Digital tools for entomological surveillance and interventions monitoring: DHIS2 modules and Malaria Threats Map

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WHO standard DHIS2 Modules for entomology and vector control

Purpose:

• Facilitate the collection and interpretation of data from routine/programmatic entomological surveillance and vector control interventions monitoring at national level

• Integrate entomology and VC data into National Health Information/Disease surveillance Systems.

Activities covered:

- **Insecticide resistance monitoring** (discriminating concentration, intensity and synergist-insecticide bioassay; and molecular and biochemical assays)
- IRS campaign results
- IRS quality and residual efficacy (i.e. cone bioassays)
- LLIN campaign results
- LLIN bio efficacy
- Breeding sites mapping
- Adult surveillance
DHIS2 modules for implementation at national level

A DHIS2 package

- A data collection form (with standard variables aligned with WHO how-to guides, e.g. Test procedures for Insecticide Resistance monitoring in malaria vectors.
- Indicators: campaign coverage, mosquito mortality, mosquitoes densities
- Dashboards: maps, line and bar charts, tables.


Updates: [https://www.who.int/malaria/areas/vector_control/dhis-tools/en/](https://www.who.int/malaria/areas/vector_control/dhis-tools/en/)
DHIS2 modules for implementation at national level

Implementation:
1. Customization to national context (docker images library)
2. Integration into the national health information system
3. Prospective data collection
4. Historical data “rescue”

Countries supported in 2019:

Metadata distribution
Making metadata available on:
https://www.who.int/malaria/areas/vector_control/dhis-tools/en/
Malaria Threats Map: global monitoring of VC threats

Malaria Threats Map
Tracking biological challenges to malaria control and elimination

VECTOR INSECTICIDE RESISTANCE
Resistance of malaria mosquitoes to insecticides used in core prevention tools of treated bed nets and indoor residual sprays threatens vector control effectiveness

PARASITE pfhrp2/3 GENE DELETIONS
Gene deletions among some malaria parasites cause false negative diagnostic test results, complicating case management and control

PARASITE DRUG EFFICACY AND RESISTANCE
Resistance of malaria parasites to artemisinin – the core compound of the best available antimalarial medicines – threatens antimalarial drug efficacy

INVASIVE VECTOR SPECIES
The spread of anopheline mosquito vector species and their establishment in ecosystems to which they are not native poses a potential threat to the control and elimination of malaria

https://www.who.int/malaria/maps/threats-about/en/
Malaria Threats Map: developments in 2019

New theme showing the distribution of *Anopheles stephensi*. *Other species will be included as detections are reported*

New detection integrated last week
Malaria Threats Map: developments in 2019

Wizard to guide users through MTM

Welcome to Malaria Threats Map!
You are at a WHO official platform created to present the magnitude and spread of four biological challenges for malaria control and elimination. This wizard will show how to use the platform.

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Global Malaria Programme
Maps to guide the deployment of pyrethroid – PBO nets

*Based on WHO recommended criteria for deployment*
Much more and better insecticide resistance data

- 34503 study results from 1955 to 2019
- 89 countries
- 4312 geographical sites
Malaria Threats Map: developments in 2019

Routing to facilitate sharing visualizations

https://apps.who.int/malaria/maps/threats/?theme=prevention&mapType=prevention%3A0&insecticideClass=CAR_BAMATES&insecticideTypes=&assayTypes=MOLECULAR_ASSAY%2CBIOCHEMICAL_ASSAY%2CSYNERGIST-INSECTICIDE_BIOASSAY&synergistTypes=&species=An.+funestus+s.l.&vectorSpecies=&surveyTypes=&deletionType=HRP2_PROPORTION_DELETION&plasmodiumSpecies=P._FALCIPARUM&drug=DRUG_AL&mmType=1&endemicity=false&countryMode=false&storyMode=false&storyModeStep=0&filterOpen=true&filtersMode=filters&years=2011%2C2016

Improve visualization for mobile devices
Malaria Threats Map: developments in 2019

Improved acknowledgements for data curation and source references

**Umren**

**Species:** An. stephensi s.l.
**Sampling period:** 2012
**Sampling method:** Not reported
**Species identification method:** morphology, DNA sequencing


**Acknowledgement for data curation**
Sinka & Massey, HuniBug project

**Soroti, Uganda**

Discriminating concentration bioassays, WHO test kit bioassay

- % mosquito mortality

Abeiku et al. (2017) Insecticide resistance patterns in Uganda and the effect of indoor residual spraying with bendiocarb on kdr I1014S frequencies in Anopheles gambiae s.s., Malar J. 2017 Apr 20;16(1):155

**Acknowledgement for data curation**
VectorBase - www.vectorbase.org
Data download feature

- To allow download of Drug Efficacy, Insecticide Resistance and Invasive species data
- To understand and track data use
- Data use subjected to the Terms and Conditions of use for WHO data compilations, aggregations, evaluations and analyses
Map export feature
To export maps and add them to reports and presentations.

Time slider
to show temporal trends in threat evolution.

Insecticide Resistance and Drug Efficacy status updates generated automatically as new data comes in and corresponding to / informing Global Reports.

User subscription to threat alerts
To send alert messages to subscribers when a threat expands geographically or a new threat emerges.

Improved collection of user feedback
to help better understand user needs and inform next phases of development.
Digital solutions to facilitate global reporting

WHO - Standard modules for entomology and vector control
This is a demo of the WHO DHIS2 standard modules for entomology and vector control

[NEW] WHO MetaDataSync
(DHIS2 app for data synchronization)

Global Malaria Programme
World Malaria Report 2019


Malaria Threats Map
Tracking biological challenges to malaria control and elimination

Global Malaria Programme
World Health Organization
To request support for implementing the DHIS2 modules:
fernandezl@who.int

To submit questions or suggestions about Malaria Threats Map:
gmp-maps@who.int

To report data on detections of invasive vector species:
vector surveillance@who.int

To receive regular updates on WHO’s vector control work:
WHO Vector Control Updates: www.who.int/vector-control