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
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

03 February, 2020
NgenIRS: A catalytic intervention to address market shortcomings

Project Accomplishments

<table>
<thead>
<tr>
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<th>Low Uptake</th>
<th>Unstable Market</th>
<th>One Supplier</th>
<th>Weak Evidence</th>
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• Adoption of sub-national rotation | • 1 - 3 products  
• 2 in the pipeline  
• Enabled implementation of IRM plans in line with GPIRM | • 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 bed net
NgenIRS project partners: Evaluating the evidence
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.

ICER = Incremental cost-effectiveness ratio
# Malaria case reduction and cost-effectiveness*

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


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 falling\(^1\)

- 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

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\(^1\) 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

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

- 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

District spray status
2015

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%

Baseline household ownership of at least one LLIN ~80%
Shifting IRS operations – reintroducing IRS in Ghana

District spray status
2016

District spray status
2017

Percent change in malaria incidence, 2016–2017

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

Baseline household ownership of at least one LLIN ~80%
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 recommendations**

**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
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:

"The goal remains universal coverage\(^1\) 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"

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\(^1\) 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.