the 1998-99 wave of the National Family Health Survey.

Table 3: Impact of Supportive Intervention on Mosquito Net Usage Across Districts

Mayurbhanj	$\bar{K}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Fraction Under Net	0.86	0.09**	0.00	0.04*	0.03	-0.05**	0.00
Fraction of Under Fives Under Net	0.85	0.07*	0.02	-0.02	0.52	-0.09*	0.004
Net Use by Pregnant Women†	0.83	0.13	0.16	0.02	0.80	-0.10	0.16
Number of Mosquito Nets Owned by HH	2.51	-0.03	0.82	0.13	0.30	0.16	0.23
Sundargarh	$\bar{K}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Fraction Under Net	0.73	0.03	0.45	0.05	0.16	0.02	0.37
Fraction of Under Fives Under Net	0.77	0.07	0.06	-0.01	0.87	-0.08*	0.04
Net Use by Pregnant Women†	0.82	0.08	0.50	0.12	0.36	0.03	0.69
Number of Mosquito Nets Owned by HH	2.72	0.19	0.20	0.27	0.09	0.07	0.65
Pooled	p_{KA}	p_{KB}	p_{AB}	p_{distt}			
Fraction Under Net	0.46	0.37	0.01**	0.00**			
Fraction of Under Fives Under Net	0.98	0.79	0.58	0.01**			
Net Use by Pregnant Women	0.18	0.29	0.22	0.066			
Number of Mosquito Nets Owned by HH	0.34	0.39	0.68	0.00**			

There are a 120 villages in the sample; 40 in treatment arm A, 40 in treatment arm B, and 40 are internal controls.

There are 2344 households in the sample; 788 in arm A, 781 in arm B, and 775 internal controls.

* $p < 0.05$, ** $p < 0.01$. All p-values correspond to standard errors clustered at the village level.

†The corresponding survey question asks currently pregnant women, "During pregnancy, did/do you sleep under mosquito net?"

Table 4: Impact of Supportive Intervention on Fever Care Seeking Across Districts

Mayurbhanj	$\bar{K}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
First Contact– ASHA	0.17	0.19**	0.01	0.15**	0.01	-0.04	0.61
First Contact– ANM, AWW, MPW, HW	0.08	0.01	0.74	0.06	0.08	0.05	0.14
First Contact– MD	0.47	-0.09	0.14	-0.15**	0.01	-0.06	0.22
First Contact– Unskilled Provider	0.21	-0.10*	0.05	-0.07	0.17	0.03	0.41
No Treatment Sought	0.06	-0.01	0.67	0.01	0.80	0.02	0.53
Prompt Treatment by Skilled Provider†	0.54	0.17**	0.00	0.10	0.10	-0.08	0.16
Prompt Treatment by Skilled Prov.– Women†§	0.67	0.13	0.13	0.07	0.42	-0.06	0.35
Prompt Treatment by Skilled Prov.– U5†	0.66	0.26*	0.03	0.03	0.79	-0.23*	0.02
Sundargarh	$\bar{K}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
First Contact– ASHA	0.20	-0.01	0.88	0.03	0.66	0.03	0.55
First Contact– ANM, AWW, MPW, HW	0.10	0.05	0.29	-0.01	0.89	-0.05	0.20
First Contact– MD	0.43	0.04	0.51	0.05	0.39	0.01	0.84
First Contact– Unskilled Provider	0.20	-0.09*	0.03	-0.07	0.14	0.03	0.41
No Treatment Sought	0.07	0.02	0.59	0.00	0.88	-0.02	0.52
Prompt Treatment by Skilled Provider†	0.47	0.03	0.54	0.08	0.19	0.04	0.46
Prompt Treatment by Skilled Prov.– Women†§	0.51	0.11	0.36	0.03	0.74	-0.08	0.48
Prompt Treatment by Skilled Prov.– U5†	0.62	-0.04	0.75	0.14	0.15	0.17	0.11
Pooled	p_{KA}	p_{KB}	p_{AB}	p_{distt}			
First Contact– ASHA	0.02*	0.00*	0.43	0.04*			
First Contact– ANM, AWW, MPW, HW	0.48	0.07	0.05 *	0.61			
First Contact– MD	0.12	0.01**	0.34	0.05*			
First Contact– Unskilled Provider	0.93	0.17	0.97	0.51			
No Treatment Sought	0.49	0.8	0.36	0.40			
Prompt Treatment by Skilled Provider.	0.08	0.09	0.13	0.00**			
Prompt Treatment by Skilled Prov.– Women	0.87	0.41	0.90	0.00**			
Prompt Treatment by Skilled Prov.– U5	0.07	0.78	0.00 **	0.18			

There are a 120 villages in the sample; 40 in treatment arm A, 40 in treatment arm B, and 40 are internal controls.

There are 2344 households in the sample; 788 in arm A, 781 in arm B, and 775 internal controls.

* $p < 0.05$, ** $p < 0.01$. All p-values correspond to standard errors clustered at the village level.

†Defined as a fever patient contacting a skilled healthcare provider in less than 24 hours after the onset of fever.

§The female sample is restricted to women of child bearing age only, i.e. between 15 and 49 years of age.

‡The number of days of school missed by school-age children and the number of days of work missed by adults due to malaria.

Table 5: Impact of Supportive Intervention on Fever Incidence Across Districts

	$\bar{K}$	$\bar{K}-\bar{AB}$	p_{KAB}	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Mayurbhanj	0.19	-0.04	0.07	-0.04	0.09	-0.04	0.22	0.01	0.69
Sundargarh	0.16	-0.002	0.33	-0.002	0.93	-0.01	0.64	-0.01	0.68
Significance of Diff			0.21		0.19		0.46		0.57

There are a 120 villages in the sample; 40 in treatment arm A, 40 in treatment arm B, and 40 are internal controls.

There are 2344 households in the sample; 788 in arm A, 781 in arm B, and 775 internal controls.

* $p < 0.05$, ** $p < 0.01$. All p-values correspond to standard errors clustered at the village level.

†Defined as a fever patient contacting a skilled healthcare provider in less than 24 hours after the onset of fever.

§The female sample is restricted to women of child bearing age only, i.e. between 15 and 49 years of age.

‡The number of days of school missed by school-age children and the number of days of work missed by adults due to malaria.

Table 6: Impact of Supportive Intervention on Community Health Worker (ASHA) Motivation Across Districts

Mayurbhanj	$\bar{K}$	$\bar{A}$	$\bar{B}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Self Efficacy	4.36	4.78	4.50	-0.42^{**}	0.01	-0.14	0.41	-0.14^{*}	0.02
Job Motivation	2.92	3.23	3.19	-0.31	0.10	-0.28	0.14	-0.28	0.87
Autonomy	4.63	4.95	4.77	-0.32^{**}	0.01	-0.14	0.34	-0.14	0.08
Job Satisfaction	4.65	4.85	4.65	-0.20	0.23	0.00	1.00	0.00	0.13
Supervision and Support	4.28	4.83	4.54	-0.55^{**}	0.01	-0.26	0.23	-0.26	0.06
Workload	4.23	4.83	4.52	-0.61^{**}	0.01	-0.29	0.25	-0.29	0.07
Professional Recognition	4.46	4.86	4.43	-0.40^{*}	0.04	0.04	0.88	0.04^{*}	0.02
Sundargarh	$\bar{K}$	$\bar{A}$	$\bar{B}$	$\bar{K}-\bar{A}$	p_{KA}	$\bar{K}-\bar{B}$	p_{KB}	$\bar{A}-\bar{B}$	p_{AB}
Self Efficacy	3.24	3.31	3.54	-0.07	0.68	-0.30	0.07	-0.23	0.17
Job Motivation	3.11	3.12	3.22	-0.01	0.95	-0.11	0.56	-0.10	0.56
Autonomy	3.69	3.74	3.91	-0.05	0.78	-0.23	0.26	-0.18	0.34
Burnout	3.44	3.68	3.50	-0.24	0.56	-0.06	0.90	0.18	0.67
Job Satisfaction	4.09	4.00	4.19	0.09	0.69	-0.10	0.66	-0.19	0.25
Supervision and Support	3.58	3.78	4.03	-0.19	0.39	-0.44^{*}	0.03	-0.25	0.24
Workload	3.44	2.95	3.09	0.50^{*}	0.02	0.36	0.10	-0.14	0.49
Professional Recognition	2.85	3.05	3.14	-0.21	0.41	-0.30	0.21	-0.09	0.72
Pooled	p_{KA}	p_{KB}	p_{AB}	p_{distt}					
Self Efficacy	0.12	0.49	0.01^{**}	0.00^{**}					
Job Motivation	0.36	0.51	0.76	0.00^{**}					
Autonomy	0.21	0.7	0.09	0.00^{**}					
Burnout	1	0.55	0.53	0.00^{**}					
Job Satisfaction	0.3	0.73	0.06	0.00^{**}					
Supervision and Support	0.23	0.53	0.04^{*}	0.00^{**}					
Workload	0.00^{**}	0.05^{*}	0.09	0.00^{**}					
Professional Recognition	0.53	0.32	0.09	0.00^{**}					

There are 120 villages in the sample; 40 in treatment arm A, 40 in treatment arm B, and 40 are internal controls

There are 115 ASHA community health workers in the sample; 39 in each treatment arm, 37 in the internal controls arm.

* $p < 0.05$, ** $p < 0.01$. All p-values correspond to standard errors clustered at the village level.

Table 7: Significance of Differences in Balance Across Districts

General Sample	Mayurbhanj p value	Sundargarh p value	Mayurbhanj vs. Sundargarh
Livestock	0.17	0.84	0.00**
Poultry	0.23	0.85	0.00**
Asset Index	0.21	0.15	0.1
Hindu	0.14	0.33	0.00**
Scheduled Tribe	0.20	0.09	0.00**
Cropped in Past Season	0.18	0.84	0.02*
Bank Account	0.00**	0.44	0.00**
Cattle Shed	0.20	0.11	0.92
Head's Gender	0.87	0.43	0.29
Head's Age	0.02*	0.95	0.56
Head's Marital Status	0.17	0.81	0.17
Head Has $< 1^\circ$ Ed.	0.05 *	0.48	0.17
Males in Wage Labor	0.12	0.54	0.63
Females in Wage Labor	0.05*	0.00**	0.9
HH Has Non-farm Enterprise	0.04*	0.38	0.00**
Fraction of HH Under 5	0.05 *	0.67	0.2
Household Size	0.86	0.16	0.00**
ASHA Age	0.82	0.02*	0.08
ASHA Malaria Exp.	0.71	0.19	0.52
ASHA Malaria Train.	0.95	0.69	0.02*
Fever Sample	Mayurbhanj p value	Sundargarh p value	Mayurbhanj vs. Sundargarh
Livestock	0.20	0.94	0.00**
Poultry	0.39	0.65	0.05
Asset Index	0.47	0.54	0.00**
Hindu	0.25	0.55	0.00**
Scheduled Tribe	0.35	0.20	0.00**
Cropped in Past Season	0.19	0.81	0.00**
Bank Account	0.06	0.85	0.01**
Cattle Shed	0.12	0.67	0.9
Head's Gender	0.33	0.78	0.17
Head's Age	0.16	0.42	0.04
Head's Marital Status	0.49	0.64	0.01**
Head Has $< 1^\circ$ Ed.	0.05*	0.34	0.21
Males in Wage Labor	0.82	1.00	0.33
Females in Wage Labor	0.19	0.00**	0.73
HH Has Non-farm Enterprise	0.95	0.63	0.49
Fraction of HH Under 5	0.02*	0.98	0.00**
Household Size	0.43	0.85	0.00**

* $p < 0.05$, ** $p < 0.01$. All p-values correspond to standard errors clustered at the village level.

Table 8: Descriptive Characteristics of Implementing Agencies

	Mayurbhanj (LEPRA)	Sundargarh (ANGNA)	Sundargarh (RRDC)
Years Existed (pre-IE)	21	15	17
Years in District (pre-IE)	13	15	17
Malaria Control Experience (yrs.; pre-IE)	4	8	5
Staff Experience (yrs.)	8.22	5	5.6
Staff Experience in Development (yrs.)	7.67	5	2.6
Number of Technical Staff	6	0	0
Number of Staff with Masters Deg.	5	0	8
Key Activities in Malaria Control	Education Direct Service Capacity Building	Education Direct Service DDT Spray	Net Distribution DDT Spray

Table 9: Average Monthly Per-village Budgets (in INR) for the Three NGOs

	Mayurbhanj (LEPRA)	Sundargarh (ANGNA)	Sundargarh (RRDC)
Field Coordinator	282.5	-	800
Field Worker	520	630	630
Paid Volunteer	220	420	420
Training	27.75	20.83	20.83
Stationery	75	175	185
Community Mobilization	519.45	1645.83	1645.83
Overhead	261.97	289.17	369.17
Total	1906.69	3180.83	4060.84

Table 10: Blinder-Oaxaca Decomposition: Lepra versus Other NGOS

Pooled Data	Differences	Endowments	Coefficients	Interaction
Fraction Under Net	-0.14	-0.02	0.00	-0.13
	(-1.30)	(-0.51)	(0.04)	(-2.32)
Fraction Under 5s Under Net	-0.08	0.19	0.07	-0.35
	(10.78)**	(2.95)**	(0.92)	(-3.37)**
Net Use by Preg Women	0.00	0.28	-0.60	0.32
	(7.27)**	(1.82)	(-3.48)**	(1.41)
Number of Mosquito Nets	0.30	0.35	0.20	-0.25
	(5.44)**	(1.47)	(0.88)	(-0.77)
First Contact– ASHA	-0.07	0.22	-0.09	-0.20
	(9.21)**	(1.60)	(-0.92)	(-1.25)
First Contact– ANM, AWW etc.	0.01	-0.20	0.10	0.11
	(-11.70)**	(-3.25)**	(1.55)	(1.24)
First Contact– MD	0.07	-0.44	0.01	0.51
	(-17.68)**	(-4.56)**	(0.06)	(3.67)**
First Contact– Unskilled Provider	-0.02	0.27	-0.03	-0.26
	(15.52)**	(3.15)**	(-0.45)	(-2.25)*
No Treatment Sought	0.02	0.15	0.02	-0.15
	(12.95)**	(2.26)*	(0.39)	(-1.98)*
Prompt Treatment by Skilled Provider	-0.06	-0.12	0.02	0.04
	(-9.61)**	(-2.17)*	(0.48)	(0.52)
Prompt Treat. by Skilled Prov.– U5	0.04	0.02	0.11	-0.09
	(1.12)	(0.26)	(1.89)	(-1.07)
Prompt Treat. by Skilled Prov.– Women	-0.06	0.27	0.00	-0.33
	(15.10)**	(2.60)**	(0.02)	(-2.88)**

* $p < 0.05$, ** $p < 0.01$.
t-stats in parentheses

Table 11: Blinder-Oaxaca Decomposition: Lepra versus Other NGOS

Pooled Data	*Treatment Arm A*				*Treatment Arm B*			
	$\bar{K}-\bar{A}$	Endowments	Coefficients	Interaction	$\bar{K}-\bar{B}$	Endowments	Coefficients	Interaction
Fraction Under Net	-0.16	-0.01	0.09	-0.24	-0.12	0.02	0.05	-0.19
	(-0.33)	(-0.13)	-1.71	(-3.53)**	-1.28	-0.59	-0.83	(-2.68)
Under 5s Under Net	-0.09	0.21	0.21	-0.51	-0.09	0.23	0.05	-0.38
	(10.02)**	(2.70)**	(2.14)*	(-4.02)**	(10.28)**	(2.71)**	-0.75	(-3.46)**
Net Use by Preg Women	-0.01	0.2	-0.02	-0.19	0.02	0.21	-0.57	0.38
	(3.86)**	-0.36	(-0.12)	(-0.33)	(4.01)**	-1.12	(-3.03)**	-1.43
Number of Mosquito Nets	0.26	-0.19	0.37	0.08	0.33	0.78	0.44	-0.89
	(-2.73)**	(-0.75)	-1.67	-0.24	(9.46)**	(2.94)**	-1.5	(-2.28)*
First Contact: ASHA	-0.07	0.39	-0.07	-0.38	-0.03	0.13	-0.12	-0.04
	(13.31)**	(2.09)*	(-0.73)	(-1.81)	(4.25)**	-0.83	(-1.10)	(-0.19)
First Contact: ANM, etc.	0.03	-0.35	0.06	0.33	-0.02	-0.18	0.06	0.1
	(-15.13)**	(-4.71)**	-0.6	(2.63)**	(-10.15)**	(-2.28)*	-1.21	-1.05
First Contact: MD	0.03	-0.52	0.1	0.44	0.06	-0.35	0.07	0.35
	(-17.34)**	(-4.25)**	(0.94)	(2.74)**	(-11.49)**	(-2.63)**	(0.61)	(2.02)*
First Contact: Unskilled	-0.02	0.38	-0.22	-0.17	-0.02	0.28	-0.01	-0.29
	(16.54)**	(2.75)**	(-2.43)*	(-1.07)	(11.90)**	(2.20)*	(-0.14)	(-1.82)
No Treatment Sought	0.03	0.11	0.13	-0.22	0	0.12	0	-0.12
	(7.48)**	-1.32	(2.29)*	(-2.15)*	(9.33)**	(1.95)	-0.01	(-1.57)
Prompt Treat, Skilled	-0.07	-0.15	0.13	-0.05	-0.04	-0.1	0	0.06
	(-10.87)**	(-2.12)*	(2.46)*	(-0.55)	(-6.54)**	(-1.26)	-0.02	-0.69
Prompt Treat, Skilled	0.02	0.08	0.04	-0.1	0.05	0	0.06	-0.01
– Under 5	(5.30)**	-1.12	-0.74	(-1.15)	-0.23	-0.06	-1.13	(-0.13)
Prompt Treat, Skilled	-0.05	0.32	0.09	-0.46	-0.07	0.13	-0.01	-0.19
– Women	(13.54)**	(2.50)*	-1.06	(-2.97)**	(6.98)**	-0.88	(-0.19)	(-1.17)

* $p < 0.05$, ** $p < 0.01$. t-stats in parentheses.