

THE IMPACT OF INSECTICIDE RESISTANCE ON THE EFFICACY OF LLIN IN NIGERIA:

Findings for Policy Makers – Draft Document



Summary

Indoor residual spraying (IRS) and long-lasting insecticidal nets (LLINs) are the two core malaria vector control measures. Both of these methods use insecticides. However, mosquitoes in certain areas have become resistant to these insecticides. As a result, the effectiveness of these malaria control methods may have reduced.

This research analysed the effects of insecticide resistance mechanisms on malaria vector control tools in West Africa (Mali, Benin and Nigeria) under different settings using LLINs or IRS. This policy brief focuses on the research carried out in Nigeria, where the aim was to assess the performance of LLINs in areas where vectors harbour metabolic resistance mechanisms.

The research involved identifying the appropriate study sites, characterizing the malaria vectors, and understanding the habits of people in villages with and without insecticide resistance.

Key findings:

- *Anopheles gambiae* s.s was the main Anopheles species constituting 80-100% of the Anopheles population in the different villages.
- LLIN coverage in Ikorodu District (where the test and control sites were) was low, with the socio-anthropological data revealing that the use of LLINs was not a common practice in the four villages. Less than 20% of households owned a net.
- The non-availability of LLINs in the market was the main reason given for the low LLIN coverage in the four villages (prior to net distributions).
- A reduction in mosquito bites was observed when villagers slept under LLINs in areas where mosquitoes have metabolic resistance.
- In areas with metabolic resistance, the ineffectiveness of the nets was shown by mosquito bites while sleeping under LLINs, and presence of live mosquitoes hanging on LLINs.

RESEARCH APPROACH



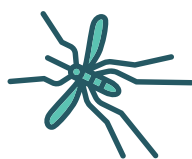
Selection of study sites

- Susceptibility screening and selection of resistant sites (test sites) and susceptible sites (control sites).
- In Nigeria the sites chosen were: Imota, Bayeku, Oreta, and Igbokuta (control village), all in the Ikorodu District.



Parasito-clinical characterization of sites

- Data on malaria prevalence according to demographics, such as age and gender, was collected through surveys.
- Data from local community health centres was collected.
- A review was conducted on insecticide resistance in *Anopheles* populations.



Entomological characterization of sites (resistance profiling)

Field and laboratory studies were conducted to determine vector density and other factors, such as the mosquito species, biting time, biting site, and whether mosquitoes were infected with the malaria parasite.



Socio-anthropological characterization of sites (e.g. human movement, practices)

- Assessed through in-depth interviews and focus group discussions with risk groups, and direct observational studies of behaviour (for example, LLIN usage).
- Malaria incidence was measured after LLIN distribution.



Entomological survey



Distribution of LLINs

Full details of experiments carried out are available on:

www.vbd-environment.org

RESULTS

1 *Less than 20% of households owned a net*

The use of LLINs was not a common practice across the four villages, and less than 20% of households owned a net.



2 *People would like to use nets*

Respondents highly appreciated the LLINs provided through the research, with more than 90% in both the resistance and control village confirming:

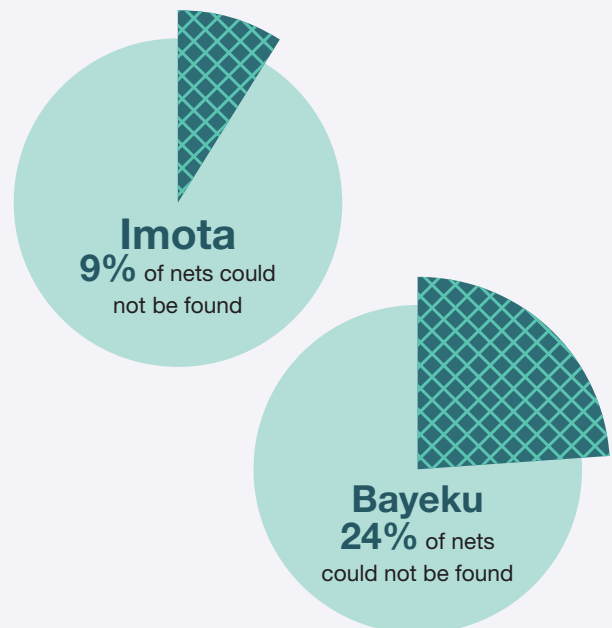
- Great reduction in mosquito bites when sleeping under LLINs;
- Presence of dead mosquitoes on the floor, bed and mats when using LLINs;
- Reduction in nuisance caused by mosquitoes; and
- Willingness to pay to continue using LLINs.



3 *Many people stopped using the nets that were distributed*

However, at Imota and Bayeku (test sites), 9% and 24% of the nets distributed respectively could not be found three months post-distribution. Reason for halt in usage included:

- The ineffectiveness of the nets as shown by mosquito bites while sleeping under LLINs and continued mosquito noises;
- Presence of mosquitoes hanging on the LLINs;
- Skin irritation due to body contact with LLINs; and
- Claim that sleeping under LLINs generates additional heat in the absence of electricity.



POLICY IMPLICATIONS

1 Increase use of LLINs



- Implementation and use of LLINs was low. Thus, universal coverage and optimal use of LLINs is required urgently.
- Following LLIN distribution, there was a significant reduction in mosquito bites in the control village (Igbokuta) compared to the three resistant villages. Vector surveillance and resistance monitoring should be included as a critical component of the national policy and strategic plan for LLIN distribution.

2 Knowledge uptake



- Health education regarding the causes and risks of malaria should be improved.
- Knowledge on resistance mechanisms of mosquitoes should be disseminated to local health authorities to distribute to the local communities.
- Resistance management strategies should be employed in areas with metabolic-based resistance mechanism(s) to increase the susceptibility of mosquitoes to pyrethroid insecticides.

About this project

This policy brief summarizes outcomes of the research project on *Understanding the impact of insecticide resistance on the efficacy of IRS and LLIN in 3 ecological settings of Mali, Benin and Nigeria*. The principal investigator was Dr Nafomon Sogoba, Head of Vector Control and GIS Unit, Malaria Research and Training Center (MRTC), University of Sciences, Techniques and Technologies of Bamako, FMOS.

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