



IR Mapper: Mapping Insecticide Resistance

Dr. Helen Pates Jamet, AMP Partners meeting
Geneva, 26th January 2015

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Insecticide resistance in the news

Hybrid malaria mosquito is resistant to bed-net insecticide

Last updated: 13 January 2015 at 3am PST

Tropical Diseases

Aid / Disasters

Public Health

MRSA / Drug Resistance

f 90

74

MNT featured


Academic journal

A hybrid "super mosquito" that is resistant to the insecticide used to treat life-saving anti-malaria bed nets has emerged in Mali as a result of the interbreeding of two species of malaria mosquito.

Gregory Lanzaro, medical entomologist and professor at University of California Davis (UC Davis) and leader of the research team behind the discovery, says they are calling the hybrid mosquito a "super" mosquito because it can survive exposure to the insecticides used to treat bed nets.

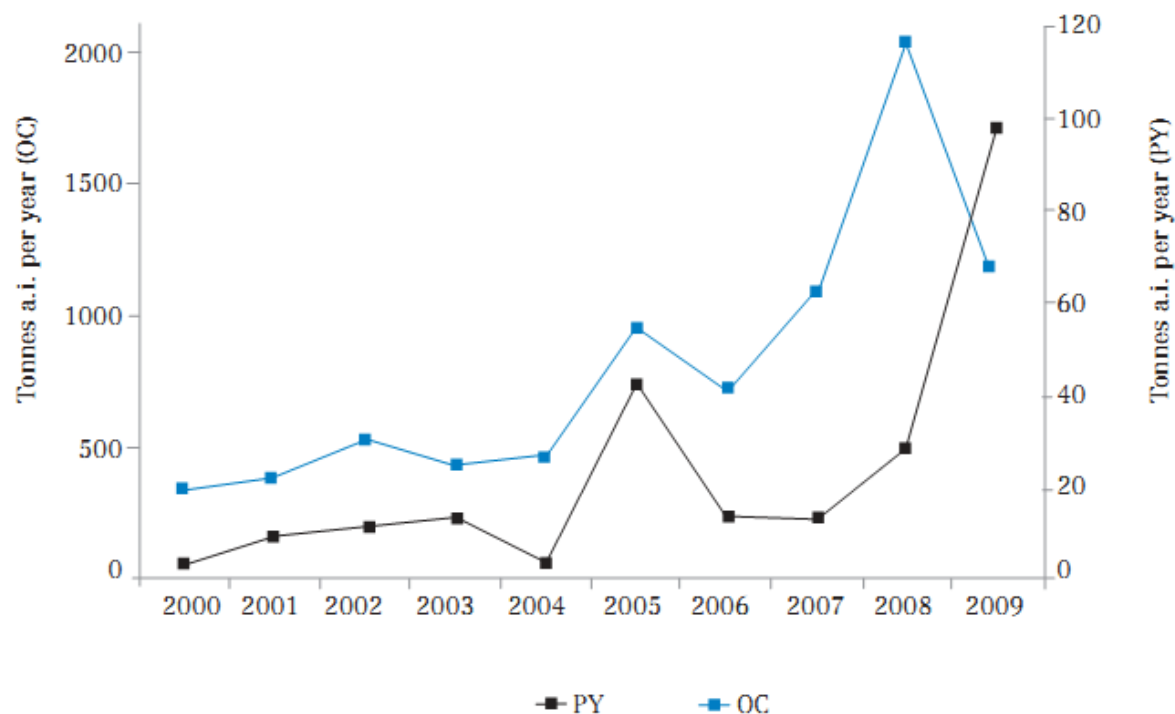
He and his team report their findings in the *Proceedings of the National Academy of Sciences*.

Prof. Lanzaro says the study provides convincing evidence that a man-made change - namely the introduction of insecticides - into the environment of the malaria-carrying mosquitoes altered their evolutionary



A new mosquito that is resistant to insecticide-treated bed nets has emerged as a hybrid of two malaria-carrying species.

Insecticide resistance challenges

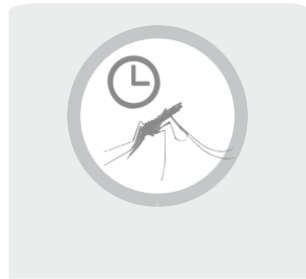


From: WHO (2011) Global Insecticide Use for Vector-Borne Disease Control

What causes insecticide resistance?



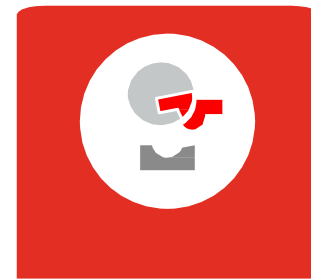
Reduced
penetration



Change in
behaviour

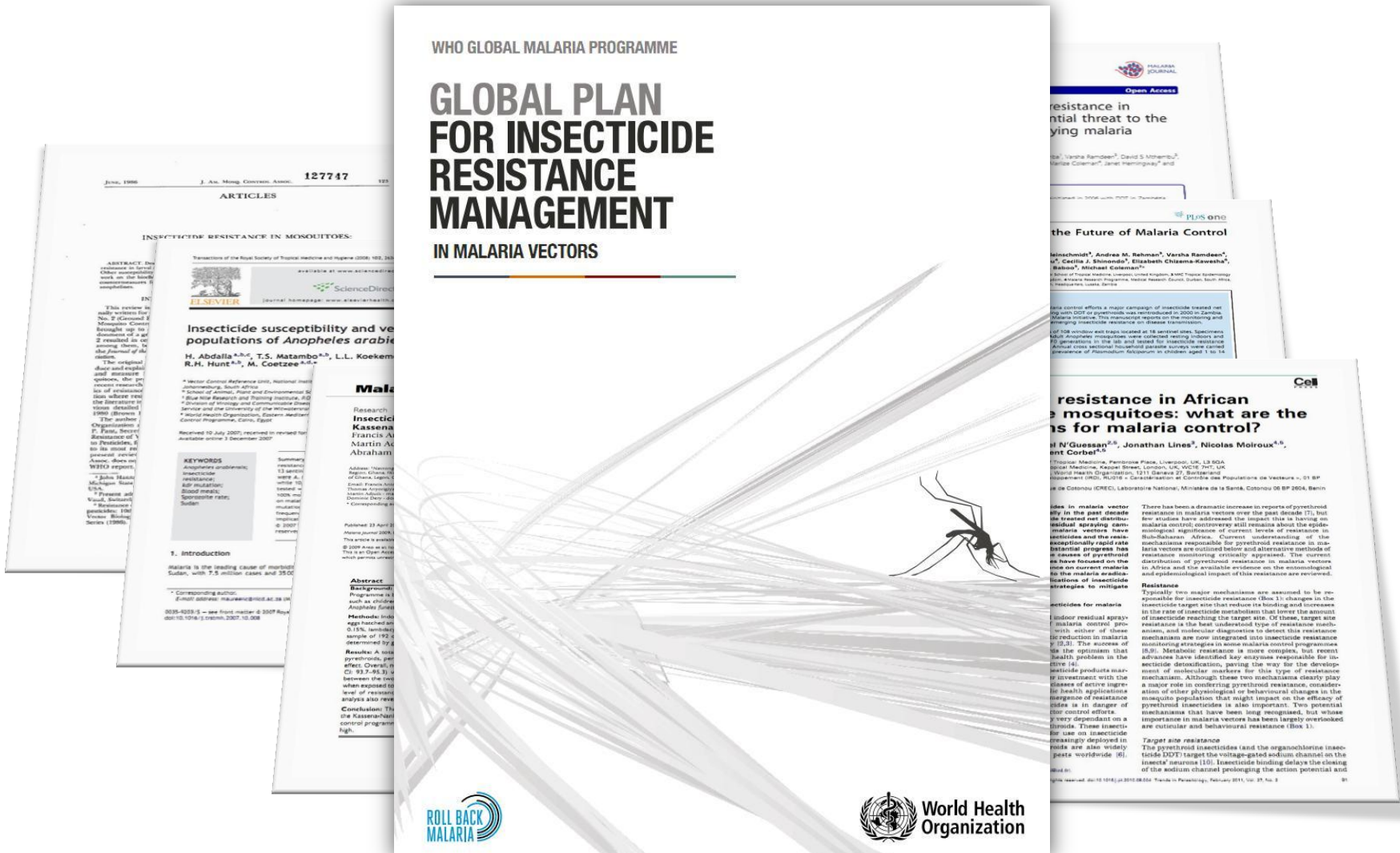


Altered
target site



Metabolic
resistance

The need for a database



Online database developed to fill gap

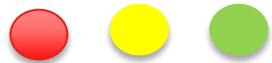
- User-friendly and freely accessed
- Repository of all published data
- Flexible (tailored maps)
- Updated frequently to reflect most recent data
- Used by malaria control programs to support evidence-based decision making
- Used by researchers as an access-point for country IR data

Building IR Mapper

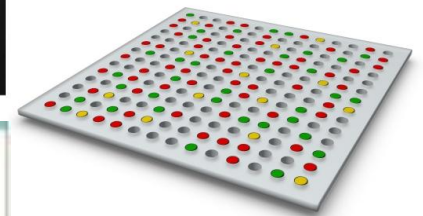
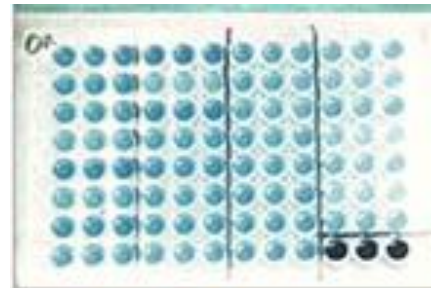
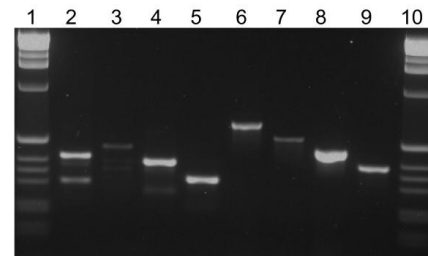


IR Mapper data

Insecticide Susceptibility status



Resistance mechanisms



Go to:
www.irmapper.com



IR Mapper is an interactive map for visualizing data from **insecticide susceptibility** and **resistance mechanisms** tests. It is used to:

- View published data from 1954 to present
- View own data from a template. See [here](#) for instructions

Tailored maps are generated by:

Using the left map legend to:

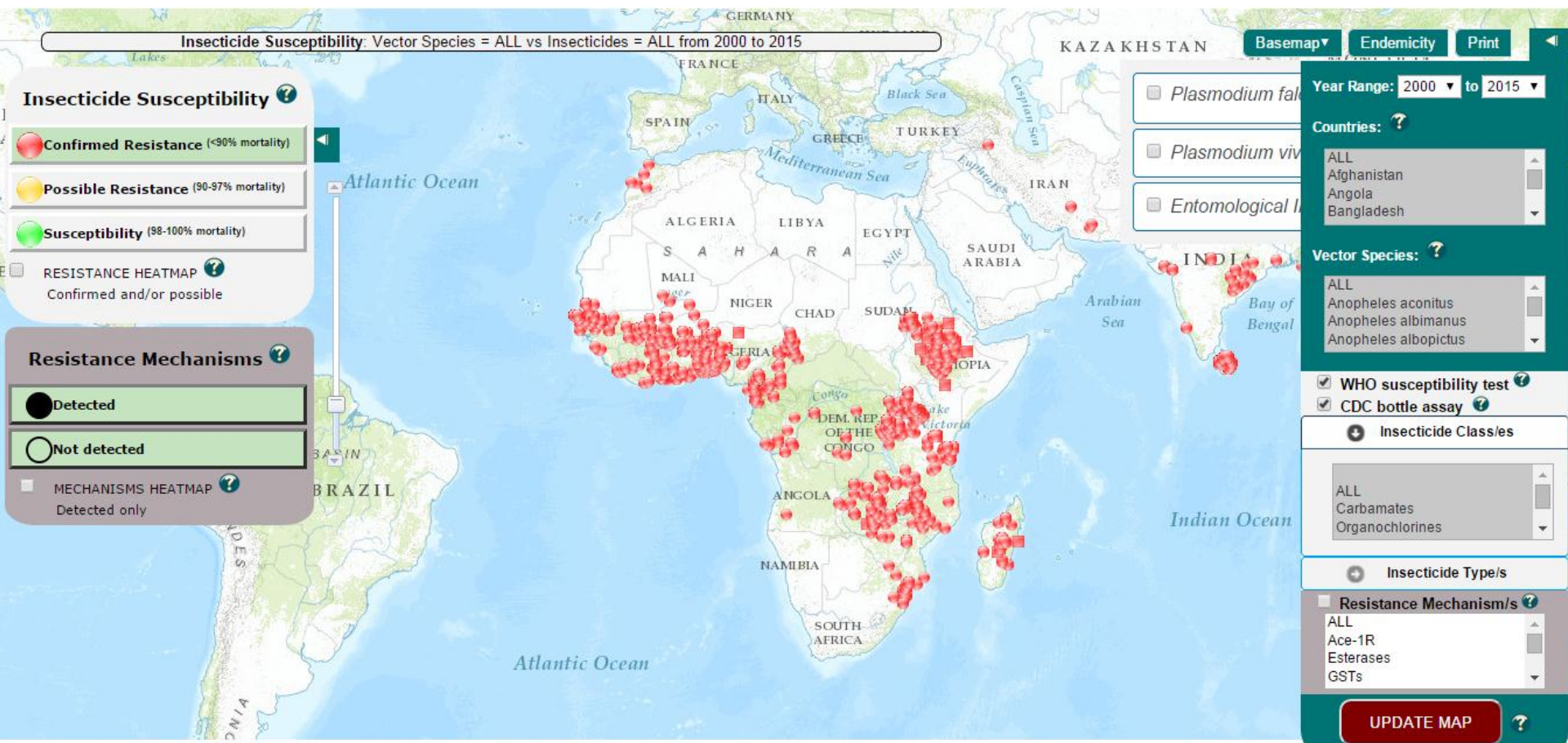
- Switch data layers on/off or show hotspots

Using the right map filters to:

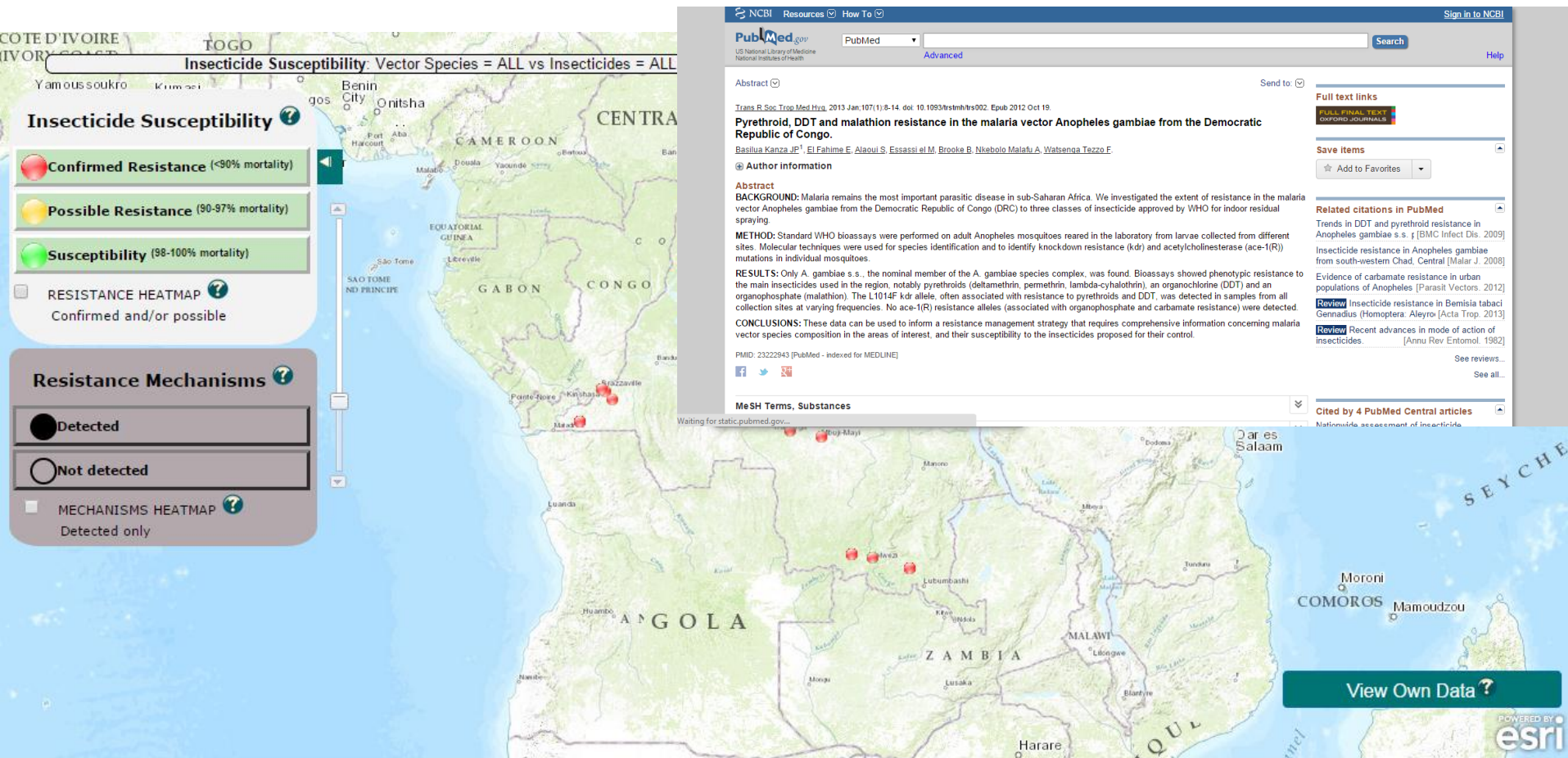
- Display insecticide susceptibility and/or resistance mechanisms data via the check boxes
- Select single or multiple years, vector species, insecticide classes/types and resistance mechanisms via the menus

[Continue Here.](#) | [Go To Map](#)

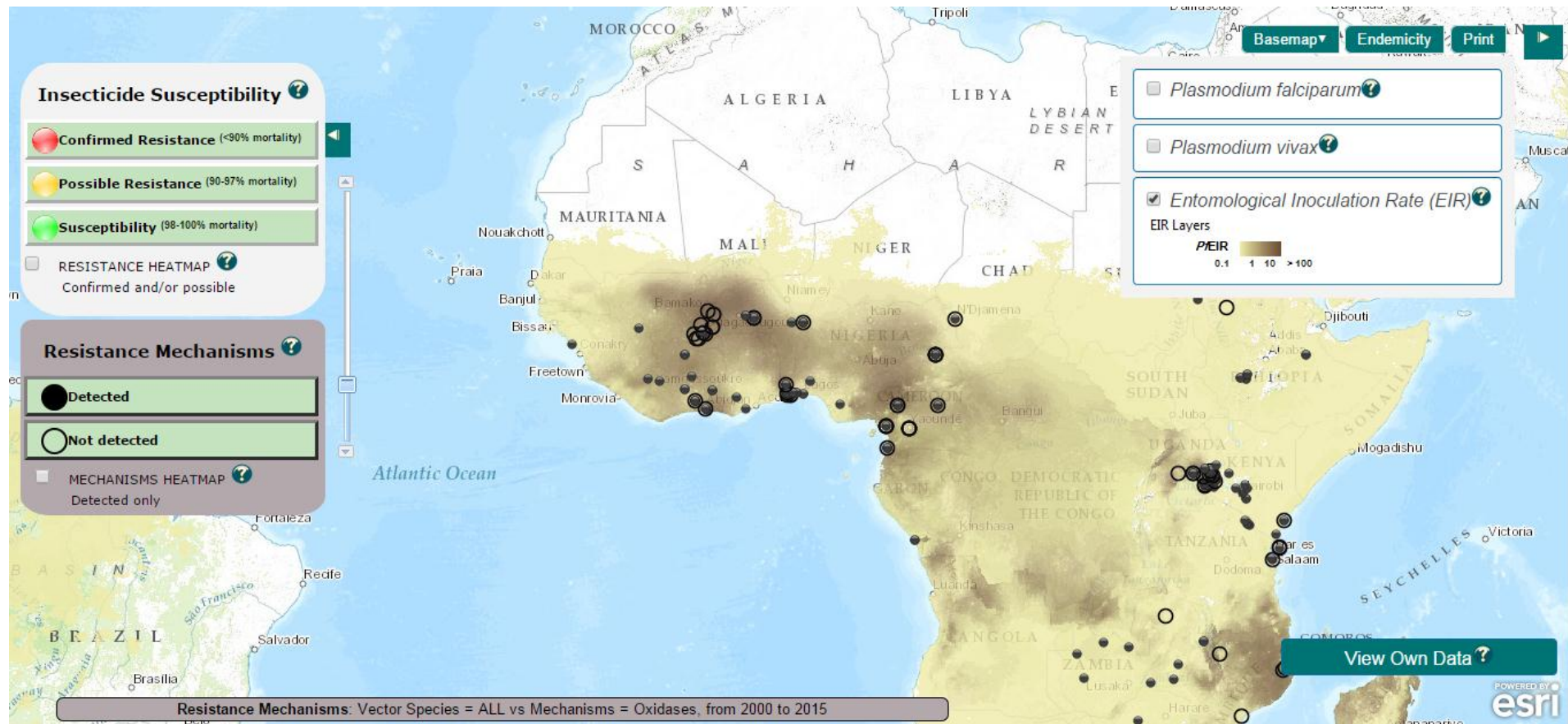
Map interface



Data points and links to data sources



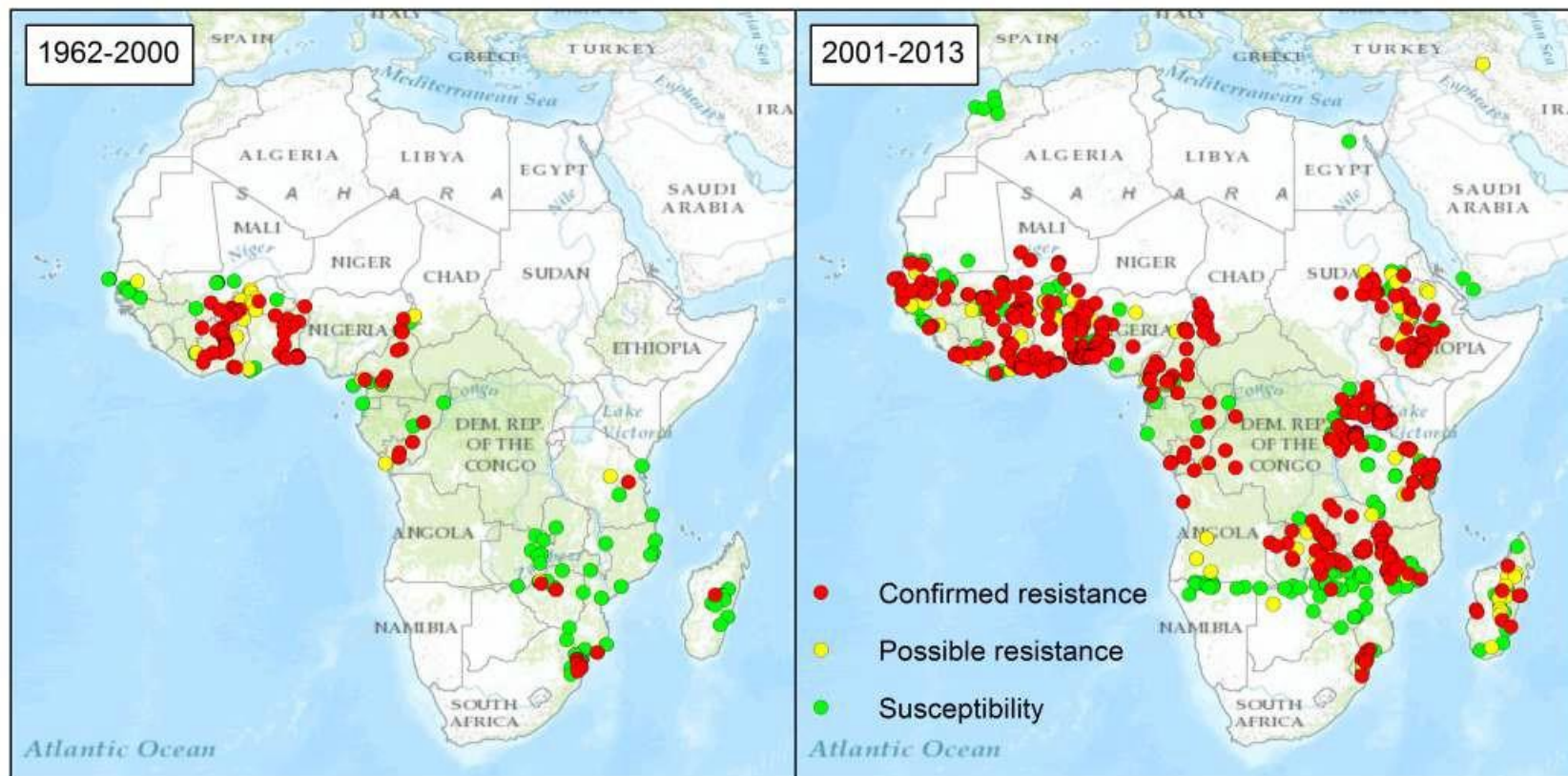
Data layers



IR Mapper statistics

- **9433** individual entries in more than **3257** geo-referenced localities
- **81%** of countries have reported resistance to at least one insecticide, **76%** have reported testing of resistance mechanisms
- **76%** of resistance mechanisms tests are target site assays, **24%** metabolic mechanisms assays
- **Three times** more reports of insecticide resistance in *Anopheles* between **2000-2014**, compared with previous **45** years
- Only **59** reports of insecticide resistance testing in DRC, which is estimated to account for **34%** of global malaria cases (compared to **850** reports in Benin, with estimated **5%** of global cases)

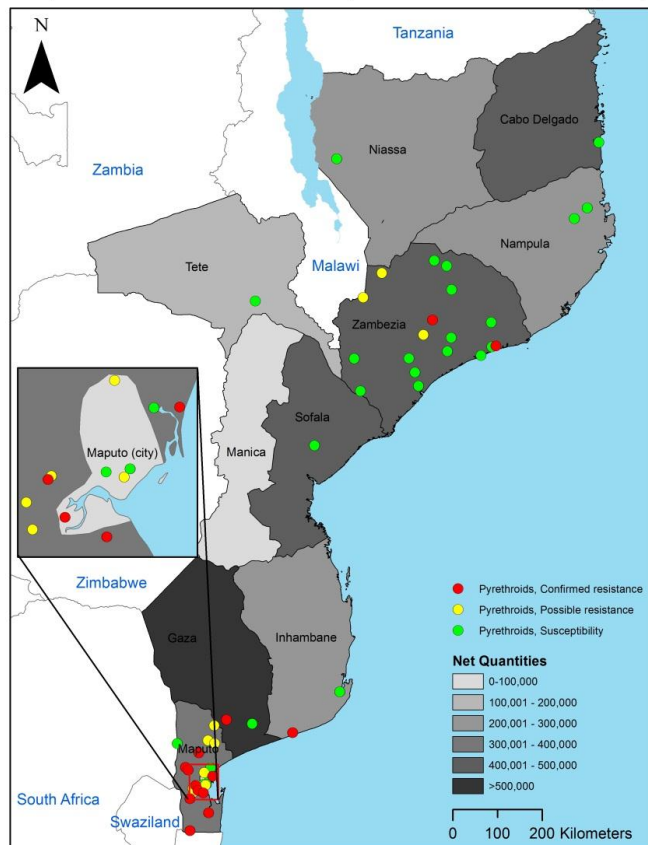
Increasing reports of pyrethroid resistance



Overlaying LLIN distribution data with data from IR Mapper

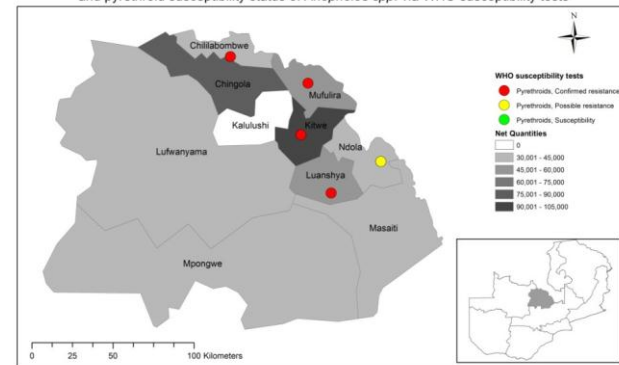
Mozambique

Campanha de distribuicao de redes mosquiteiras - Cobertura universal (2013)



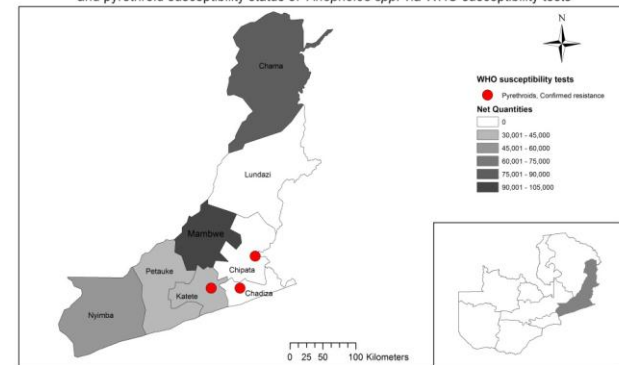
Zambia

Map of Copperbelt Province indicating anticipated distribution quantities of LLINs by district and pyrethroid susceptibility status of *Anopheles* spp. via WHO susceptibility tests



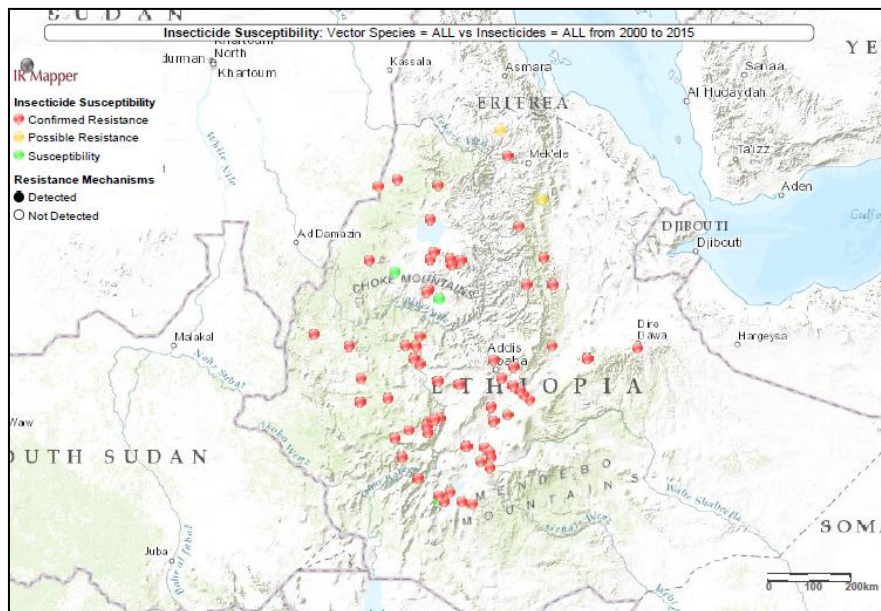
Data sources: Net quantities - Zambia National Malaria Control Centre; Insecticide susceptibility* - www.imapper.com and President's Malaria Initiative
*Where multiple species, insecticides or timepoints data are available the lowest susceptibility status is shown

Map of Eastern Province indicating anticipated distribution quantities of LLINs by district and pyrethroid susceptibility status of *Anopheles* spp. via WHO susceptibility tests

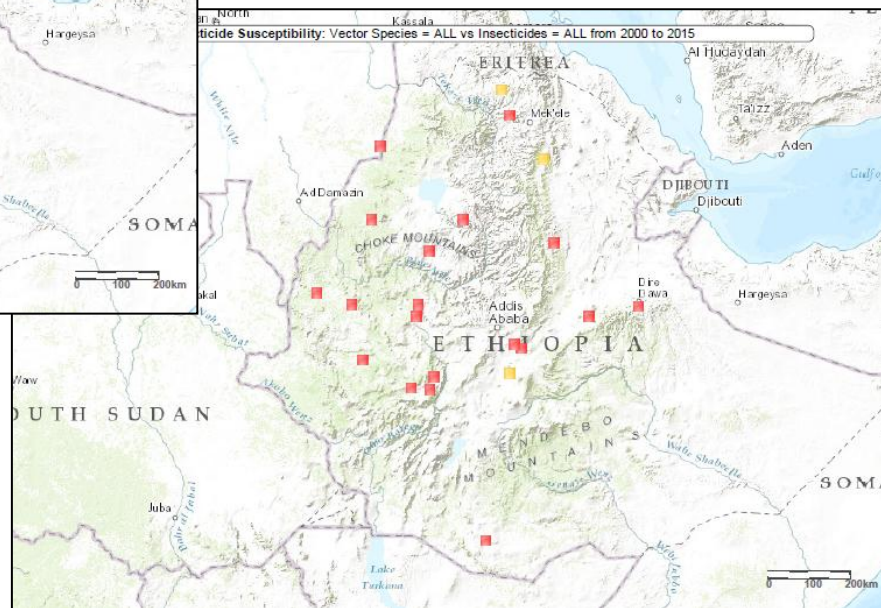


Data sources: Net quantities - Zambia National Malaria Control Centre; Insecticide susceptibility* - www.imapper.com and President's Malaria Initiative
*Where multiple species, insecticides or timepoints data are available, the lowest susceptibility status is shown

2014 upgrades: CDC bottle assay data

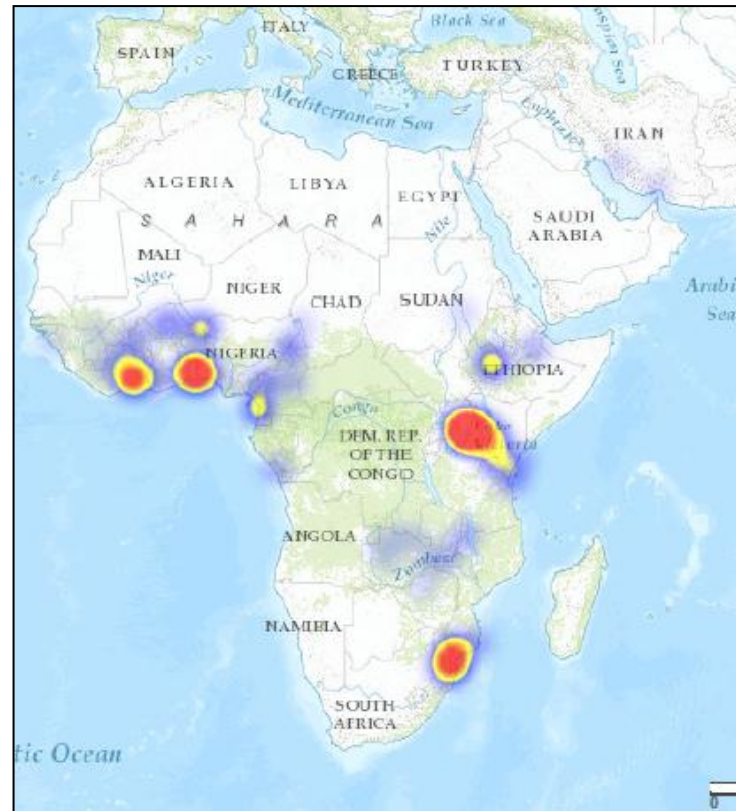


WHO susceptibility test



CDC bottle assay

2014 upgrades: synergist assays



Frequency of reports confirming oxidase-based metabolic resistance in Anopheles, 2000-2014

Summary

- IR Mapper is a free online platform providing a consolidation of published insecticide resistance data since 1954
- Supports the global call for pre-emptive action to address insecticide resistance (GPIRM)
- Allows display of *Plasmodium* endemicity and EIR layers with IR data
- Can be used to inform monitoring activities, research initiatives, product development, tool deployment etc.
- Allows users to display their own data alongside historic data sets and print maps

Acknowledgements



Conceived of idea, database development, application functionality



Data Proofing and verification



Mapping application programming



Plasmodium and EIR layers



IR Mapper

Visit us at: www.irmapper.com

We welcome all feedback to help continually improve the tool