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Incremental impact of IRS + ITNs in a highly malaria-endemic area in Mozambique: a cluster-randomized study

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Find our study protocol here

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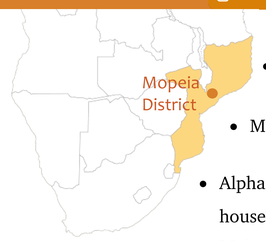

- Cluster-randomized, open label, parallel arms, superiority trial
- Mopeia district in Zambezia, Mozambique from 2016 to 2018
- Alphacypermethrin insecticide-treated net (ITN) use among households with at least one ITN was 89% in province (2018 Malaria Indicator Survey)

86 clusters stratified and randomized to receive/not receive indoor residual spray (IRS) with pirimiphos-methyl (Actellic®300 CS)

16,500 structures (83%) sprayed in 2016
16,936 structures (85%) sprayed in 2017

The cohort consisted of 1536 enrolled children (Fig.2).

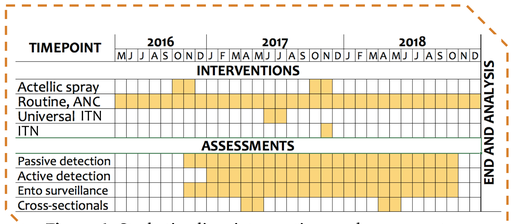

Figure 1. Study timeline, interventions and assessments

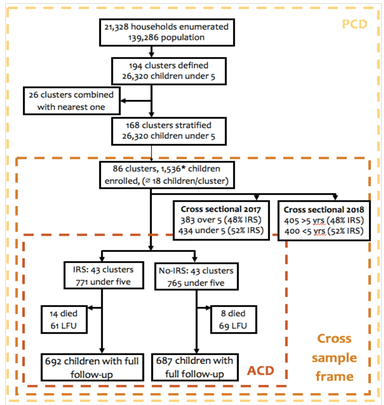

Figure 2. Study flow chart. ACD: active case detection, PCD: passive case detection. *3 were <6 mos at enrollment & 54 were between 5 and 5.5 yrs

Outcome measures

Efficacy of adding IRS was assessed through:

1. malaria incidence in a cohort of children under five followed prospectively for two years,
2. enhanced passive surveillance at health facilities and by community health workers, and
3. yearly cross-sectional surveys conducted at the peak of the transmission season (Fig.1).

? In an area with high malaria endemicity and high ITN access, what is the incremental benefit of IRS with Actellic® for reducing malaria transmission in children under five years?

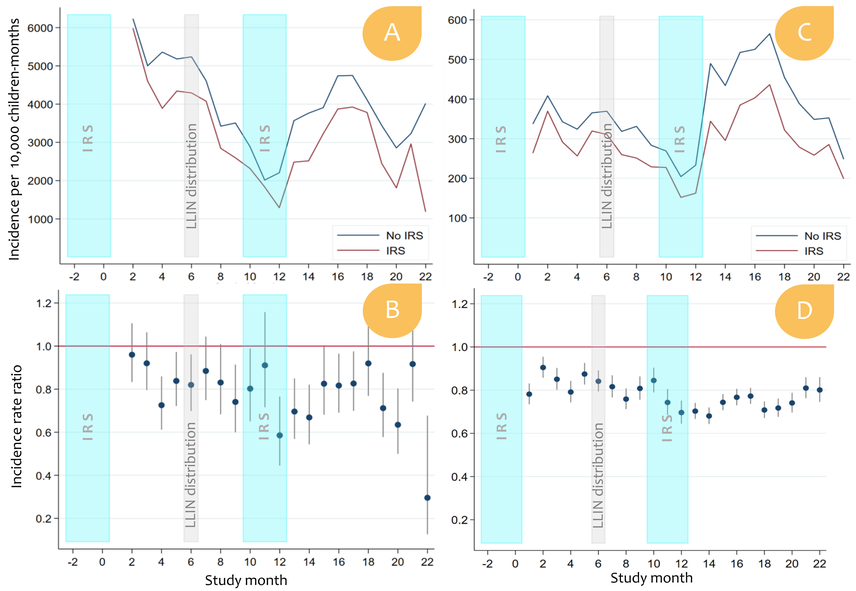

Figure 3. A Cohort incidence by spray status; B Spray IRR (with 95%CI) at cohort level; C Monthly population incidence at health facilities; D Monthly incidence rate ratio.

! In a highly endemic area with high ITN access and emerging pyrethroid resistance, adding IRS with Actellic® resulted in significant additional protection (18% incidence reduction) for children under five years of age.

Results

1 Incidence by active detection: The children in the IRS arm experienced significantly lower malaria incidence throughout the study: we registered 4,801 cases in the IRS arm (incidence rate of 3,532 per 10,000 children-month at risk) vs. 5,758 cases in the no-IRS arm (incidence rate of 4,297 per 10,000 children-month at risk), resulting in a crude risk reduction of 18% and an **incidence rate ratio of 0.82 (95%CI: 0.79, 0.86, p-value <0.001)**.

2 Incidence by passive detection: Facility and community health worker passive surveillance showed a malaria incidence in the overall population of 278 per 10,000 person-month in the IRS group (43,974 cases over 22 months) and 358 (95%CI: 355-360) per 10,000 person-month at risk in the no-IRS group (58,030 cases over 22 months) resulting in an **adjusted incidence rate ratio of 0.65 (95%CI: 0.60-0.71, p<0.001)**.

3 Prevalence: In the 2017 cross-sectional survey, prevalence did not differ significantly between the IRS and no-IRS groups; however, in the 2018 survey, **prevalence in children under five in the IRS arm was significantly lower than in the no-IRS arm (OR 0.54**, 95%CI, 0.31-0.92, p=0.0241).

Variable		Adjusted IRR	(95% CI)	p-value
IRS only[1]		0.81	(0.74; 0.87)	< 0.0001
ITN use only[1]		0.77	(0.72; 0.82)	< 0.0001
IRS + ITN use[1]		0.62	(0.57; 0.67)	< 0.0001
Sibling tested positive[1]		1.21	(1.13; 1.29)	< 0.0001
Cluster size	Small	1		0.0001
	Medium	0.95	(0.89; 1.02)	
	Large	0.85	(0.79; 0.92)	
km to nearest health facility[2]		1.01	(1.01; 1.02)	0.0001

Table 1. Adjusted incidence using a multi-variable generalized estimating equation model. [1]Adjusted IRR using children w/o ITN or IRS as reference group; [2]Adjusted IRR per one-km increase. Nr of observations = 27,479, nr of subjects = 1,521.

Using these data, the IRS campaign in Mopeia **averted between 15,697 and 21,651 malaria infections in the 12,670 children <5 years of age** living in the IRS clusters from Jan 2017 to Oct 2018.

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