

Can informal health providers help improve health?

Experimental evidence from Nigeria

Pedro Carneiro, University College London

Michell Yoonjei Dong, World Bank & KDI School of Public Policy and Management

Sanghmitra Gautam, University of Washington in Saint Louis

Marcus Holmlund, World Bank

1. **Main challenge: poor people do not seek adequate health care**
 - households with malaria tend to self-diagnose and buy over-the-counter medication (Dupas 2011; Cohen et al. 2011)
 - reluctant to seek formal care due to long waiting times, high user fees, and transportation costs (Gertler et al. 1987; Ogunfowokan and Mora 2012)

1. Main challenge: poor people do not seek adequate health care

- households with malaria tend to self-diagnose and buy over-the-counter medication (Dupas 2011; Cohen et al. 2011)
- reluctant to seek formal care due to long waiting times, high user fees, and transportation costs (Gertler et al. 1987; Ogunfowokan and Mora 2012)

2. Potential Solutions

- Increase demand for formal health care?
 - Importance of formal care (Adhvaryu and Nyshadham 2015)
 - [Low quality of services at public health facilities](#) (Das et al. 2008; Bedoya et al. 2020)
- Increase quality and supply of existing (informal) sources of healthcare
 - In Nigeria, drug vendors are the first source of treatment where people seek care from when they are sick (DHS 2013).
 - Informal providers are preferred since they have flexible working hours and offer more rapid services (World Bank 2015).
 - [What we do!](#)

1. Research question:

- Can improving access to informal health providers increase health of households in developing countries?

2. What we do:

- Use [cluster-randomized controlled trial](#) to evaluate the effectiveness of involving non-traditional health services providers in malaria prevention and treatment in Southern Nigeria
 - Identify two important informal health providers in the region - community-directed distributors (CDDs) and patent medicine vendors (PMVs)
 - Randomly assign 280 wards in Anambra into four study arms - (i) CDD; (ii) PMV; (iii) CDD+PMV; (iv) control arm
- Understand the [heterogeneous treatment effect](#) by quality of formal health services

Preview of Findings

1. Main Findings:

- ↑↑ household knowledge on malaria
- no change in preventive activities or care-seeking behavior
- ↓↓ malaria prevalence across treatment villages

2. Potential Mechanism:

- Higher impact in wards with better quality primary health facility
 - Complementary effect between non-traditional health workers and the existing public health system
- Non-poor households are more likely to benefit from the intervention
 - Financial constraints prevent poor households from translating their improved knowledge into behaviors.

1. Context and Intervention Design
2. Data and Empirical Strategy
3. Estimation Results
4. Heterogeneity
5. Potential Mechanism

1. Context and Intervention Design

- **Malaria is the leading health burden in Nigeria.**
 - In 2015, 27 percent of children under five were tested malaria positive (Malaria Indicator Survey).
 - Economic cost of malaria in Nigeria has been estimated to be 13 percent of the country's GDP (Jimoh et al. 2007).
- **Our study takes place in Anambra State.**
 - In Anambra, 10 percent of children under five were tested malaria positive (2015 Malaria Indicator Survey).
 - The state has 327 wards, of which 280 were included in the study area for the impact evaluation.
 - There are 382 public primary health facilities, each covering approximately 10,936 individuals.

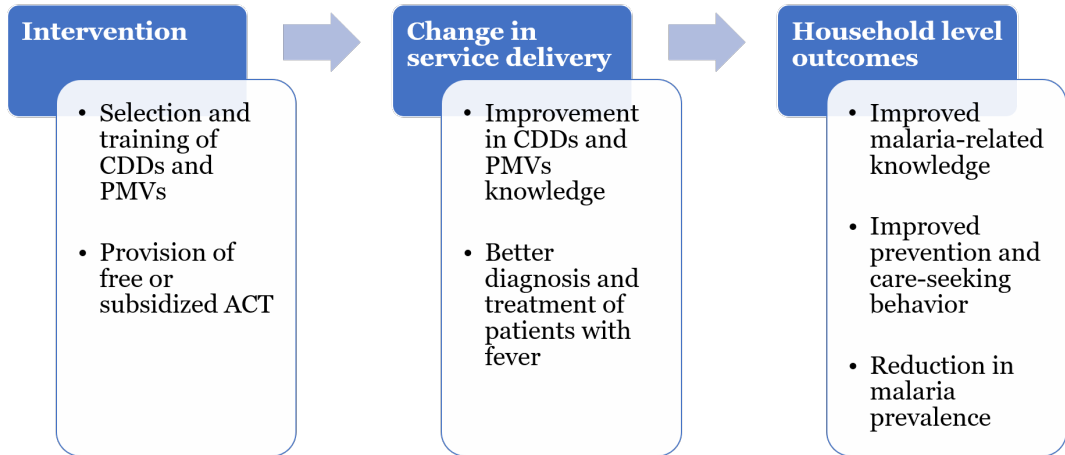
CDDs

- CDDs serve as health workers for members of their community.
- 4,176 CDDs from Anambra were trained on malaria prevention, diagnosis and treatment.
- Malaria drugs were provided **for free for CDDs**.

PMVs

- PMVs are private entrepreneurs running service outlets and selling medicines.
- 979 PMVs from Anambra were trained on malaria prevention, diagnosis and treatment.
- Malaria drugs were **subsidized for PMVs** to be passed through to consumers.

Causal Chain



Main Outcome of Interest

1. Knowledge

- Main cause of malaria
- Danger signs of malaria
- Most vulnerable group to malaria
- Best protection against malaria
- Best treatment for malaria as ACT
- Knowledge on RDT

2. Preventive activities

- Have at least one mosquito net
- Sprayed dwelling in the past 12 months
- Percentage of household members sleeping under a net is higher than 50
- Used mosquito net against malaria

3. Malaria prevalence

- Malaria prevalence for children under five and children 5-12

2. Data and Empirical Strategy

- Baseline data collected in 2013 and endline data collected in 2015
- Collected data from both supply and demand-side actors
 - household, community, PMVs, CDDs, and PHF workers
- Total sample consists of approximately 4,200 households per wave
 - Conducted biomedical test for children under 12

$$\begin{aligned} Var_{ijs} = & \beta_0 + \beta_1 CDD_j + \beta_2 PMV_j + \beta_3 (CDD + PMV)_j \\ & + X_{js}\gamma + \delta_s + \varepsilon_{ijs} \end{aligned} \tag{1}$$

- Var_{ijs} : Outcome for individual i , ward j , and senatorial district s
- X_{js} : Vector of ward-level control variables measured at baseline
- δ_s : Senatorial district fixed effects
- Standard errors are clustered at ward level

3. Estimation Results

Main Result

	(1) Knowledge	(2) Behavior	(3) ACT Treated	(4) RDT under five	(5) RDT 5-12
CDD	0.171** (0.072)	0.004 (0.086)	0.030 (0.035)	-0.009 (0.020)	-0.061* (0.033)
PMV	0.257*** (0.066)	0.020 (0.085)	0.075* (0.040)	-0.036** (0.018)	-0.030 (0.034)
CDD+PMV	0.263*** (0.065)	0.045 (0.076)	0.053 (0.038)	-0.013 (0.021)	-0.070** (0.030)
Observations	4,265	4,265	1,978	1,931	1,550
Control	YES	YES	YES	YES	YES
Strata FE	YES	YES	YES	YES	YES
Control group mean	-0.184	0.000	0.231	0.0854	0.186

- Break in the causal pathway between knowledge and behavior suggests that the intervention was not sufficient to change household's care-seeking behaviors.
- The lower malaria prevalence in the treatment arms suggests that there could be another mechanism, possibly on the supply-side.

4. Heterogeneity

1. Why PHF quality?

- There is a large variation in the quality of health facilities, which is one of the main barriers to better health outcomes in low-income countries (Das and Hammer 2014).
- Importance of quality of health facilities and implementing agency (Das et al. 2017; Cameron et al. 2019)

2. PHF quality index

- Select PHF characteristics that best predict baseline malaria prevalence using LASSO method
- Create PHF quality index based on the selected PHF quality variables
- Categorize into above-median and below-median PHFs
- Community characteristics do not differ by PHF quality

PHF Quality Index

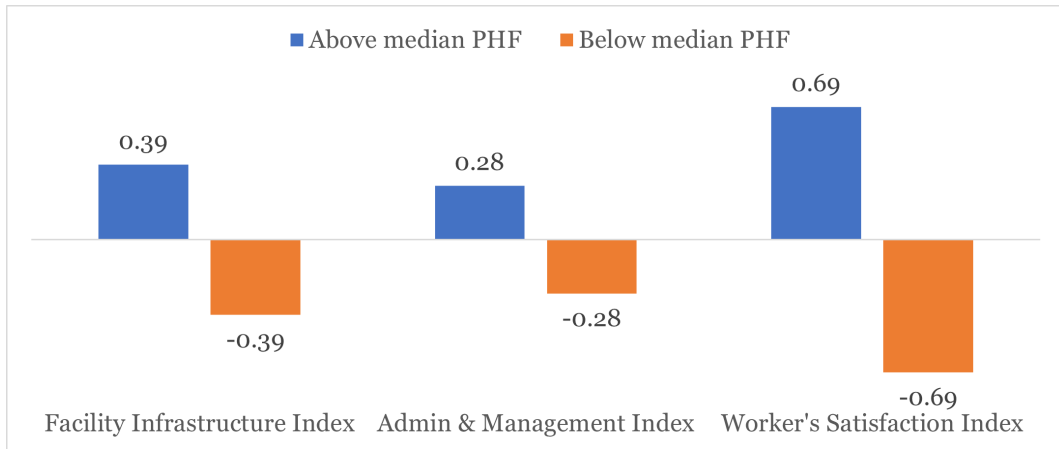


Figure 1: PHF Quality Index

By PHF Quality

	(1) knowledge low	(2) index high	(3) behavior low	(4) index high	(5) rdt under5 low	(6) rdt under5 high	(7) rdt 5-12 low	(8) rdt 5-12 high
CDD	0.037 (0.101)	0.278*** (0.092)	-0.155 (0.117)	0.148 (0.115)	-0.002 (0.027)	-0.026 (0.032)	-0.067 (0.043)	-0.077* (0.042)
PMV	0.116 (0.087)	0.378*** (0.097)	-0.032 (0.124)	0.036 (0.112)	-0.022 (0.025)	-0.057** (0.029)	0.028 (0.049)	-0.104** (0.040)
CDD+PMV	0.130 (0.083)	0.380*** (0.097)	0.023 (0.109)	0.053 (0.103)	0.008 (0.027)	-0.035 (0.031)	-0.039 (0.040)	-0.068 (0.049)
Observations	2,110	2,155	2,110	2,155	734	728	536	535
Control	YES	YES	YES	YES	YES	YES	YES	YES
Strata FE	YES	YES	YES	YES	YES	YES	YES	YES

5. Potential Mechanism

Why is PHF quality important?

1. Stock-out issue

- Drug stock-out is a well-documented problem in Nigeria
 - * 57% of CDDs and 24% of PMVs experienced at least one **stock-out of ACT** at endline
- Above-median PHFs (and informal health providers in these areas) are **less likely to suffer** from drug stock-outs

2. Referral activities

- CDDs and PMVs refer their patients to nearby health facilities for complicated malaria
 - * **Complementary effect** between informal health providers and the existing public health system

Drug availability of PHF

	(1)	(2)
	Availability of ACT	
	above-median PHF	below-median PHF
CDD	0.551** (0.229)	-0.059 (0.261)
PMV	0.107 (0.229)	-0.406 (0.261)
CDD+PMV	0.491** (0.235)	-0.245 (0.252)
Constant	-0.109 (0.153)	0.031 (0.195)
Observations	133	131
R-squared	0.060	0.025

1. Main obstacles in translating improved knowledge into behaviors?

- Financial constraints prevented **poor households** from having access to ACT
- Treatment effect stronger for **non-poor households**
 - More educated households are more likely to process and adopt the new information or technology (Dupas, 2011)

By asset index

	(1)	(2)	(3)	(4)	(5)	(6)
	Knowledge score		ACT treated		RDT 5-12	
	poor	non-poor	poor	non-poor	poor	non-poor
CDD	0.376*** (0.114)	0.168 (0.113)	0.019 (0.065)	0.097** (0.048)	-0.062 (0.055)	-0.121** (0.057)
PMV	0.403*** (0.118)	0.394*** (0.109)	0.021 (0.068)	0.217*** (0.066)	-0.059 (0.056)	-0.169*** (0.060)
CDD+PMV	0.418*** (0.124)	0.367*** (0.105)	-0.014 (0.071)	0.175*** (0.063)	-0.034 (0.053)	-0.125* (0.063)
Observations	1,131	996	533	483	396	356
Control	YES	YES	YES	YES	YES	YES
Strata FE	YES	YES	YES	YES	YES	YES
Control group mean	-0.393	-0.131	0.216	0.183	0.180	0.243

Conclusion

1. There is a **break in the causal pathway** between knowledge and behavior especially among poorer households
2. Significantly higher treatment effects in areas with **better quality of primary health facilities**
 - Informal health providers should be regarded as **complementary** with rather than substituting the existing public health system
3. Non-poor households were able to translate their improved knowledge into better care-seeking behavior and better health outcomes
 - Need a more **reliable supply chains** for any intervention aiming to extend primary healthcare services