November 21, 2019 ASTMH Session 4 Malaria: Vectors and Vector Control

## The cost of measuring impact

RCT trial methodologies for vector control

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NgenIRS Project Partners: **Evaluating** the Evidence







CDC





Randomized Controlled Trial Setup - Mopeia
 Methodologies used to measure impact
 Results by Method
 Summary and Discussion

## Cluster Randomized Controlled Trial Setup

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## **RCT Setup**



# EMJ Global HealthCombination of indoor residual<br/>spraying with long-lasting insecticide-<br/>treated nets for malaria control in<br/>Zambezia, Mozambique: a cluster<br/>randomised trial and cost-effectiveness<br/>study protocol

Carlos J Chaccour,<sup>1,2</sup> Sergi Alonso,<sup>1,2</sup> Rose Zulliger,<sup>3</sup> Joe Wagman,<sup>4</sup> Abuchahama Saifodine,<sup>5</sup> Baltazar Candrinho,<sup>6</sup> Eusébio Macete,<sup>2</sup> Joe Brew,<sup>1</sup> Christen Fornadel,<sup>7</sup> Hidayat Kassim,<sup>8</sup> Lourdes Loch,<sup>9</sup> Charfudin Sacoor,<sup>2</sup> Kenyssony Varela,<sup>9</sup> Cara L Carty,<sup>4</sup> Molly Robertson,<sup>2,4</sup> Francisco Saute<sup>2</sup>

BMJ Glob Health 2018;3:e000610. doi:10.1136/bmjgh-2017-000610















Protocol

## **RCT Setup**



### HOW TO DESIGN VECTOR CONTROL EFFICACY TRIALS

Guidance on phase III vector control field trial design provided by the Vector Control Advisory Group



who/HTM/NTD/VEM/2017.03

2.1.2 Choosing outcome measures

he Global Fund

The best epidemiological measure is generally the incidence of clinical disease, diseasespecific mortality, or the prevalence of infection...



# Methods used to measure the impact of IRS

## Methods



#### Active Cohort

- 86 Cluster (43 per arm)
- 18 children per cluster (774 per arm)
- Monthly follow up
- u5 infection incidence
- Health behavior & HH spending data

#### **Enhanced Passive Surveillance**

Continual

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- Village of origin for each suspected case recorded at public health facilities and by community health workers
- Case incidence symptomatic cases
  presenting to the public health system

#### **Cross Sectional Surveys**

- April 2017 & April 2018
  - 385 Surveys per arm (770 Total)
- Community infection prevalence
- Health behavior & HH spending data

#### **Entomological Surveillance**

- 10 clusters (5 per arm)
- 9 houses per arm (8 CDCLT and 1 HLC)
- Monthly follow up

#### Costing

- Program-wide ingredient-based approach scaled to Mopeia District
- Deterministic and probabilistic cost-effective analyses











### Population measured by each methodology



## Results by Method

# 

### **Results – Active Cohort**

**Monthly Cohort Incidence By Spray Status** 

LLIN ownership before and after the June 2017 campaign:





### **Results – Passive Case Surveillance**



## Results – Cross-Sectional Surveys

	2017				2018			
	Spray Status		OR (95% CI)	p-value	Spray Status		OR (95% CI)	p-value
	No-IRS	IRS			No-IRS	IRS		
Under 5	109 / 231 (47%)	100 / 202 (50%)	1.10 (0.62,1.93)	0.7473	121 / 195 (62%)	96 / 205 (47%)	0.54 (0.31,0.92)	0.0241
Overall	183 / 418 (44%)	171 / 397 (43%)	0.97 (0.65,1.46)	0.8894	173 / 407 (43%)	136 / 398 (34%)	0.70 (0.49,1.00)	0.051

## **Results – Cross-Sectional Surveys**

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		2017		2018			
	Spray	Status	n velve	Spray Status			
	No IRS	IRS	p-value	No IRS	IRS	p-value	
Gender Female	169 / 420 (40.2%)	174 / 397 (43.8%)	0.2986	210 / 407 (51.6%)	186 / 398 (46.7%)	0.1676	
Age under 5	232 / 420 (55.2%)	202 / 397 (50.9%)	0.2123	195 / 407 (47.9%)	205 / 398 (51.5%)	0.3076	
Distance to nearest HF <sup>a</sup>	7.1	6.8	0.7702	6.9	7.1	0.8821	
ITN ownership	235 / 419 (56.1%)	204 / 397 (51.4%)	0.1783	384 / 407 (94.3%)	379 / 398 (95.2%)	0.5758	
Electricity in the household	2 / 420 (0.5%)	19 / 397 (4.8%)	0.0001	2 / 407 (0.5%)	4 / 398 (1.0%)	0.4465	
Head of household with any formal education	206 / 419 (49.2%)	203 / 397 (51.1%)	0.574	299 / 407 (73.5%)	292 / 398 (73.4%)	0.975	
Head of household farmer	350 / 419 (83.5%)	344 / 397 (86.6%)	0.2119	368 / 407 (90.4%)	348 / 398 (87.4%)	0.1776	

#### RESEARCH

**Open Access** 

The economic burden of malaria on households and the health system in a high transmission district of Mozambique

Sergi Alonso<sup>1,2,3\*</sup>, Carlos J. Chaccour<sup>1,2</sup>, Eldo Elobolobo<sup>1</sup>, Amilcar Nacima<sup>1</sup>, Baltazar Candrinho<sup>4</sup>, Abuchahama Saifodine<sup>5</sup>, Francisco Saute<sup>1</sup>, Molly Robertson<sup>6</sup> and Rose Zulliger<sup>7</sup>

Alonso et al. Malar J (2019) 18:360 https://doi.org/10.1186/s12936-019-2995-4



## **Results - Comparison**

Passive Case Incidence (u5) By Spray Status 1600 100% 2017 IRS 2016 IRS LLIN Campaign **RDT Confirmed Cases per 1,000 Months at Risk** 90% 1400 80% 1200 70% Infection Prevalence 1000 60% 800 50% 40% 600 30% 400 -No IRS 20% -IRS 200 10% 0 0% Aug-18 Sep-18 Oct-18 Nov-17 Mar-18 Apr-18 Dec-16 Jan-17 Feb-17 Mar-17 Apr-17 May-17 Jun-17 Jul-17 Aug-17 Sep-17 Oct-17 Dec-17 Jan-18 Feb-18 May-18 Jun-18 Jul-18 **Study Month** 



## Results – Comparison



12:00pm – 1:45pm



## Results – Entomological Surveillance



Monthly trends in <u>total</u> *An. funestus* specimens collected in CDCLTs, by IRS status.

Crude reductions in total mosquito density:

- 63% in year 1
- 85% in year 2

### Over the 2 years: an average reduction of 33 mosquitoes per house per month

1735 - A Good Spray: Entomological Surveillance Results from a Cluster Randomized Trial to Evaluate the Impact of a Third Generation Indoor Residual Spray Product on Malaria Transmission in Mozambique

Joseph Wagman<sup>1</sup>, Aklilu Seyoum<sup>2</sup>, Stephen Magesa<sup>3</sup>, Kenyssony Varela<sup>3</sup>, Rodaly Muthoni<sup>3</sup>, Christelle Gogue<sup>1</sup>, Kenzie Tynuv<sup>1</sup>, Carlos Chaccour<sup>4</sup>, Francisco Saute<sup>5</sup>, Rose Zulliger<sup>6</sup>, Abuchahama Saifodine<sup>7</sup>, Baltazar Candrinho<sup>8</sup>, Jason Richardson<sup>9</sup>, Christen Forndel<sup>9</sup>, Laurence Slutsker<sup>10</sup>, Molly Robertson<sup>1</sup>



## Summary & Discussion

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## Methods



#### **Active Cohort**

- 86 Cluster (43 per arm)
- 18 children per cluster (774 per arm)
- Monthly follow up
- True u5 infection incidence
- Health behavior & HH spending data

#### **Enhanced Passive Surveillance**

#### Continual

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#### Costing

- Program-wide ingredient-based approach scaled to Mopeia District
- Deterministic cost-effective analysis

#### Active Most expensive (35%)

Passive Middle Expensive (28%)

Cross Least expensive (20%)

Costing

(5%)

Ento (12%)

## Acknowledgements









The NgenIRS (Next Generation IRS) project is a partnership, led by IVCC, that includes the US President's Malaria Initiative (PMI), the Global Fund, Abt Associates, and PATH. NgenIRS works in close collaboration with leading insecticide manufacturers, national malaria control and elimination programs and other stakeholders to save lives and protect health by reducing transmission of malaria through affordable indoor residual spraying of long-lasting insecticides. NgenIRS is funded by UNITAID and this work has been co-funded by PMI. For more information please visit <u>www.ivcc.com/market-access/ngenirs</u> or email David McGuire, Programme Director (david.mcguire@ivcc.com).



