



Partnership To End Malaria

February 3rd, 2020

NgenIRS Project: Summarizing Catalytic Market Impact and Evidence of Cost-effectiveness and Impact of 3GIRS in Combination with LLINs

Molly Robertson – Evidence Lead

Presentation summary

NgenIRS Background and Update X – Y
IRS in SSA
Overcoming market failures
Creating an evidence base

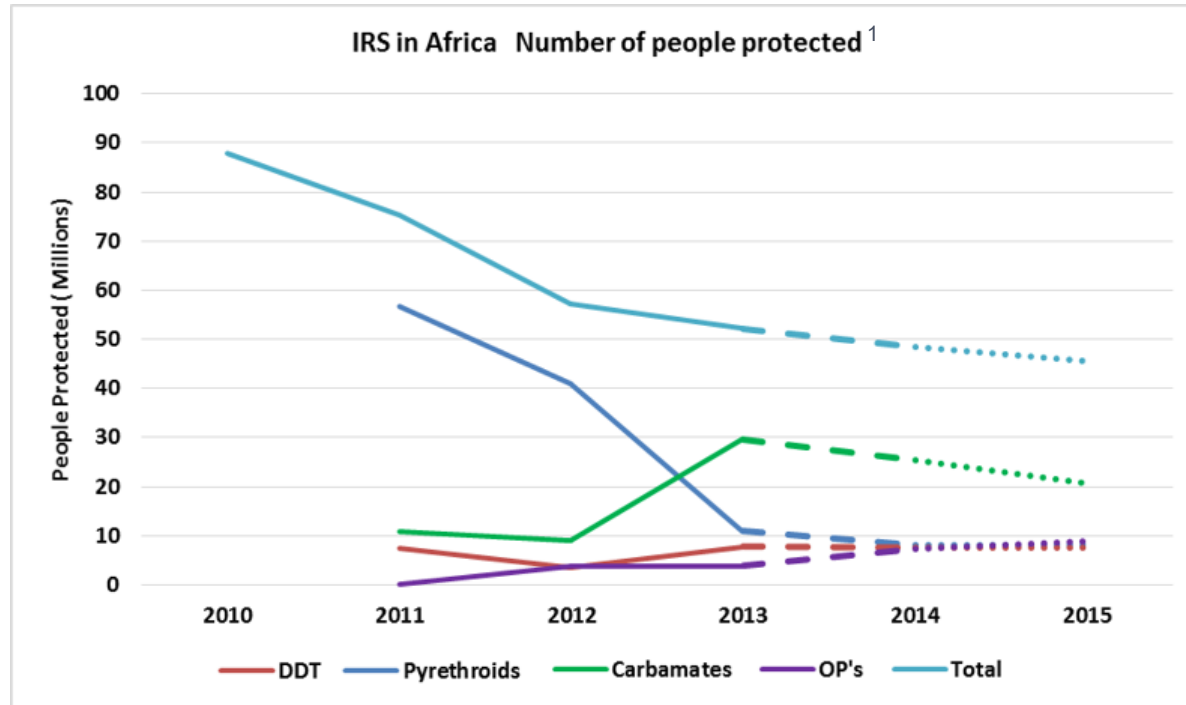
Evidence of Impact A – B
Summary of impact analyses
Summary of cost-effectiveness findings

Summary C - D
Key Messages
Implications



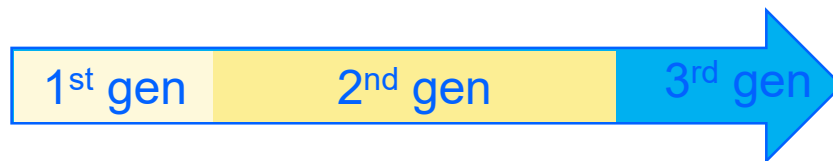
 **NgenIRS**

IRS coverage in Africa fell between 2010–2015



2011–2012
Switch from
pyrethroids to
carbamates

2013–2015
Decreasing coverage



*3GIRS products are **effective against pyrethroid resistant vectors** and have a residual efficacy of **at least 6 months**

¹Data collated by IVCC from a mix of private and public data sources

NgenIRS: A catalytic intervention to address market shortcomings

Project Accomplishments



2016 – 2019*

High Price

- 37% reduction in median price
- US\$39 million saved by partners
- Price caps for 2020–2021

Low Uptake

- Reversed downward market trend
- 4 - 16 countries
- Market expansion/diversification

Unstable Market

- Consolidated global forecast and volume guarantee
- Adoption of sub-national rotation

One Supplier

- 1 - 3 products
- 2 in the pipeline
- Enabled implementation of IRM plans in line with GPIRM

Weak Evidence

- Evidence showing impact and cost-effectiveness of 3GIRS in combination with LLINs and other interventions



*Projected figures for 2019

GPIRM = Global plan for insecticide resistance management; IRM = insecticide resistance management; LLIN = long-lasting insecticidal net

NgenIRS: A catalytic intervention to address market shortcomings

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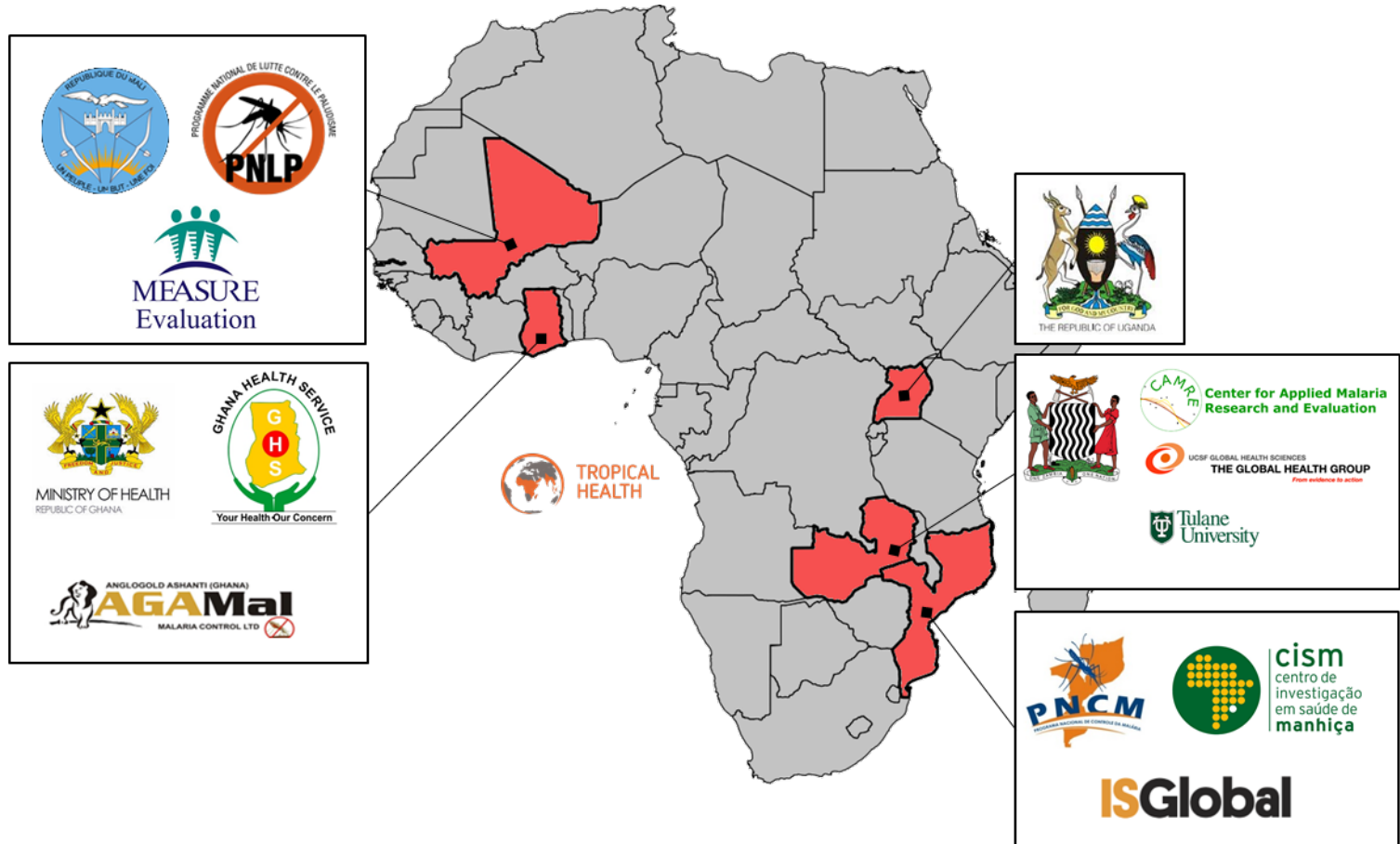
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NgenIRS project partners: Evaluating the evidence



NgenIRS



Malaria case reduction and cost-effectiveness

Overall, 3GIRS resulted in a **22–47% reduction** in confirmed cases recorded in the public health system compared to similar regions without IRS

ICER range* of **\$3.20–\$41.25** per case averted, making 3GIRS **cost-effective** or **highly cost-effective** by WHO standards

Mali (observational – 3 yrs)

32%	Fewer Cases
Cases averted in 3 years	350K
ICER (per case averted)	US\$6.76

Uganda (observational – 1 yr)

47%	Fewer Cases
Cases averted in 1 year	245K
ICER (per case averted)	US\$41.25

Ghana (observational – 3 yrs)

40%	Fewer Cases
Cases averted in 3 years	260K
ICER (per case averted)	US\$3.20

Mozambique (CRT – 2 yrs)

22%	Fewer Cases
Cases averted in 2 years	20K
ICER (per case averted)	US\$34.44



ICER = Incremental cost-effectiveness ratio

Malaria case reduction and cost-effectiveness*

	Insecticide product	Cost per person targeted	IRR estimate (95% CI)	Incremental cost per case averted	Incremental cost per DALY averted	Incremental cost-effectiveness
Ghana	Actellic®300CS	5.21 USD	0.60 (0.36–1.00)	3.20 USD	48.00 USD	Highly cost-effective
Mali	Actellic®300CS	7.76 USD	0.68 (0.52–0.89)	6.76 USD	102.00 USD	Highly cost-effective
Mozambique	Actellic®300CS	4.68 USD	0.78 (0.77–0.79)	34.44 USD	519.00 USD	Cost effective
Uganda	Actellic®300CS	5.53 USD	0.53 (0.43–0.66)	41.25 USD	625.00 USD	Highly cost-effective
Zambia	Actellic®300CS	3.35 USD	0.88 ^a (0.82–0.95)	78.85 USD	1,194.83 USD	Highly cost-effective

*Yukich, et al. 2019. Cost and cost-effectiveness of third-generation indoor residual spraying (3GIRS) in sub-Saharan Africa. Annual meeting of ASTMH; Abstract # LB-5499; November 2019. *Manuscript in preparation*

^a The Zambia evaluation utilized a modeling approach to estimate the effect of increasing IRS coverage on malaria burden

DALY = disability-adjusted life year; USD = US dollar
Cost-effectiveness by WHO standards

Malaria case reduction and cost-effectiveness*

- ❑ Several factors contribute to the cost of an IRS program:
 - Cost of the insecticide was one of the most significant during this work, contributing 20% to 40% to the overall cost - but this proportion is falling¹
- ❑ There is significant heterogeneity in both cost and impact for IRS campaigns
- ❑ Regardless, **IRS campaigns with 3GIRS products are expected to be cost-effective to very cost-effective** in sub-Saharan Africa when used in addition to current standard of care, including:
 - LLINs
 - Testing (RDT) and treatment (ACT)
 - IPTp and SMC where appropriate

*Yukich, et al. 2019. Cost and cost-effectiveness of third-generation indoor residual spraying (3GIRS) in sub-Saharan Africa. Annual meeting of ASTMH; Abstract # LB-5499; November 2019. *Manuscript in preparation*

¹ As the costs of 3GIRS products fall this is changing, shifting much of the overall cost to operations
ACT = artemisinin combination therapy; IPTp = intermittent preventative treatment in pregnancy; RDT = rapid diagnostic test

3GIRS vs. Non-3GIRS in Uganda: 2014 - 2016

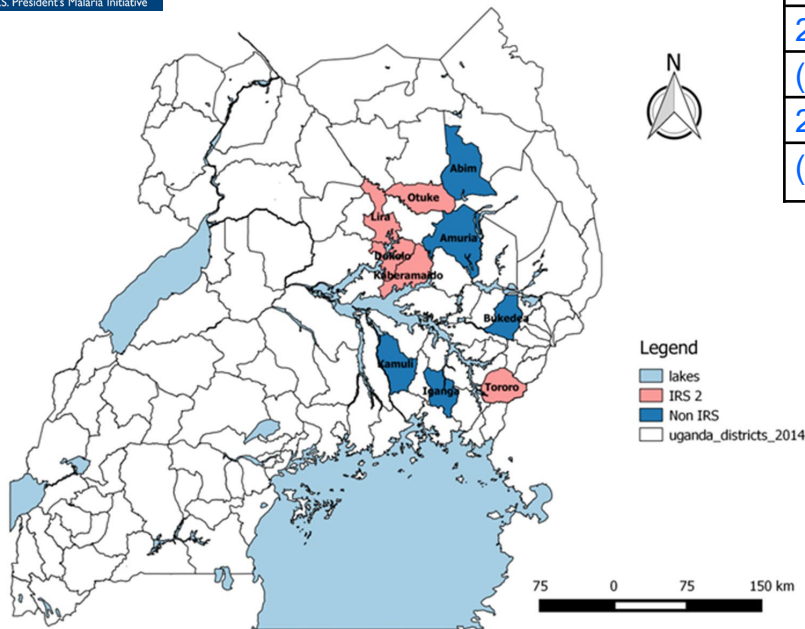
Changes in Malaria Morbidity following Indoor Residual Spraying in Eastern and Northern Uganda: A Comparative Analysis of IRS and non-IRS districts, 2013-2016

Joselyn Annet Atuhairwe^{1,2,4*}, Jimmy Opiyo², Bosco Bekitja Agaba², Damian Rutazaana², Daniel Kyabayinze², Christelle Gogue³, Joseph Wagman³, Molly Robertson³, Alex Riolexus Ario¹, Daniel Kadobera¹, Adoke Yeka⁴

¹Uganda Public Health Fellowship Program, Kampala, Uganda
²National Malaria Control Program, Kampala, Uganda
³NIH Washington D.C.
⁴Makerere University School of Public Health, Kampala, Uganda



U.S. President's Malaria Initiative



Period	Status	Confirmed malaria cases	IRR (95% CI)
2014	Pre-IRS	362,014	1.0 (0.9-1.1)
(pre-IRS)	Non-IRS	335,645	
2015	IRS	251,485	0.8 (0.7-0.9)
(bendiocarb IRS)	Non-IRS	395,729	
2016	IRS	239,459	0.53 (0.43-0.66)
(Actellic IRS)	Non-IRS	519,446	

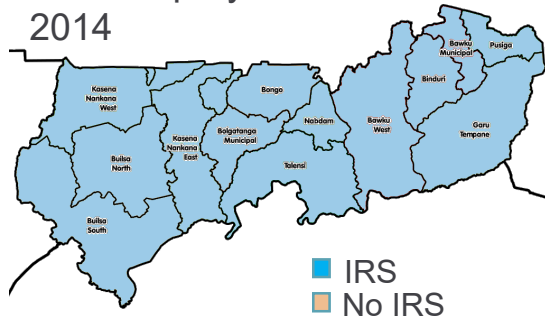
- IRS was associated with a significant reduction in malaria incidence
- Greatest effect measured in year with 3GIRS campaign (2016), compared to bendiocarb campaigns (2015)

Baseline household ownership of at least one LLIN = 90%

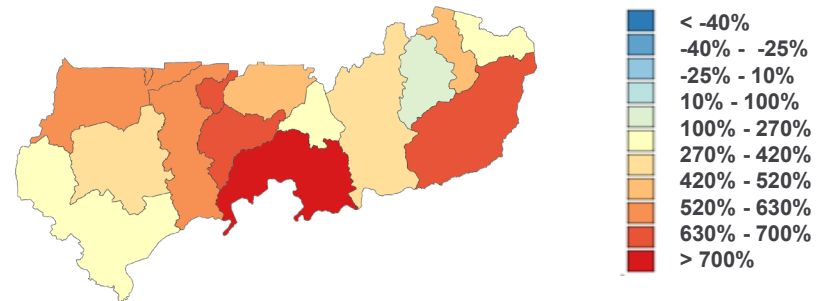
IRR = incidence rate ratio

Shifting IRS operations – suspending IRS in Ghana

District spray status
2014

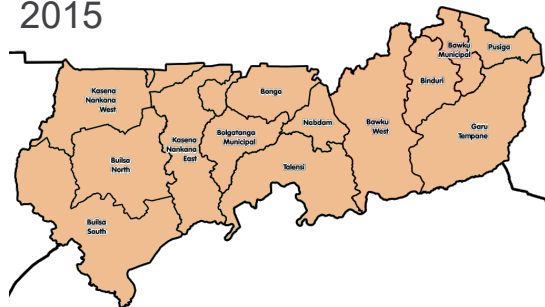


Percent change in malaria incidence, 2014–2015



- Removal of 3GIRS from districts in Upper East resulted in an average increase in malaria cases of over 400%

District spray status
2015



Baseline household ownership of at least one LLIN ~80%

Shifting IRS operations – reintroducing IRS in Ghana

District spray status
2016



Percent change in malaria incidence, 2016–2017



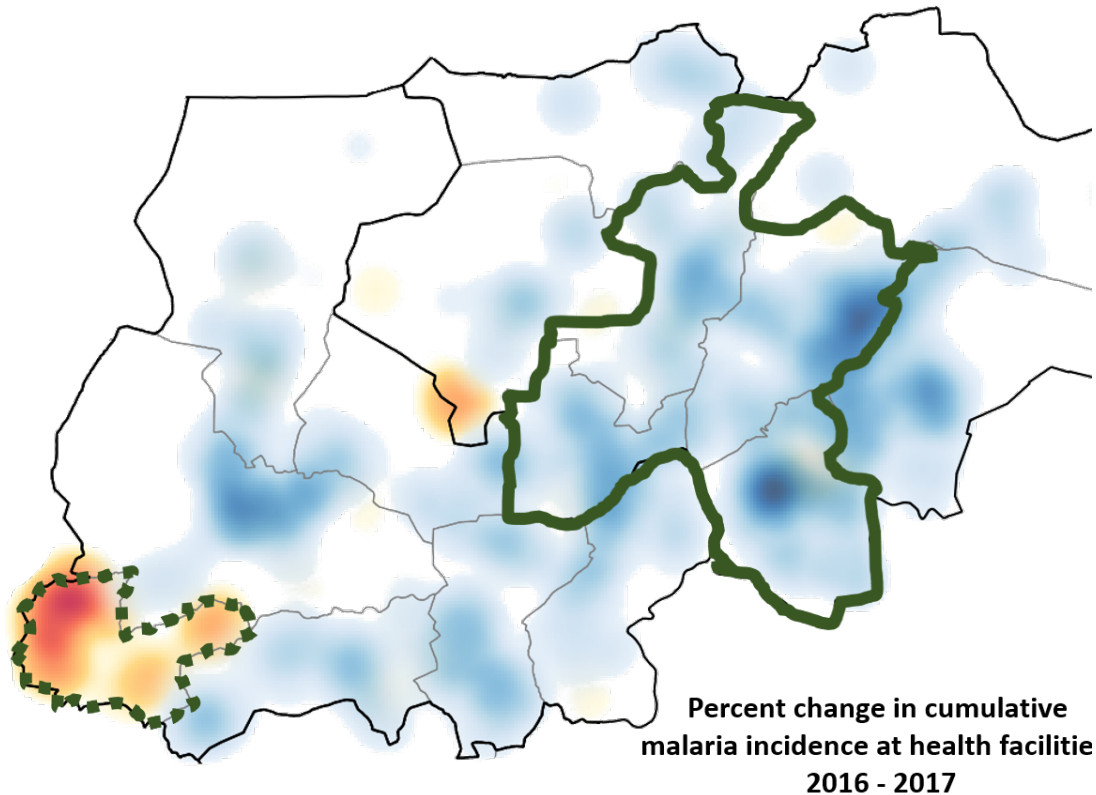
- Reintroducing 3GIRS into some of those districts in 2017 reduced malaria cases by an average of 42%

District spray status
2017

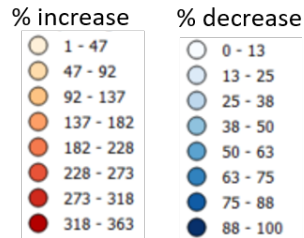


Baseline household ownership of at least one LLIN ~80%

Shifting IRS operations – Mali: 2016 - 2017



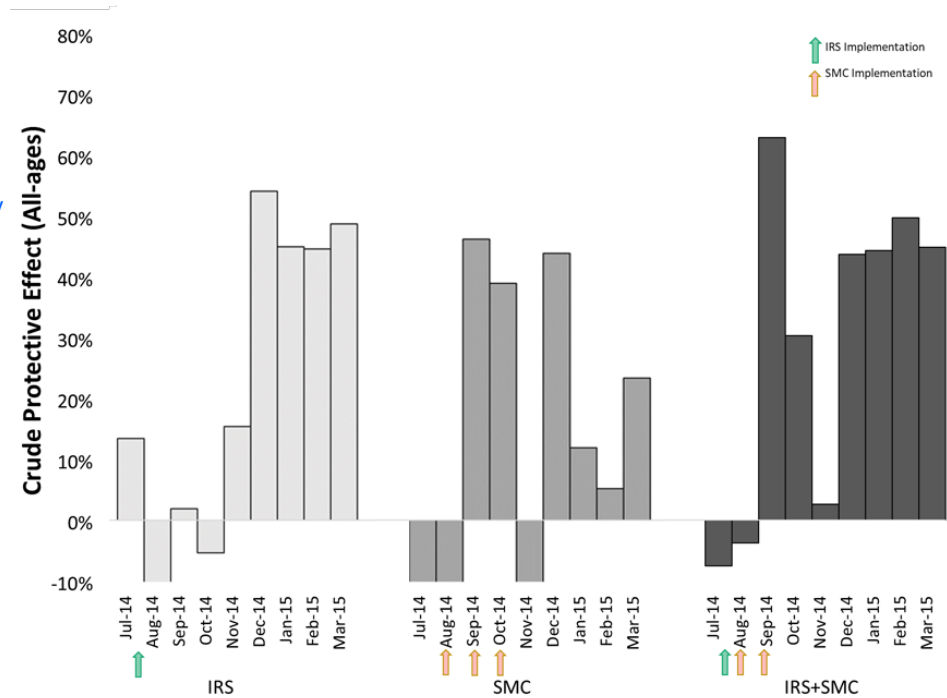
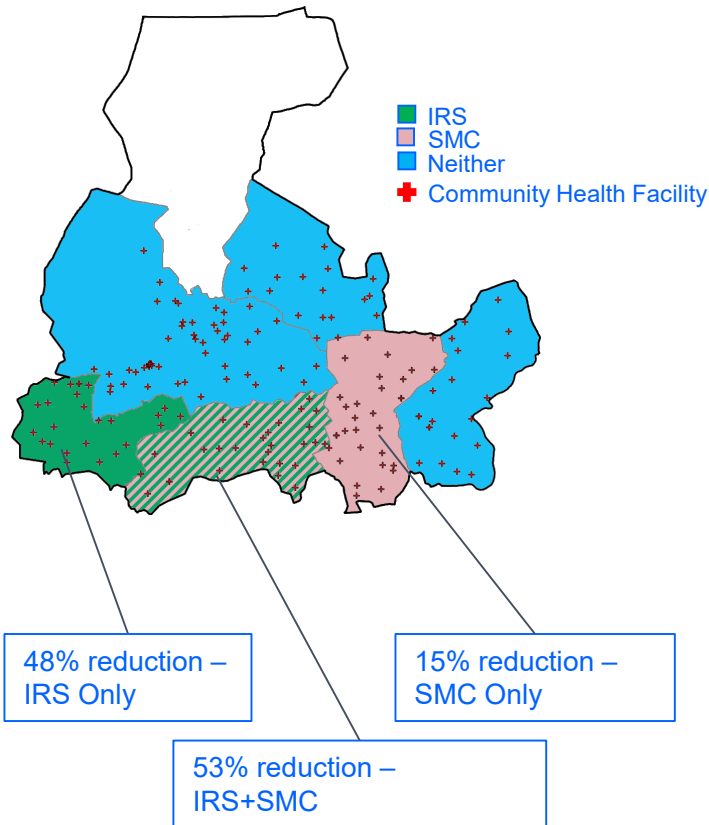
- - - IRS Withdrawn 2017
— IRS Introduced 2017



- Introduction of 3GIRS in Mopti Region resulted in a 42% decrease in incidence in IRS districts
- Removal of 3GIRS from Ségou Region resulted in a 106% increase in incidence

Baseline household ownership of at least one LLIN = 85% - 90%

Combined effect of IRS + SMC in Mali: 2014



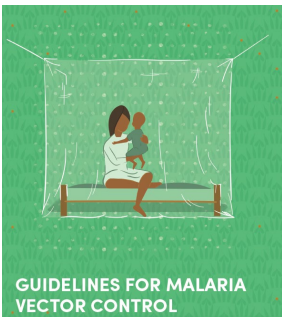
Baseline household ownership of at least one LLIN = 85%–90%

NgenIRS evidence generation – Key Messages

- 3GIRS, in addition to standard LLINs, provides additional protection against malaria by reducing vector populations in areas of moderate to high transmission with evidence of pyrethroid resistance
- Careful consideration should be given before removing IRS
- Adding 3GIRS to drug-based interventions (SMC & MDA) is likely to maximize the impact of those interventions
- Switching from an older product to a 3GIRS product significantly increased the public health impact of IRS campaigns on top of standard LLINs in an area of high pyrethroid resistance
- **Collectively, results show that 3GIRS in addition to standard LLINs is a cost-effective to highly cost-effective public health intervention in a variety of transmission settings across sub-Saharan Africa**

Implications?

Much of this data was shared with Global Malaria Programme during the public comment period following their 2019 policy recommendation based on the Cochrane Review:



Brief summary of recommendations¹



Malaria vector control

- Priority to be given to delivering either insecticide-treated nets (ITNs) OR indoor residual spraying (IRS) at high coverage and to a high standard
- Conditional recommendation against combining these two core interventions to reduce morbidity and mortality

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Global Malaria Programme

WHO Malaria Policy Advisory Committee (MPAC) meeting

OCTOBER 2019

MEETING REPORT

“The goal remains universal coverage¹ with an appropriate mix of interventions for at-risk populations...

...MPAC agreed with the conclusions from the consultations:

- **Intervention prioritization should not be driven solely by sequentially optimizing interventions for maximal coverage**
- **Instead, intervention prioritization should be based on local evidence and aligned to the specific needs of different epidemiological strata/settings, as defined in the country's national strategic plan”**

¹ Universal coverage for malaria vector control is defined as universal access to and use of appropriate interventions by populations at risk of malaria.



Thank you.

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