MACEPA PATH
Malaria Control and Elimination Partnership in Africa

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PNLP

# Case investigation with reactive focal drug administration for malaria in northern Senegal

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## Background

Systematic investigation of malaria cases and neighboring households might play a key role in the path to elimination in low malaria transmission settings.

The objective of this study was to evaluate whether case investigation with focal testing (FT) and focal drug administration (FDA) can decrease malaria incidence.

## Methods

### Study design

- A pilot quasi-experimental study was conducted during the 2015 transmission season in the districts of Kanel, Linguère, and Ranérou (Senegal).
- Six health post catchment areas that had received a mass test and treat campaign in 2014 were purposefully selected to conduct case investigation with FT/FDA. Seven adjacent health post catchment areas with similar characteristics but lower malaria incidence were selected for comparison.
- Primary endpoint: incidence of passively detected malaria cases confirmed by rapid diagnostic test (RDT) during 2015–16 transmission season.

### Study procedures

- Malaria cases passively diagnosed at the health posts or by community health workers were considered index cases and triggered a reactive case investigation in the index case household and the closest five households in a 100m radius.
- A focal testing (FT) was conducted in all visited households: all consenting household members older than 2 months of age received a rapid diagnostic test (RDT).
- In households with at least one positive RDT, a focal drug administration (FDA) was conducted: all individuals were treated with dihydroartemisinin-piperaquine (DHAp).
- An FDA was also conducted in response to outbreaks (≥5 RDT-positive individuals found within a 100–150m radius within 7 days).
- All cases receiving DHAp were followed up one week later to assess adherence to treatment and adverse events.

### Data collection and analysis

- Data were collected in standardized questionnaires using Open Data Kit on smartphones.
- A census of the study population was conducted in 2014.
- The impact was evaluated using a difference-in-difference analysis (before and after comparison in intervention versus controls):
  - Negative binomial regression adjusting for confounders with a random effect on health post.
  - Weekly malaria case counts at health post level (excluding cases coming from outside the catchment area) from September 7, 2015, to January 31, 2016.

## Results

- For the 2,882 index cases identified, more than 90% occurred between week 32 and week 49 in the calendar year with a general peak identified between weeks 40 to 47.
- 57% of the index cases were eligible for investigation, of which 57% were male, 9% were under 5 years old, and 70% were aged 5–19 years old.
- Among these cases, 67% were investigated and 2,050 households were visited. Among the 537 non-investigated cases, 76% recently received the intervention through the investigation of another case or an FDA conducted in response to an outbreak.
- An average of 2.1 households were visited per investigation.

## Results

**Figure 1. Study areas in Linguère, Ranérou, and Kanel districts**

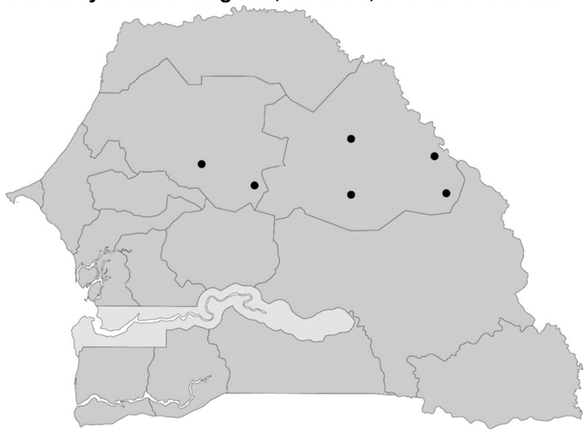
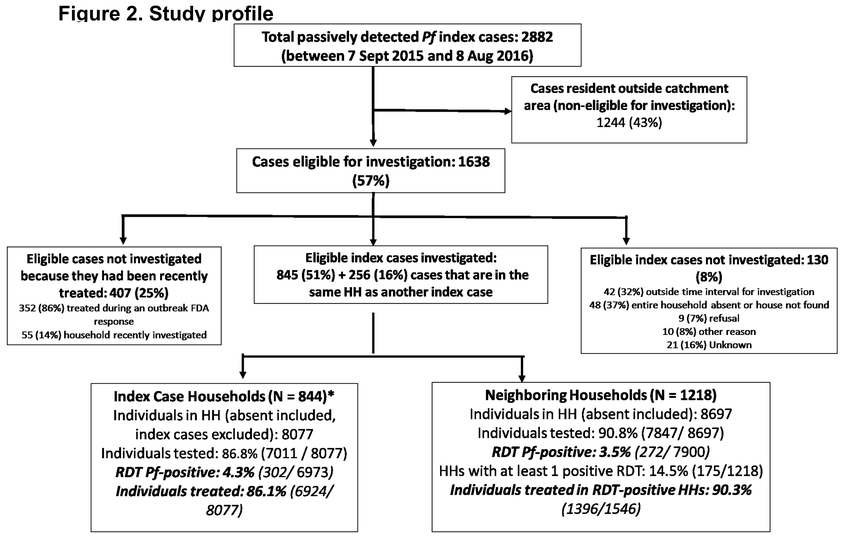
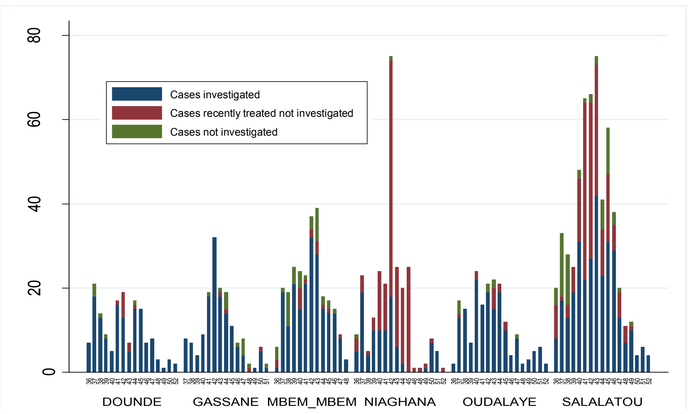


**Figure 2. Study profile**




- An average of 0.7 additional secondary cases were found per index case.
- 23.7% of index-case households had at least one additional RDT positive person and 14.5% of the neighboring households had at least one RDT positive person and received FDA.
- The RDT positivity rate (ranging between 1–10% by health post) was consistently higher in index case households versus neighboring households, although the difference was small.
- 93 outbreaks were detected and FDA responses targeting 4,324 individuals were conducted.
- The mean number of days between index case diagnosis and initiation of case investigation was 7.6.
- Treated individuals received a follow-up visit a median of 3 days after the initial visit and compliance with the 3-day treatment was high (>95%).
- Adverse events were infrequent (1.9% of total individuals) and mostly mild—only one AE was reported as severe (headaches) and there were no serious adverse events.

**Figure 3. Cases per week for 6 health posts during weeks 36–52 (September 1 through December 31) of 2015**




## Results continued

**Figure 4. Incidence of malaria before and after the intervention by health post catchment area**

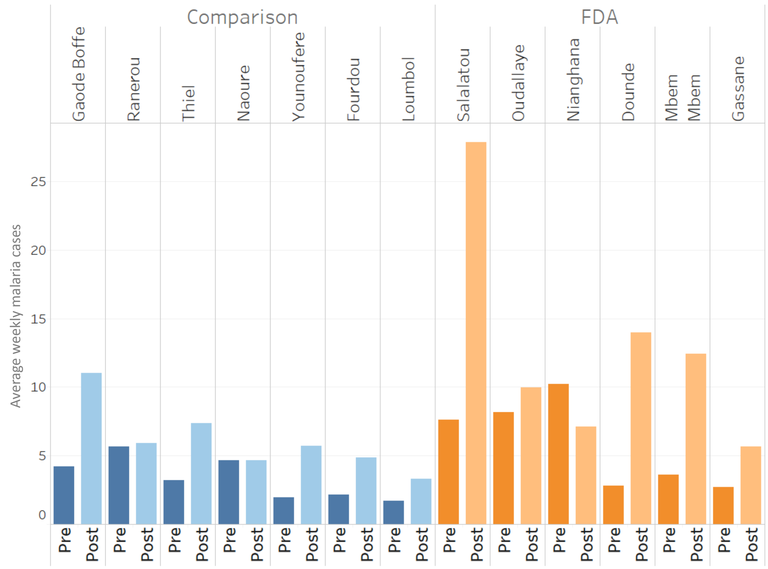



**Table 1. Difference-in-difference negative binomial regression on malaria cases**

| Covariates | IRR (95% C.I.) | p-value |
|---|---|---|
| Time effects | | |
| Pre-intervention | 1.0 (Ref.) | - |
| Post-intervention | 1.37* (1.09 – 1.72) | 0.006 |
| Group effects | | |
| Control group | 1.0 (Ref.) | - |
| Treated group | 0.56* (0.39 – 0.81) | 0.002 |
| Intervention effect (interaction term) | 1.37 (1.00 – 1.87) | 0.051 |
| Healthpost-level controls | | |
| Average ITN ownership | 5.26** (2.00 – 13.79) | 0.001 |
| Average household size | 0.91** (0.87 – 0.96) | 0.001 |
| Environmental controls | | |
| Rainfall (2 mo. lag) | 1.04** (1.04 – 1.05) | 0.001 |
| EVI (2 mo. lag) | 1.01** (1.00 – 1.01) | <0.001 |
| Constant | 0.00** (0.00 – 0.00) | <0.0001 |
| Observations | 544 | |
| Number of healthposts | 13 | |

## Conclusions

- In these investigation areas, malaria was highly seasonal with 90+% of cases occurring during 18 weeks from Sept–Dec.
- 33% of the eligible cases were not investigated, although most of the non-investigated cases received an intervention through the investigation of another index case or through an outbreak FDA.
- A low number of households were visited per case investigation and a low number of secondary cases were found.
- Case numbers during intervention follow-up increased in both the comparison and intervention group. This increase at times overwhelmed the ability of the health workers to follow up cases.
- The lack of impact attributable to the program may have been due to the large increase in cases and the subsequent imperfect case investigation.