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Background documentation for Day 1

This file contains the slides that were shown by the presenters during Day 1 of the meeting as well the background documentation shared with MPAG members ahead of the meeting.

Monday, 4 March 2024			
	Session 1	**Open**	
09:00 – 09:05	Welcome by the Chairperson, MPAG	Professor Dyann Wirth MPAG Chairperson	**For information**
09:05 – 10:30	Report from the Director, GMP	Dr Daniel Ngamije M. Director, Global Malaria Programme	
	Session 2	**Open**	
11:00 – 12:00	Progress on malaria vaccine introduction and scale up Background | Presentation	Dr Mary Hamel Senior Technical Officer, Product & Delivery Research	**For information**
12:00 – 12:30	Update on Gavi supported malaria learning agenda	Dr Stephen Sosler Head of Vaccine Programmes, GAVI, the Vaccine Alliance	
	Session 3	**Open**	
14:00 – 15:00	"High burden to high impact" (HBHI) approach and catalytic role of GMP & RBM in support to countries to own and implement HBHI approach Background | Presentation	Dr Maru A. Weldedawit Unit Head, High Burden to High Impact MPAG subcommittee on HBHI NMCP	**For advice**
	Session 4		
15:00-17:00	Sub-national tailoring (SNT) for decision-making – Overview and update Background | Presentation	Dr Beatriz Galatas Technical Officer Strategic Information for Response Unit (virtual)	**For information**
	Guiding principles for prioritization overview Background | Presentation	Dr Andrea Bosman Unit Head, Diagnostics, Medicines & Resistance	**For decision**
	Biological threats to malaria vector control interventions Background | Presentation	Dr Jan Kolaczinski Unit Head, Vector Control & Insecticide Resistance	**For Information**

WHO/UCN/GMP/MPAG/2024.01

Report from the WHO Global Malaria Programme

Malaria Policy Advisory Group
Yaoundé, Cameroon

4 March 2024

Dr Daniel Ngamije, Director

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Overview

1. WHO certifies Cabo-Verde as malaria-free
2. World Malaria Report
3. GMP operational strategy 2024-2030 – vision and implementation
4. Meeting reports
5. Technical updates
6. Upcoming: Ministerial Conference, World Malaria Day, Technical Publications

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1. Malaria-free certification of Cabo Verde

- Cabo Verde awarded a malaria-free certification by WHO in January 2024 – a significant public health milestone.
- It is the 3rd country in the WHO African Region to be certified malaria-free, after Mauritius (1973) and Algeria (2019)
- A total of 43 countries and 1 territory have received the certification.

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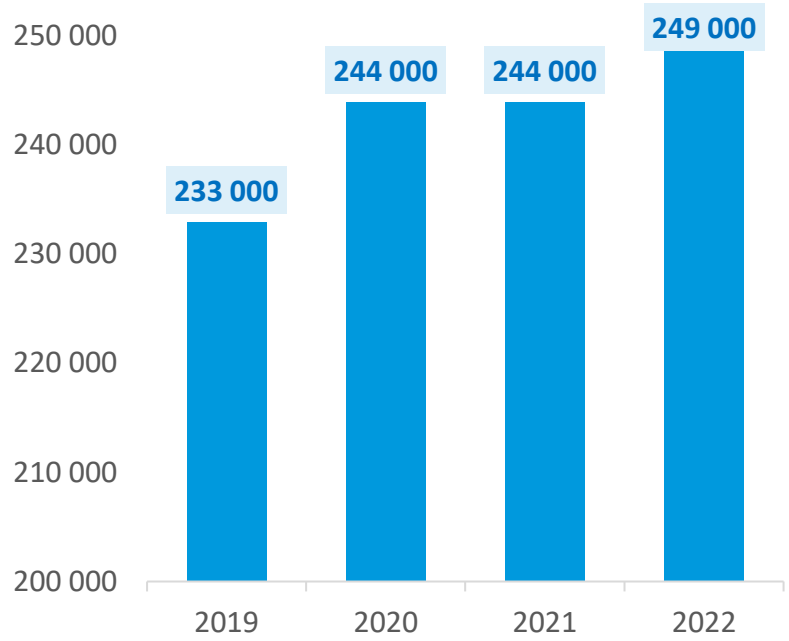
2a. World Malaria Report

Key findings:

- # of cases and deaths was significantly higher in 2022 than in 2019 (pre-pandemic)
- Too many people still miss out on the services they need to detect, prevent and treat malaria. In 2022:
  - ITN use among pregnant women and children has changed very little since 2015 (56%)
  - 58% of pregnant women were still not benefiting from the recommended 3 or more doses of IPTp
  - About one third of febrile children were not taken to a health providers for care.

Number of malaria cases (000), 2019–2022



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2b. Threats to progess, including new focus on climate change

- 2023 report included, for the first time, a dedicated chapter focused on the malaria-climate nexus
- Climate variability is expected to have *direct* effects on malaria transmission and indirect effects on malaria through:
  - reduced access to essential health services;
  - disruptions to supply of key malaria commodities;
  - population displacement, insecurity and impact on livelihoods.
- Report highlighted other key threats to progress, incl. conflict and humanitarian crises, resource constraints, drug & insecticide resistance and fragile health systems.

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GTS Vision: A world free of malaria

GMP Operational Strategy

WHAT?

Mission

Support all Member States in implementing the Global technical strategy for malaria 2016–2030 and promote effective partnerships with malaria stakeholders

Principles

Country ownership and leadership, with a whole-of-government & whole-of-society approach

- Resilient health systems
- Equitable access
- Data and science

HOW[1]?

Norms & Standards	New tools & innovations	Strategic information for impact	Leadership
Develop and disseminate **up-to-date and relevant norms and standards**	Proactively **shape research agenda** and accelerate the **development, introduction, and adoption** of new tools & innovations	**Track global trends and threats** and act on **strategic information**	**Mobilize** the malaria community through strong **technical leadership** to secure renewed commitment & resources

CONTEXT-BASED COUNTRY SUPPORT[1]

Burden

HBHI
Endemic
Elimination
Prev. of reest.

- Rapid adoption & adaptation of guidance
- Timely introduction of new tools & innovations
- Countries capacitated to collect and act on data
- Concerted effort to strengthen commitment

BOLD: Differentiated approach

Closely integrated with broader UHC/PHC, MNCH[2] , GER[3] , malnutrition, and climate agendas – contributing to impact on malaria and equitable outcomes

ENABLERS

- Complementarity across 3-levels
- Cross-departmental coordination
- Partner engagement
- Transformation & talent
- Financing

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1. Across the following interventions: Vector control, Immunoprevention, Chemoprevention, Diagnosis, Chemotherapy, Surveillance; 2. Maternal, Neonatal, and Child Health 3. Gender, Equity, Rights

Putting the Operational Strategy into action

GMP Operational Strategy outlines overall direction of GMP's work towards achieving the Global Technical Strategy for Malaria 2016-2030 targets - supported by tools to help raise needed resources, prioritize work, be accountable and deliver.

Costed Operational Plans :outline detailed work to implement the strategy and funding needs and gaps to guide resource mobilization efforts

Monitoring & Evaluation Framework: translates the strategy into operations for tangible impact (tracks inputs, outputs to eventual outcomes and impact)

Resource Mobilization strategy: guides efforts to mobilize resources for the work outlined and costed in the Operational Plans

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4. Meeting reports

- Virtual consultation on expansion of the external quality assessment scheme for molecular markers of antimalarial drug resistance, 14 July 2023 – in preparation
- Regional stakeholder meeting on the response to antimalaria drug resistance in Africa, 7-8 November 2023, Kampala, Uganda – in preparation
- Meeting on subregional network of antimalarial drug resistance and efficacy in Eastern Africa and the Horn of Africa, 9-10 November 2023, Kampala, Uganda – in preparation
- 19th Meeting of the Vector Control Advisory Group, 27 – 28 September 2023 (https://www.who.int/publications/i/item/9789240087699)

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5. Technical updates

a) Vector control and insecticide resistance

b) Vaccines

c) Diagnostics, medicines & resistance

d) Strategic information for response

e) High burden to high impact

f) Elimination

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5a. Vector control and insecticide resistance

Progress since November 2023

- IRS manual updated and published (February) https://www.who.int/publications/i/item/9789240083998
- IRS video developed and published https://youtu.be/uTNoT2gSLz0
- Deep dive on successes and failures of *An. stephensi* control conducted for Sri Lanka, India and Iran
- Comparative efficacy study protocol updated
- Public consultation on quality of WHO test kits and papers completed
- Planning proposal for 2024/2025 guidelines development submitted to the WHO Guidelines Review Committee

Priorities for next quarter

- Publish documents updated since Nov 2023
- Finalize update to document on Norms, standards and processes
- Initiate cost of goods study on insecticide treated papers and test kits
- Initiate discriminating dosage study for broflanilide and isocycloseram
- Initiate update to the operational manual on larval source management
- Hold 20th Meeting of the Vector Control Advisory Group, 25-28 March 2024

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5b. Vaccines

Progress since November 2023

- Malaria Vaccine Implementation Programme (MVIP) completed and pilot countries* successfully transitioned to Gavi support
- 2 additional countries introduced malaria vaccine: Cameroon on 22 January and Burkina Faso on 5 February
- 2 additional countries approved to receive Gavi support (Guinea and Côte d'Ivoire), bringing the total to 20 countries. 6 new applications submitted and under review
- R21/Matrix-M pre-qualified; 2 vaccines resolve supply constraints; countries allocated either RTS,S or R21 for scale-up
- Learning agenda on implementation and operational research:
  - WHO Coordination group convened to prioritize and monitor progress of implementation of SAGE/MPAG identified high priority research recommendations for R21
  - GAVI and WHO development of malaria vaccine learning agenda through broad consultation (by PMI Insights)

Priorities for next quarter

- Continue to provide technical support for malaria vaccine introductions:
  - Learning workshops and webinars
  - Review of vaccine applications
  - Support vaccine implementation
- Continue to disseminate results of the MVIP:
  - Support for the development of peer-reviewed publications
  - Presentation at scientific, public health symposia and other country and regional meetings
- Update WHO position paper and WHO malaria guidelines to reflect updated recommendation (including R21)

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*Ghana, Kenya, Malawi

5c. Diagnostics, Medicines & Resistance

Progress since November 2023

- GDG meeting for malaria chemotherapy on Tafenoquine and Primaquine, 14-15 November, Geneva
- Virtual GDG meeting on near-patient G6PD tests to support safe and effective P. vivax anti-relapse treatment, 30 November- 1 December and 26 and 29 February 2024
- Technical consultation to update WHO practical handbook for management of severe malaria, 16-17 November, Geneva
- Regional stakeholder meeting on the response to antimalarial drug resistance in Africa, 7-8 November, Kampala
- Meeting on subregional network of antimalarial drug resistance and efficacy in Eastern Africa and the Horn of Africa, 9-10 November, Kampala
- Rwanda assessment and strategy to respond to antimalarial drug resistance

Priorities for next quarter

- Workshop to review the operational manual on Outreach Training and Supportive Supervision, 14-15 March 2024, Geneva
- Technical consultation on multiple first line therapy (MFT), Mid-May 2024, Geneva
- Piloting the EQA scheme expansion (K-13)
- *pending PQ listing of near-patient G6PD tests:*
  - Updated WHO malaria guidelines on Tafenoquine/Primaquine and G6PD near patient tests
  - Technical consultation to develop a WHO field guide for case management of *P.vivax* malaria

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5d. Strategic information for impact

Progress since November 2023

- Publication of the World Malaria Report 2023
- EPI stratification workshop in collaboration with AFRO – 10 countries trained
- SNT: Direct support provided on use of data for decision-making: Burkina Faso, Côte d'Ivoire, DRC, Guinea, Liberia, Nigeria, São Tomé e Principe, Sierra Leone, Somalia, Yemen
- Analysis and use of health facility data: completed start-to-end review
- WHO academy: Online training in analysis and use of health facility data
    - Complete storyboard submitted for review, Module 1 of 3 completed, under review,
- Surveillance Assessments: Digital toolkit: completed start-to-end review
    - In-country: Botswana (used to inform the NSP), South Africa and Eswatini are in the final stages of completion
- Malaria Threats Map: New dashboard charts, improved data synchronization
    - Updates of antimalarial drug resistance, hrp23 and invasive species datasets

Priorities for next quarter

- Subnational tailoring implementation manual
- Publication of the Analysis and use of health facility data guidance
- SNT: Continued direct support on use of data for decision-making: Burkina Faso, Côte d'Ivoire, DRC, Guinea, Liberia, Nigeria, São Tomé e Principe, Sierra Leone, Somalia, Yemen
- Surveillance Assessments:
    - Digital toolkit piloting
    - In-country assessments in two or more: India, Mozambique, Tanzania and São Tomé and supporting ongoing assessments
- Technical support to GAVI and MVIP to inform the extent of the vaccine scale-up plans
- Malaria Threats Map : Updates of insecticide resistance datasets
- Revised WMR data collection forms/tools for 2024

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5e. High burden to high impact (HBHI)

Progress since November 2023

- Field Manual for Malaria in Emergencies
  - Taskforce in-person meeting (5-8 Dec 2023)
  - Three virtual meeting for incorporating feedback and inputs
- Developed 12 HBHI Country profiles
- Drafted Declaration for the Ministerial Conference
- Concept note for Accelerated Mortality Reduction
- Finalized Combined HBHI Evaluation Report (RBM and WHO-led)
- Continuation of the 1,7 mRCTR operational research in four countries

Priorities for next quarter

- Finalization and editing of Field Manual for Malaria in Emergencies (Publication in Q2)
- Update Epidemic Preparedness and Response in the latest Surveillance Manual
- Refinement of the HBHI Approach (following the recommendations)
- Plan for expansion of the HBHI approach to the 2nd tier countries
- Develop implementation and M&E framework of the Declaration of the Ministerial Conference (together with RBM)
- Initiate Mortality Mapping at country level
- 1,7 mRCTR operational research

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5f. Elimination

Progress since November 2023

- One more country has been certified malaria-free, two countries supported to prepare for certification
- 36 workshops / trainings were held in 12 countries
- Surveillance assessment was initiated/completed in 3 countries
- 5th meeting of the TAG-MEC was held on 27-28 November 2023, in Cairo, Egypt
- Sub-group on zoonotic malaria was establishment under the TAG-MEC
- Two publications of the **TOWARDS MALARIA-FREE WORLD** series have been released
- Video on “reactive” strategies developed and published

Priorities for next quarter

- Certification of Egypt and Timor-Leste; continue supporting Georgia and Türkiye to prepare for certification
- Finalization of the 2th edition of the Framework for malaria elimination
- Meetings of the TAG-MEC
- Supporting surveillance assessment and National Malaria Elimination Strategies in two countries
- Introduction of elimination accelerators in three countries

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6. Upcoming

- Ministerial Meeting
- World Malaria Day 2024
- Technical publications expected in Q2 2024

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6a. Malaria Ministerial Conference, Yaoundé, 6 March 2024

- Convening of Ministers of Health from high burden countries + key malaria stakeholders
- Co-hosted by WHO and the Government of Cameroon, with support from the Government of France, BMGF, RBM Partnership, ALMA, Gavi, and Unitaid
- Four key objectives: 1) Review progress and challenges in meeting GTS targets; 2) discuss mitigation strategies and funding; 3) agree on effective strategies for accelerated mortality reduction in Africa; 4) establish roadmap for increased political will and societal engagement, with a clear accountabilitiy mechanism
- Expected outcome: Declaration signed by African MoH from high burden countries committing to:
    - An accelerated reduction in malaria mortality in their respective countries
    - Other key actions that will speed progress towards the GTS targets

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6b. World Malaria Day

- 2024 theme: WHO, RBM and broader malaria community will call attention to the importance of **health equity, gender equality and human rights** in the malaria response
- Opportunities to amplify the theme throughout 2024:
  - International Women's Day (8 March)
  - World Health Day (7 April – this year's focus is on human rights)
  - World Malaria Day (25 April)
  - MIM Pan-African Malaria Conference (21-27 April)
  - World Malaria Report 2024 (December – dedicated chapter on equity, gender & rights)
  - International Human Rights Day (10 Dec)

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6c1. Technical publications expected in Q1 2024

- Community deployment of intermittent preventive treatment of malaria in pregnancy with sulfadoxine-pyrimethamine: a field guide
- Guidance for malaria programme managers on analysis and use of health facility data
- Meeting report of the WHO technical consultation to update the global *pfhrp2/3* response plan
- Diagnostic tests for detecting the risk of *Plasmodium vivax* relapse: Preferred product characteristics (point of contact and population-based)
- Operational manual on indoor residual spraying: control of vectors of malaria, *Aedes*-borne diseases, Chagas disease, leishmaniases and lymphatic filariasis
- Safety of artemisinin and non-artemisinin antimalarials in the first trimester of pregnancy: review of evidence
- Guiding principles for prioritizing malaria interventions in resource-constrained country contexts to achieve maximum impact
- Publication of feasibility, safety, and impact results of RTS,S/AS01 when implemented through national immunization programmes (MVIP results after 24 months)

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6c2. Technical publications expected in Q2 2024

- 2nd edition of the *Framework for malaria elimination* (originally published in 2017)
- 2nd edition of *Data requirements and protocol for determining non-inferiority of insecticide-treated net and indoor residual spraying products within an established WHO intervention class* (originally published in 2018)
- 2nd edition of *Norms, standards and processes underpinning development of WHO recommendations for vector control* (originally published in 2020)
- 2nd edition of the manual on malaria control in emergencies (originally published in 2013)
- 2nd edition of Malaria surveillance assessment toolkit – implementation reference guide
- *WHO guidelines for malaria*:
  - update on malaria vaccines
  - update on 8-aminoquinolines (tafenoquine and primaquine)
  - update on near-patient G6PD tests to support *P. vivax* anti-relapse treatment
- Updated global *pfhrp2/3* response plan
- Updated *pfhrp2/3* gene deletion surveillance template protocols

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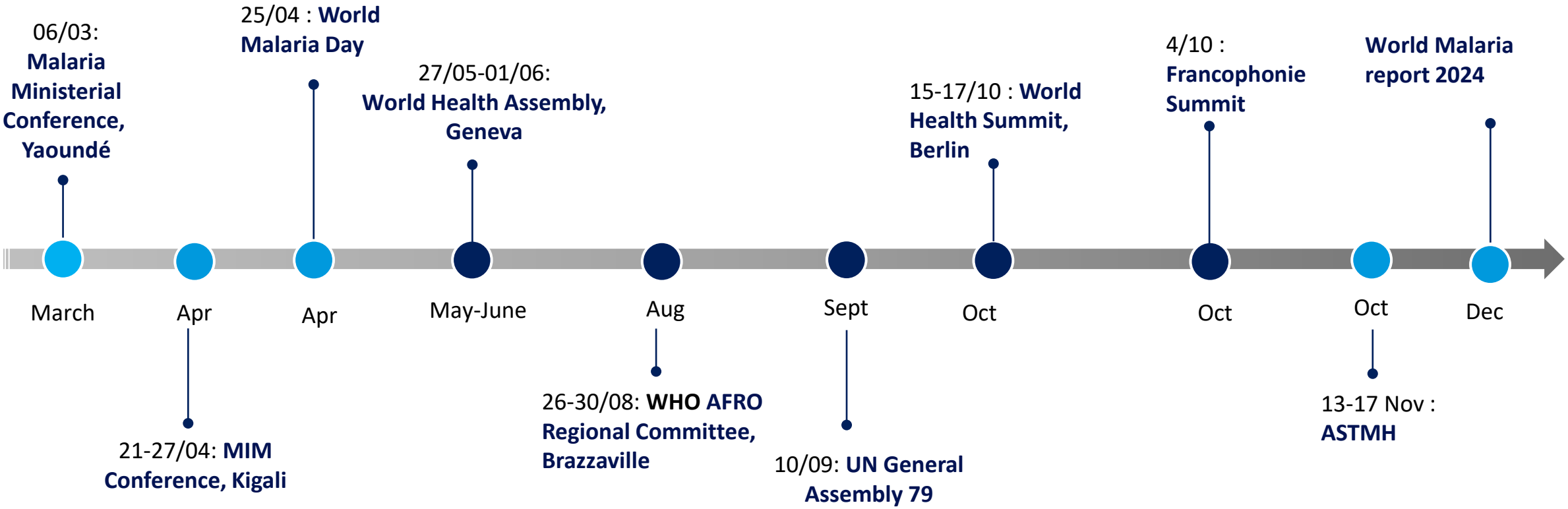
Key events in 2024



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Legend

Malaria-specific events

Non-malaria-specific events

Thank you

For more on the Malaria Policy Advisory Group, visit:
https://www.who.int/groups/malaria-policy-advisory-group

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Malaria Policy Advisory Group Meeting

4–5 March 2024, Yaoundé, Cameroon
Background document for Session 2

Update on malaria vaccines

March 2024

Background

As of October 2023, the World Health Organization (WHO) recommends two vaccines for the prevention of *Plasmodium falciparum* malaria in children, following advice from the joint review of R21/Matrix-M by the Malaria Policy Advisory Group and the Strategic Advisory Group of Experts on Immunization *(1)*. The two vaccines are RTS,S/AS01 (RTS,S) and R21/Matrix-M (R21). The WHO recommendation for RTS,S in 2021 was informed by findings from the Malaria Vaccine Implementation Programme (MVIP) in Ghana, Kenya and Malawi, which started in 2019. The MVIP demonstrated the feasibility, safety and substantial impact of the vaccine in routine use. Priority research questions on R21 were identified during the joint review by the Malaria Policy Advisory Group and the Strategic Advisory Group of Experts on Immunization. Accordingly, WHO has convened an internal coordination team to monitor initiation of and findings from those studies.

Demand for malaria vaccines is high, and, to date, 20 countries have been approved by Gavi, the Vaccine Alliance, to receive support for introduction. Beginning in 2024, the cumulative supply availability of the two WHO-recommended and -prequalified malaria vaccines is expected to meet this high demand, enabling more countries to introduce and scale up the vaccine in areas where malaria is a major public health risk.

Update on the MVIP

The WHO-coordinated MVIP was completed in December 2023. The programme yielded many lessons learned that were applied to the review of the R21 vaccine and will inform subsequent malaria vaccines in terms of their delivery, demand and impact. From the start of vaccination with the first malaria vaccine, RTS,S, in 2019 to December 2023, over 6.5 million doses were administered and over 2 million children reached in Ghana, Kenya and Malawi. All three pilot countries have secured support from Gavi to continue vaccine implementation following the end of the MVIP. In addition, Ghana (approved) and Kenya (pending review by Gavi's Independent Review Committee) have submitted applications to scale up malaria vaccine implementation outside the pilot areas.

Vaccine uptake has remained consistently high in all three countries, despite the challenges brought about by external factors during the MVIP, including the global coronavirus disease (COVID-19) pandemic and climatic factors, such as flooding. According to administrative data for 2023 (January to December), the estimated coverage of the first dose of RTS,S was 83% in Ghana (third dose: 81%; fourth dose: 83%), 83% in Kenya (third dose: 77%; fourth dose: 50%) and 87% in Malawi (third dose: 76%; fourth dose: 46%). Ghana reached high dose-four coverage by changing the timing of the delivery of dose four from 24 months of age to 18 months of age to coincide with the established administration of the meningococcal A conjugate vaccine and the second dose of the measles-rubella containing vaccine. This and the many other lessons learned from vaccine implementation in the MVIP countries have been documented and shared to support non-pilot countries in the planning of vaccine introduction *(2)*.

The 46-month community mortality and sentinel hospital surveillance, which was part of the malaria vaccine pilot evaluation, was completed in Ghana and Malawi in February 2023 and in Kenya in July 2023. The results were presented to the MVIP Data Safety and Monitoring Board in October and to the

Strategic Advisory Group of Experts on Immunization/Malaria Policy Advisory Group Working Group on Malaria Vaccines in November 2023. In late 2023, the results were also presented at the annual meeting of the American Society of Tropical Medicine and Hygiene and the third International Conference on Public Health in Africa in Lusaka, Zambia.

The RTS,S malaria vaccine introduction was associated with a substantial reduction (13%; 95% CI: 3—22) in vaccine-attributable all-cause mortality in children age-eligible for vaccination and 22% (95% CI: 3—36) reduction in hospitalization with severe malaria. Use of insecticide-treated nets, coverage of other vaccines and care-seeking behaviour were balanced between the vaccinating and comparator areas. This impact was achieved during the period of vaccine scale-up (with coverage of the three primary doses of 75% in Ghana, 69% in Kenya and 63% in Malawi in 1-year-old children surveyed in 2022; and coverage of the fourth dose of 54%, 34% and 33% in children aged 30–41 months, or 28–39 months in Malawi, also surveyed in 2022). Impact is expected to increase further as vaccine coverage increases.

Following review of the results, the Strategic Advisory Group of Experts on Immunization/Malaria Policy Advisory Group Working Group on Malaria Vaccines concluded that the final MVIP results strengthen the evidence that informed the existing WHO malaria vaccine recommendation made in October 2021 and demonstrate a good safety profile and significant reduction in hospitalized severe malaria and all-cause mortality in young children.

Malaria vaccine roll-out

The demand for malaria vaccines among governments and communities in malaria-endemic countries is high. As of February 2024, 20 countries have been approved by Gavi to receive support for initial subnational malaria vaccine introduction, and six applications, including from two new countries are currently under review.[1] On 22 January 2024, Cameroon became the first country outside the pilot programme to introduce malaria vaccines into its childhood immunization programme, initially targeting 42 health districts in the country's 10 regions as part of a phased introduction *(3)*. On 5 February, malaria vaccination in selected health districts was launched in Burkina Faso. WHO is coordinating and providing technical support, leveraging the experience from the pilots to support country introductions in 2024. Following the WHO recommendation for the R21 malaria vaccine in October 2023 and WHO prequalification of the vaccine in December, Gavi has included R21 in its malaria programme. The cumulative supply availability of the two WHO-recommended and -prequalified malaria vaccines is expected to meet the high demand, starting in 2024. Given the forecasted easing of supply constraints *(4)*, the *Framework for allocation of limited malaria vaccine supply (5)* will no longer be applied. As a result, Gavi has developed updated guidelines for countries to submit malaria vaccine scale-up plans *(6)*. These updated guidelines will enable countries to expand the scope of malaria vaccine introduction beyond the areas initially approved by Gavi, in line with Gavi and WHO guidance.

Gavi-supported malaria vaccine learning agenda

The Gavi Board recently approved the provision of funds for a learning agenda to help identify and address potential implementation challenges to the uptake and roll-out of the malaria vaccine. PATH has provided technical support to WHO to develop a country-driven global malaria vaccine research agenda specifically focused on operational and implementation research. The aim of this research

[1] Countries with approved Gavi applications for subnational malaria vaccine introduction include: Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Ghana, Guinea, Kenya, Liberia, Malawi, Mozambique, Niger, Nigeria, Sierra Leone, South Sudan, Sudan and Uganda.

agenda is to support a more coordinated approach across global health stakeholders and funders to address key evidence gaps for malaria vaccine scale-up. Drawing from this global malaria vaccine research agenda, WHO has worked with Gavi to identify and prioritize the evidence gaps that are particularly relevant to the scope and timeline of the Gavi learning agenda funding. The shortlisted research areas are currently being finalized and funds are expected to be awarded and spent by the end of 2025.

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5. Framework for the allocation of limited malaria vaccine supply. Geneva: World Health Organization; 2022 (https://www.who.int/publications/m/item/framework-for-allocation-of-limited-malaria-vaccine-supply, accessed 16 February 2024).
6. Gavi Malaria Vaccine Support: Interim Guidelines, December 2023. Gavi, The Vaccine Alliance, 2023. (https://www.gavi.org/sites/default/files/support/guidelines-2023/Gavi_Interim_Guidelines_Malaria_Vaccine_Support.pdf, accessed 20 February 2024).

Contact

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Malaria vaccines update

Malaria Policy Advisory Group

Yaoundé, Cameroon

4 March 2024

Dr Mary J Hamel, Team Lead Malaria Vaccines, IVB

World Health Organization

Session 5: Malaria vaccines
FOR INFORMATION

1. **Progress on malaria vaccine introduction and scale up**
   Dr. Mary Hamel, WHO

2. **Update on Gavi Supported Malaria Vaccine Learning Agenda**
   Dr. Stephen Sosler, Gavi

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Progress on malaria vaccine introduction and scale-up

Dr. Mary J. Hamel,

Team Lead, Malaria Vaccines, IVB, WHO

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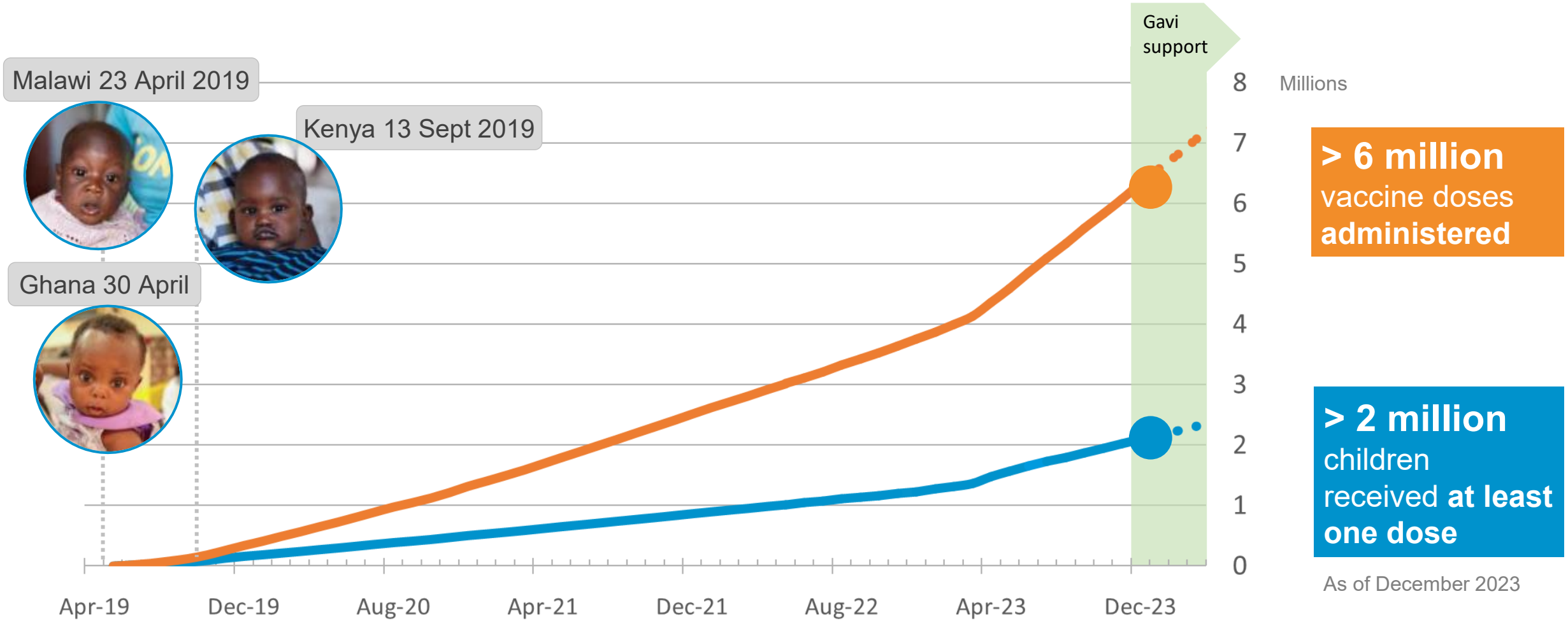
Malaria Vaccine Implementation Programme (MVIP) completed

MVIP countries successfully transitioned to Gavi-supported (and co-financed) vaccine doses



> 6 million vaccine doses **administered**

> 2 million children received **at least one dose**

As of December 2023

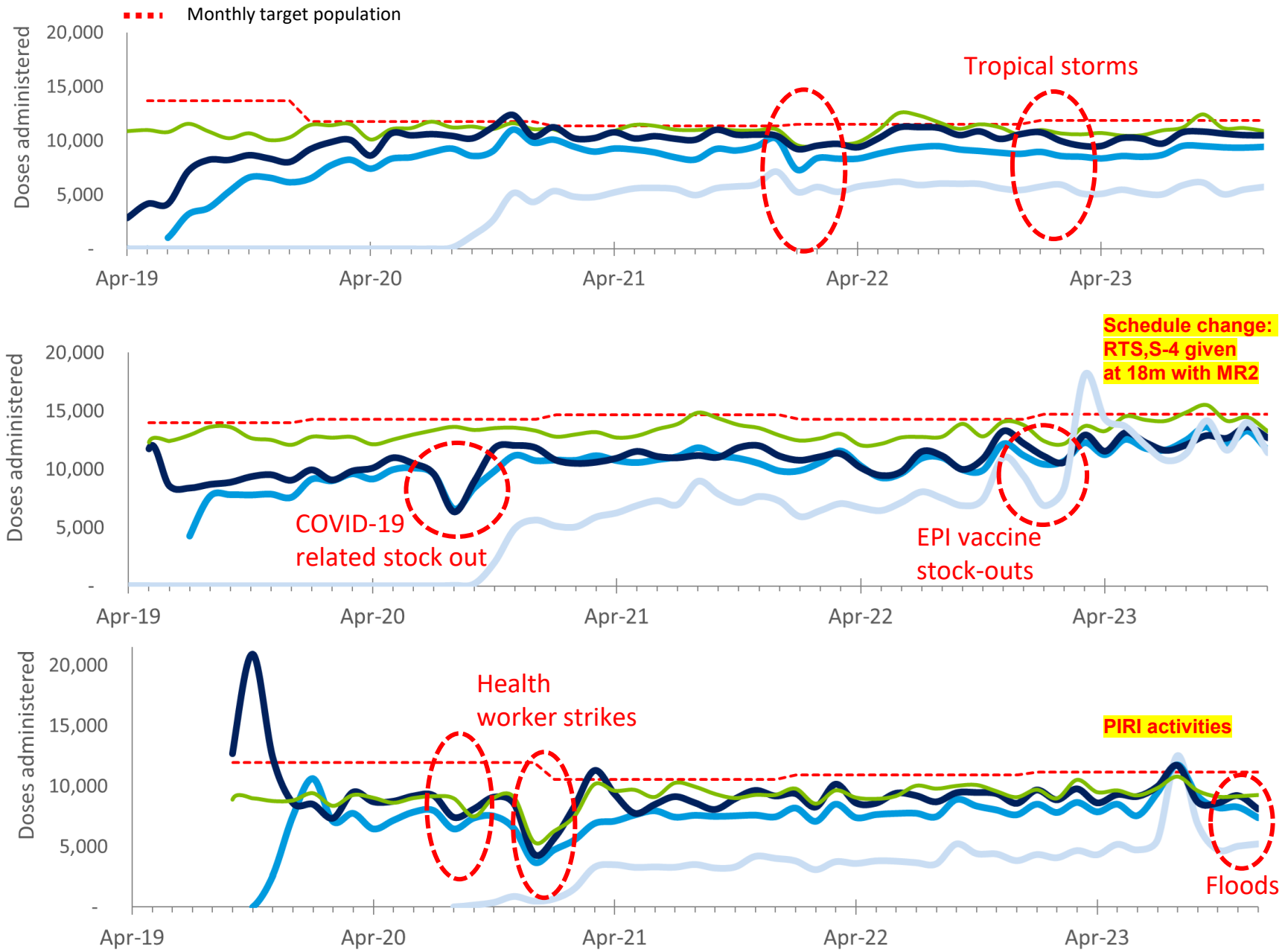
Estimates as of January 2024 - based on monthly MOH/EPI administrative data reports until December 2023, MVIP team projections for subsequent months.

Immunization coverage in MVIP areas from monthly administrative data reports (through Dec 2023)

Malawi	2020	2021	2022	2023
Penta-3	95%	97%	95%	**93%**
RTS,S-1	88%	93%	90%	**87%**
RTS,S-3	73%	81%	76%	**76%**
RTS,S-4	--	49%	50%	**46%**

Ghana	2020	2021	2022	2023
Penta-3	92%	92%	91%	**94%**
RTS,S-1	71%	76%	77%	**83%**
RTS,S-3	66%	74%	74%	**81%**
RTS,S-4		47%	53%	**83%**

Kenya	2020	2021	2022	2023
Penta-3	72%	87%	87%	**90%**
RTS,S-1	69%	82%	83%	**83%**
RTS,S-3	60%	67%	72%	**77%**
RTS,S-4		29%	36%	**50%**



Summary findings from the Malaria Vaccine Programme Evaluation during 46 months of vaccine introduction and scale-up (RTS,S/AS01 implementation 2019 - 2023)

Since 2019: > 2 million children vaccinated with RTS,S/AS01, > 6 million doses administered

*Data shared at MPAG 30 Oct 2023 meeting https://iris.who.int/bitstream/handle/10665/376070/9789240089648-eng.pdf?sequence=1

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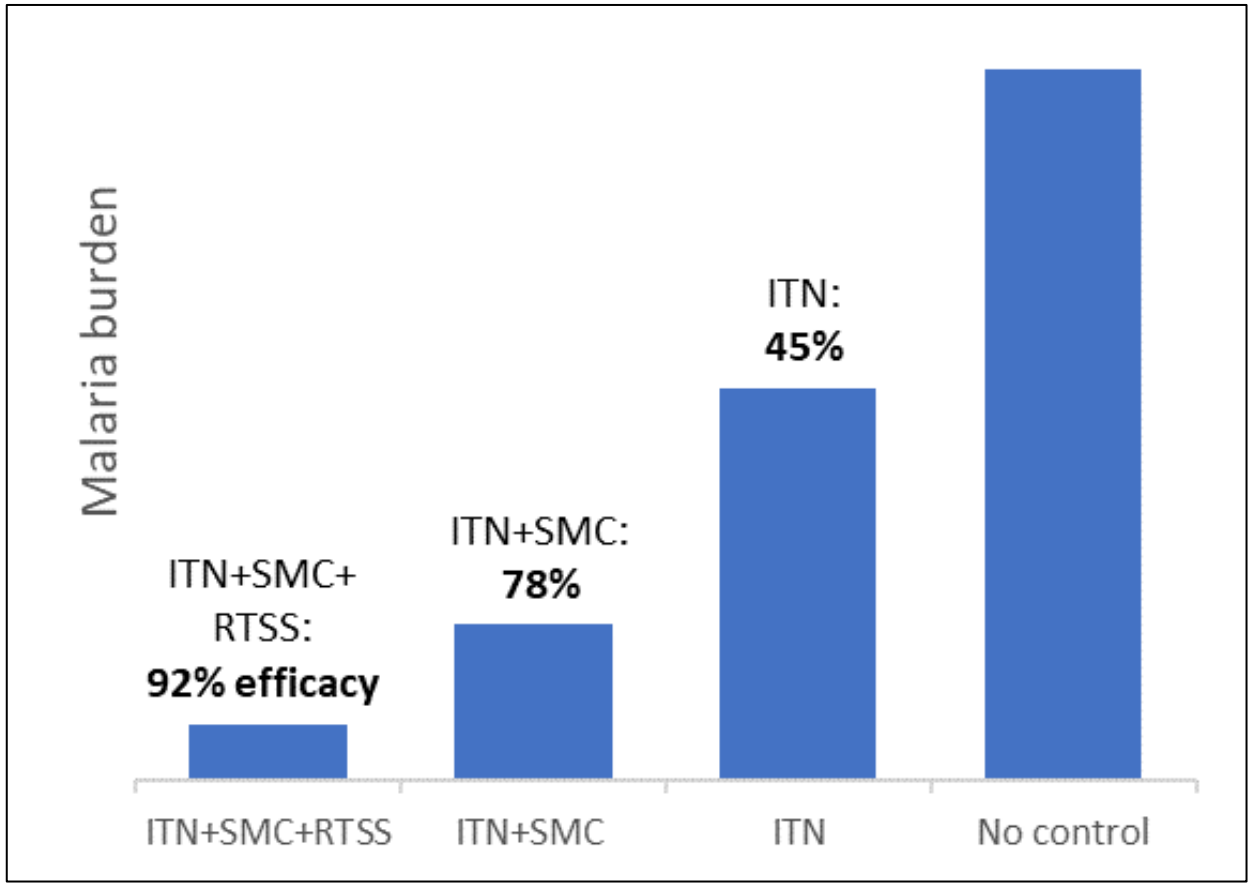
- **High impact during 46 months of vaccine introduction*:**
  - **13% vaccine-attributable reduction in <u>all-cause</u> mortality** excluding injury [0.87 (95% CI: 0.78, 0.98)]
    - Malaria-specific mortality reduction not measured, but must have been much higher
  - **22% reduction** in hospitalized severe malaria [0.78 (95%CI: 0.64, 0.96)]
  - **17%** (95% CI: 6%, 27%) reduction in hospitalization with positive malaria test

  Impact measured in children age-eligible to receive the vaccine (~64-74% dose 3 coverage, ~35-54% dose 4 coverage)
- **Vaccine confirmed to be safe**
- **Feasible to introduce** with high uptake, demand, acceptability, no reduction in ITN use, care-seeking behavior, other vaccines
- **Equity:** Vaccine delivery equitable by gender or SES and is reaching children who are not using other forms of prevention

Highest impact achieved when mix of malaria interventions used together

Will not reach goal of driving malaria illness and death down, without applying a mix of available interventions



Insecticide Treated Net (ITN) efficacy: **45% over 1 or 2 years** https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD000363.pub3/full

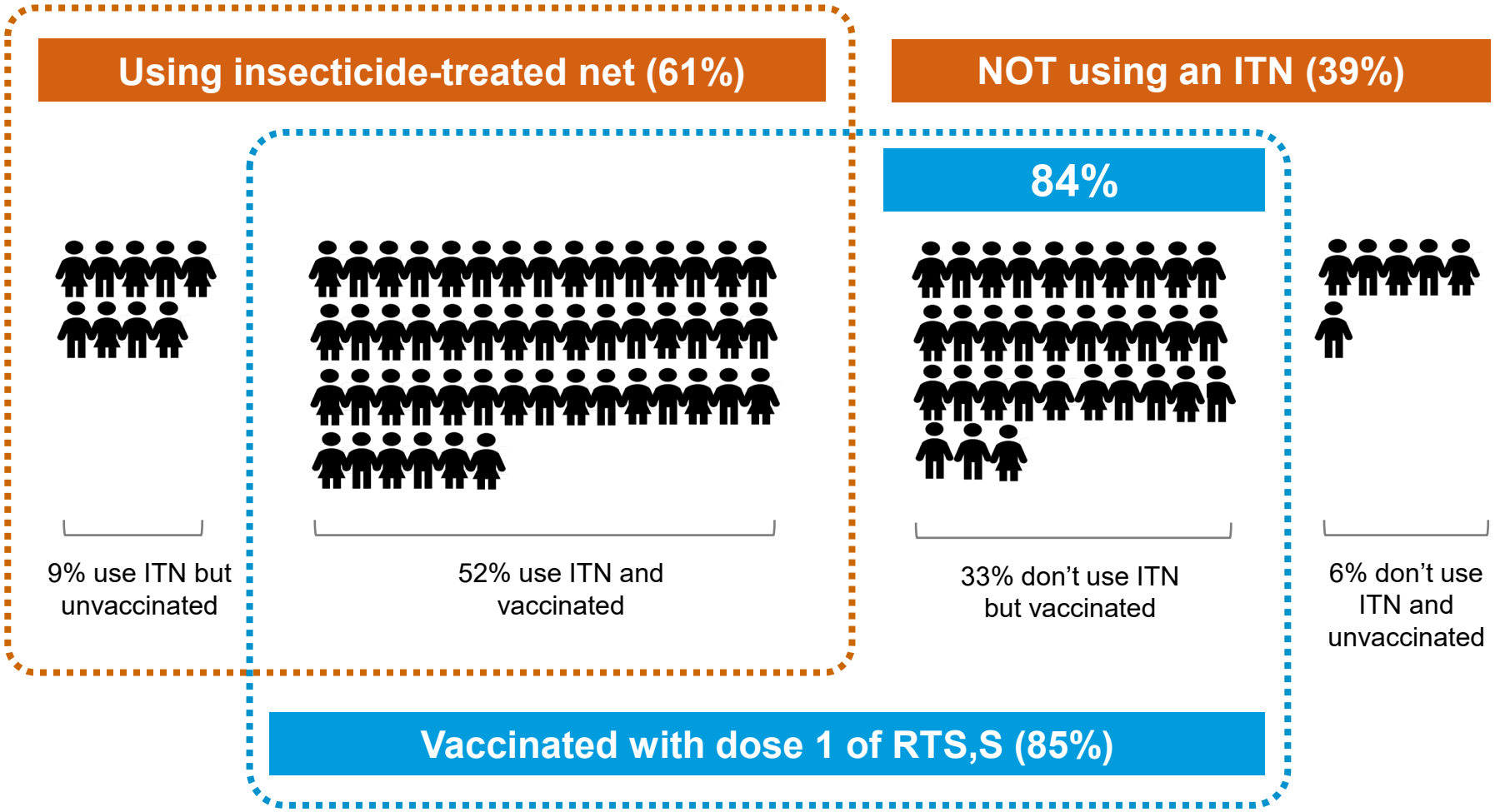
Seasonal Malaria Chemoprevention (SMC) efficacy: **85% per month**, case control studies in 5 countries, https://journals.plos.org/plosmedicine/article/authors?id=10.1371/journal.pmed.1003727
(SMC for 5 months covering 70% of annual burden)

RTS,S/AS01 efficacy of seasonal vaccination **63% efficacious over 3 years** https://www.nejm.org/doi/full/10.1056/NEJMoa2026330

World Health Organization

Prof Paul Milligan, LSHTM

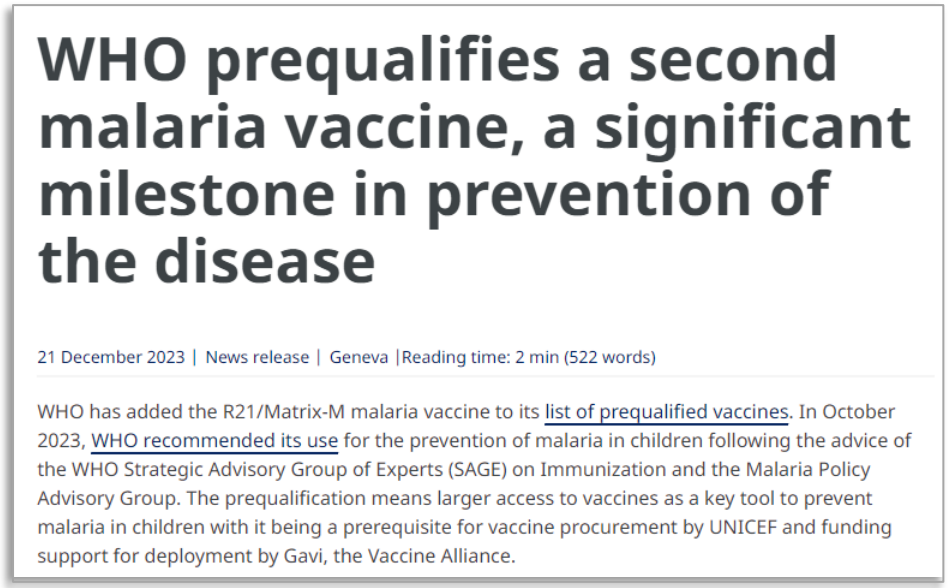
Ghana Endline Feasibility Survey: ITN use and RTS,S, children 12-23 months



World Health Organization

October 2023: WHO recommeds R21/Matrix-M

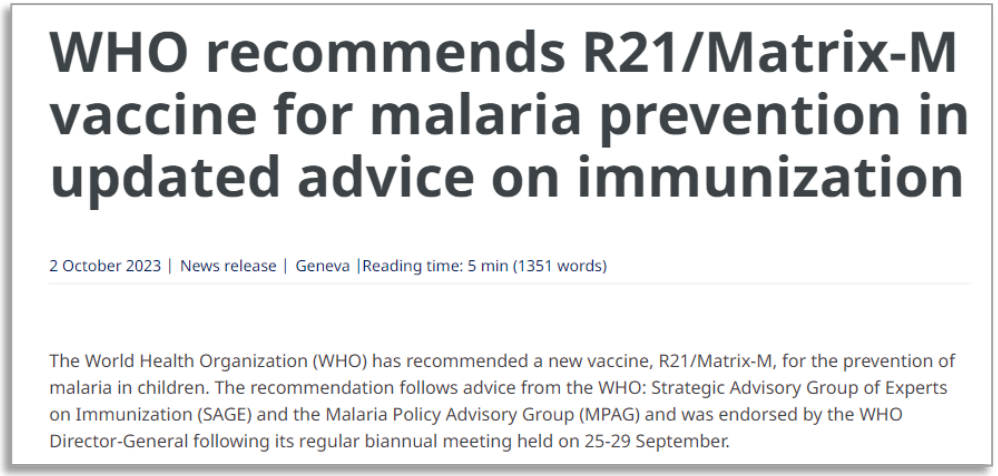
- R21/Matrix-M prequalified in December 2023
- Based on data from a phase 3 clinical trial in 5 study sites in Africa, R21 showed
  - 75% efficacy 12 months after dose 3 when given prior to high transmission season
  - 66% efficacy 12 months after dose 3 when given age-based
  - 4th dose prolonged protection
  - No major safety concerns
- Modelling estimates high public health impact and cost-effectiveness comparable to other malaria interventions and childhood vaccines
- High manufacturing capacity and lower vaccine cost will enable more countries to introduce and scale up malaria vaccine



WHO prequalifies a second malaria vaccine, a significant milestone in prevention of the disease

21 December 2023 | News release | Geneva |Reading time: 2 min (522 words)

WHO has added the R21/Matrix-M malaria vaccine to its list of prequalified vaccines. In October 2023, WHO recommended its use for the prevention of malaria in children following the advice of the WHO Strategic Advisory Group of Experts (SAGE) on Immunization and the Malaria Policy Advisory Group. The prequalification means larger access to vaccines as a key tool to prevent malaria in children with it being a prerequisite for vaccine procurement by UNICEF and funding support for deployment by Gavi, the Vaccine Alliance.



WHO recommends R21/Matrix-M vaccine for malaria prevention in updated advice on immunization

2 October 2023 | News release | Geneva |Reading time: 5 min (1351 words)

The World Health Organization (WHO) has recommended a new vaccine, R21/Matrix-M, for the prevention of malaria in children. The recommendation follows advice from the WHO: Strategic Advisory Group of Experts on Immunization (SAGE) and the Malaria Policy Advisory Group (MPAG) and was endorsed by the WHO Director-General following its regular biannual meeting held on 25-29 September.

World Health Organization

Two safe and effective malaria vaccines are recommended by WHO and pre-qualified

RTS,S/AS01
Malaria Vaccine

WHO recommended: since October 2021
WHO PQ: since July 2022

R21
Malaria Vaccine

WHO recommended: since October 2023
WHO PQ: since December 2023

- Product Choice: There is no evidence that one vaccine performs better than the other. Country decisions on which vaccine to introduce should be made on programmatic characteristics, such as affordability and supply to scale-up
- Supply availability: With two pre-qualified products, supply is expected to be sufficient to meet demand, with scale up by countries with either RTS,S or R21
  - Framework for Allocation of Limited Malaria Vaccine Supply no longer in use

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WHO list of pre-qualified vaccines: https://extranet.who.int/prequal/vaccines/prequalified-vaccines

WHO recommendation: malaria vaccines

WHO recommends the programmatic use of malaria vaccines for the prevention of *P. falciparum* malaria in children living in malaria endemic areas, prioritizing areas of moderate and high transmission

- The malaria vaccine should be provided in a schedule of 4 doses in children from around 5 months of age[1] for the reduction of malaria disease and burden
- A 5th dose, given one year after dose 4, may be considered in areas where there is a significant malaria risk remaining in children a year after receiving dose 4
- Countries may consider providing the vaccine using an age-based, seasonal, or a hybrid of these approaches in areas with highly seasonal malaria or areas with perennial malaria transmission with seasonal peaks
- Countries should prioritize vaccination in areas of moderate and high transmission, but may also consider providing the vaccine in low transmission settings
    - Decisions on expanding to low transmission settings should be considered at a country level, considering, overall malaria control strategy, cost, cost-effectiveness, affordability, programmatic considerations, such as whether including such areas would simplify delivery
- Vaccine introduction should be considered in the context of comprehensive national malaria control plans

This recommendation includes 2 malaria vaccines:

- **RTS,S/AS01**
- **R21/Matrix-M**

More information on the WHO website:
Immunization, Vaccines and Biologicals (who.int)

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[1] Vaccination programmes may choose to give the first dose at a later age based on operational consideration.

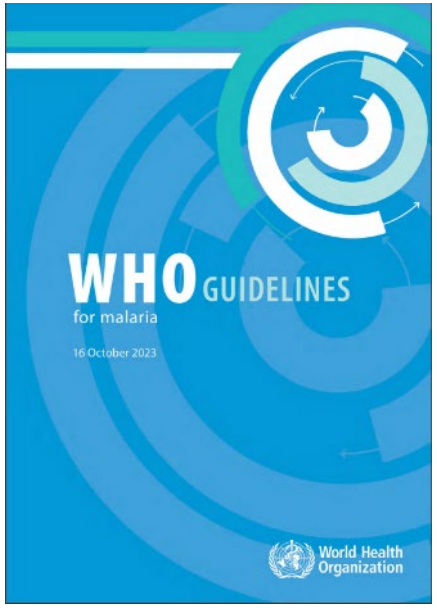
WHO guidance and technical resources

In process of updating to reflect revised recommendations

Malaria vaccine position paper

https://www.who.int/publications/i/item/who-wer9709-61%E2%80%9380
https://www.who.int/publications-detail-redirect/WER-9847-599-620

Guidelines for malaria



https://www.who.int/teams/global-malaria-programme/guidelines-for-malaria

Technical resources to support vaccine introduction

- Guide for introducing a malaria vaccine into national immunization programmes (incl. lessons from pilot countries)
- Generic training materials for health workers
- Guides for promoting demand and for risk communication
- Malaria vaccine introduction readiness assessment tool
- Etc.

Available on TechNet-21 Malaria Vaccine site: https://www.technet-21.org/en/topics/programme-management/malaria-vaccine

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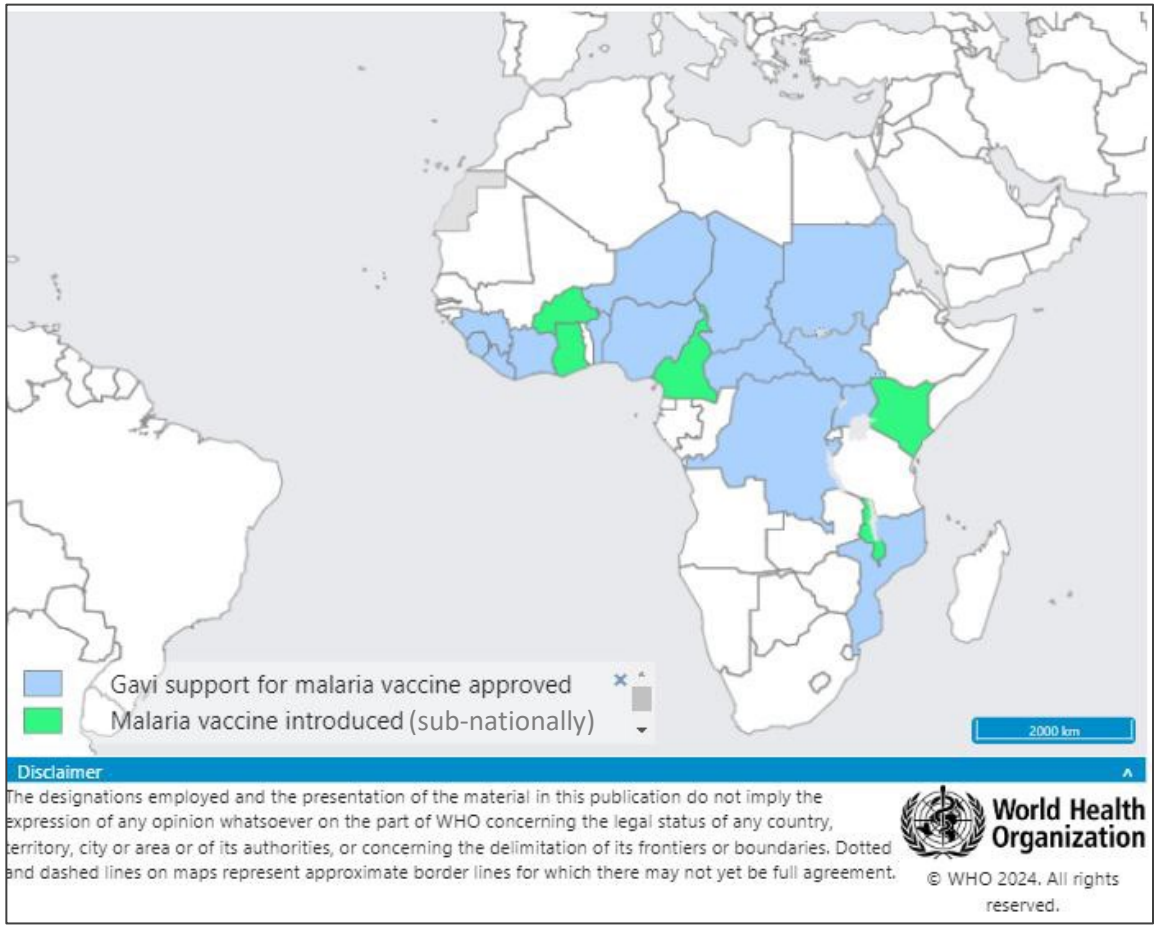
Status of malaria vaccine roll-out – as of early March 2024

- **At least 30 countries** in Africa expressed interest
- **First introductions underway** (sub-national with RTS,S)
  Cameroon introduced on 22 January and Burkina Faso on 5 February
- To-date **Gavi approved applications from 20 countries**:
  Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, DR Congo, Ghana, Kenya, Malawi, Niger, Nigeria, Liberia, Mozambique, Sierra Leone, South Sudan, Sudan, Uganda, Côte d'Ivoire, Guinea
- 6 new applications submitted and under review – including for scale-up
- Following updated WHO recommendation and PQ, Gavi is able to support **R21** with procurement by UNICEF

  Roll-out of R21 expected to start mid-2024



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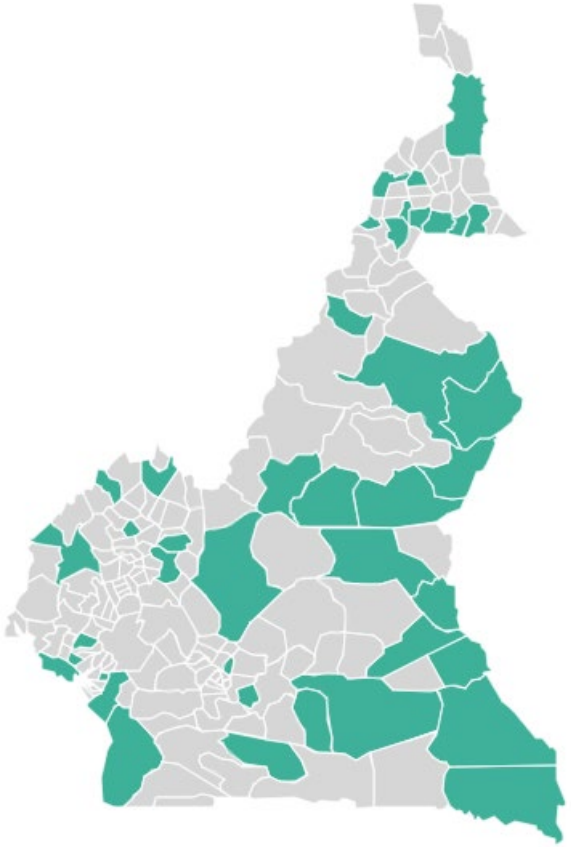
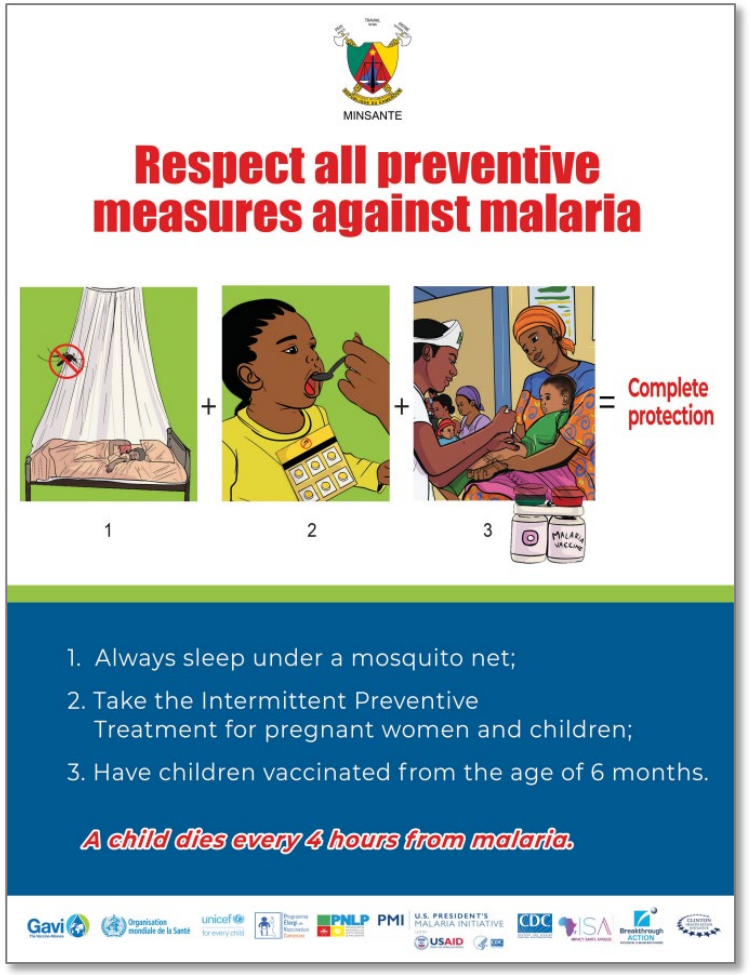
Congratulations to Cameroon for the start of malaria vaccination

On 22 January 2024

Sub-national roll-out initiated in 42 districts



The first children to take malaria vaccine at the SOA District Hospital



Malaria Vaccine Coordination Team (MVCT)

Co-chaired by Gavi and WHO, a platform for coordination and information sharing

MVCT 1.0 – since early 2022

Initial focus: support design and start of the Gavi malaria vaccine programme

MVCT 2.0 – transitioning since early 2024

Support the implementation of the Gavi programme & coordination among partners

Additional technical assistance and implementing partners

++ others to follow

Gavi Board approved funding for the Malaria Vaccine Programme in December 2021

Background

- WHO and Gavi request support from PATH PMI Insights to develop a “global good” comprehensive malaria vaccine learning and research agenda.
- Agenda to build upon research and learnings from the Malaria Vaccine Implementation Programme and other ongoing research efforts.
- Aim of the research agenda is to support a more coordinated approach to address key evidence gaps and information needs by countries taking up the malaria vaccine to ensure effective and efficient vaccine rollout and scale-up.
- Gavi to leverage exercise to select specific areas for investment to inform program design, implementation, and optimization questions.

World Health Organization PMI Insights KINTAMPO HEALTH RESEARCH CENTRE GHS-MOH Gavi The Vaccine Alliance

Objectives and scope of Global learning agenda

Objectives

- Develop a research agenda that identifies and serves to address key **operational challenges** or **knowledge gaps** as they pertain to the **design, implementation,** and **optimization** of the malaria vaccine as it is rolled out and scaled up.
- By developing a "global good" research and learning agenda, foster **improved alignment** of priority research areas identified by malaria-affected country stakeholders with those of funding agencies and facilitate a more **coordinated and efficient approach** to addressing the identified research priority areas.

Scope and proposed thematic areas

- Research agenda to include **implementation** and **operational** research questions related to the deployment of malaria vaccines.
  - *Implementation feasibility*
  - *Acceptability of and demand creation for the vaccine*
  - *Vaccine safety*
  - *Equitable coverage*
  - *Synergies/antagonisms of the vaccines with other health interventions*
  - *Economics and cost-effectiveness of the vaccine*
  - *Impact/effectiveness of the vaccine*

Geographic focus

- Gavi-eligible countries with **moderate** or **high** *P. falciparum* transmission in **sub-Saharan Africa**.

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PMI Insights

Ifakara Health Institute

Gavi The Vaccine Alliance

Global learning and research agenda

Stakeholder engagement

Ranking approach

Participants scored each topic against criteria using a 5pt Likert scale

1. Broad relevance of topic across country settings
2. Urgency of the topic for informing vaccine introduction and scale-up
3. Feasibility of undertaking a research study to address the topic

32 topics prioritized

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PMI Insights

Ifakara Health Institute, Kintampo Health Research Centre, GHS-MOH

Gavi The Vaccine Alliance

Overall top 10 ranked topics

Research topic	Thematic area
Assess the optimal schedule for the malaria vaccine to achieve the highest coverage and effectiveness, particularly for the timing of the 4th dose (*1*)	Implementation feasibility
Assess feasibility and coverage achieved through different delivery strategies/platforms in areas where delivery of the vaccine will be seasonal (*2*)	
Identify and evaluate strategies to improve uptake of malaria vaccines during 2nd year of life (*6*)	
Evaluate approaches to improve the collection and reporting of vaccine coverage data to inform programmatic decision-making (*8*)	
Identify and evaluate effective strategies for ensuring equitable access to the vaccine among hard-to-reach/vulnerable populations (e.g., conflict, humanitarian, urban poor/slum areas) (*4*)	Equitable coverage
Measure the impact of the malaria vaccine on malaria transmission, malaria burden, and malaria mortality (*5*)	Impact and effectiveness of the vaccine
Assess the safety of the co-administration of the malaria vaccine with other vaccines (*3*)	Safety of the vaccine
Evaluate approaches to monitoring adverse events following malaria vaccination across different delivery strategies (age-based vs. seasonal) and contexts (e.g. emergency/humanitarian/hard-to-reach areas) (*7*)	
Evaluate social and behavior change and community engagement strategies to address challenges with vaccine acceptability and demand (*9*)	Acceptability and demand creation for the vaccine
Assess how community acceptance and uptake of the vaccine changes over time, considering factors such as the partial protection of the vaccine, the 4-dose schedule, and availability of other malaria interventions (*10*)	

Next steps

- Dissemination of the global MLA
- WHO - Gavi to shortlist and refine key operational and implementation research questions from global learning agenda
    - Time, budget and proposed methodological approaches -- per importance, urgency and feasibility/affordability
- Upcoming Gavi RFPs/RFQs to be issued
- Coordination and collaboration across funders and stakeholders on addressing the remaining questions on the global MLA

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PMI Insights

KINTAMPO HEALTH RESEARCH CENTRE
GHS-MOH
RESEARCH
POLICY
TO

Gavi
The Vaccine Alliance

Thank you

Malaria Policy Advisory Group Meeting
4–5 March 2024, Yaoundé, Cameroon
Background document for Session 3

World Health Organization

Concept note for accelerated malaria mortality reduction in "High Burden to High Impact" (HBHI) countries in Africa

Background

Over the past two decades, with the advent of the Global Fund to Fight AIDS, Tuberculosis and Malaria, the United States President's Initiative for Malaria, and other international and bilateral donors, significant efforts have been made to combat malaria in high-burden countries in Africa. However, progress in reducing malaria mortality has been hindered by challenges such as poor access to early diagnosis and treatment, inadequate health care infrastructure, programmatic deficiencies, biological threats and vulnerable populations with lower immunity. It is essential to shift the paradigm away from conflating targets for malaria mortality and incidence, instead acknowledging the complexities of malaria mortality drivers and setting realistic expectations for interrupting transmission and preventing malaria episodes in sub-Saharan Africa.

Rationale

Ending malaria mortality in "High Burden to High Impact" (HBHI) African countries is an achievable goal with the current tools and health care capacities. Accelerating efforts to reduce malaria-related deaths while aiming for long-term transmission interruption is a feasible strategic public health approach to which regional and national authorities can commit. This approach mirrors successful strategies used in combating other diseases, such as preventing mortality from coronavirus disease (COVID-19), tuberculosis and HIV/AIDS. The main drivers of malaria mortality are multifaceted and include socioeconomic factors, access to health care, programmatic deficiencies, emerging biological threats, and population vulnerability due to age and immunity levels. Addressing these drivers requires targeted and strategic interventions tailored to the specific needs of the respective high-burden areas. Strategies must focus on improving access to early diagnosis and treatment, strengthening health care infrastructure, deploying community health workers in targeted high mortality risk areas, enhancing programme coordination and accountability, addressing biological threats and targeting vulnerable populations with appropriate interventions.

High malaria burden countries in Africa, including Ghana, Rwanda and the United Republic of Tanzania, among others, have demonstrated sustained reductions in malaria transmission and incidence in recent years. For instance, despite sustained high vector control coverage, Rwanda experienced an unprecedented surge of malaria with an average of 6.6 million estimated malaria cases annually between 2016 and 2019; however, only an estimated 3000 deaths were recorded during this period. In comparison, South Sudan reported 2.9 million malaria cases and 6900 deaths over the same timeframe (see Fig. 1). These statistics highlight the significant progress in malaria control efforts in certain countries, leading to substantial declines in both malaria cases and mortality rates.

Rwanda's relatively good progress in lowering malaria mortality despite being located in a high transmission epidemiological zone can be mainly attributed to strong political commitment, leadership and accountability, strong health systems ensuring early diagnosis and treatment through effective public health care and community health workers, strong surveillance systems and a functional community health system. This demonstrates that even if a country faces high transmission and

incidence, malaria mortality can be minimized or avoided by providing strong leadership and accountability and optimizing the elements of health systems that critically drive malaria mortality.

Strategies for accelerated reduction of malaria mortality

Countries can accelerate the reduction of malaria mortality by synthesizing the nature and scale of the drivers and developing mitigation strategies.

a. Socioeconomic interventions:

- Identify and target populations at high risk of malaria mortality due to socioeconomic factors such as poverty, lack of education and limited infrastructure.
- Implement tailored interventions to improve access to early diagnosis and treatment, expand coverage of key interventions and promote proper care-seeking behaviour. This includes distributing and promoting the use of insecticide-treated bed nets in vulnerable communities.

b. Strengthening health care infrastructure:

- Improve access to health care facilities, especially in rural and remote areas, to ensure timely and effective treatment of severe malaria cases.
- Enhance the capacity of health care workers to manage severe malaria cases through training programmes and ongoing support.
- Strengthen referral systems to facilitate the seamless transfer of patients from the community to health care facilities.
- Establish or strengthen community-based interventions, particularly sustained deployment of community health workers targeting high mortality risk populations.

c. Strengthening surveillance and action at all levels:

- Strengthen national and subnational level data management, subnational tailoring and response capacities.
- Enhance surveillance systems and programmatic synthesis to generate local evidence for understanding the main drivers of malaria mortality within the local context and devise mitigating strategies.

d. Programme coordination and accountability:

- *Address programmatic deficiencies:*
    - Take proactive steps to mitigate programmatic deficiencies, such as stockouts of diagnostics and medicines, through the implementation of efficient procurement and supply chain management practices.
- *Leadership and accountability mechanisms:*
    - Strengthen mechanisms for leadership and accountability within the health care system, including procurement and supply chain management to prevent stockouts and ensure timely access to essential malaria commodities such as diagnostics and artemisinin-based combination therapies.
    - Enhance regulation and support of the private sector to ensure its adherence to quality standards and contribution to malaria control efforts.

- *Mortality audit and accountability schemes:*
    - Establish or integrate mortality audit and accountability schemes at the community level, supported by robust health facility and community data.
    - These schemes should involve regular review and analysis of malaria-related deaths, with a focus on identifying gaps and weaknesses in the health care system and implementing corrective actions to prevent future fatalities.

e. Addressing biological threats:

- Monitor and respond to emerging biological threats, such as parasite resistance to insecticides and antimalarial medicines, through surveillance and targeted interventions.
- Combat the proliferation of fake and substandard medicines through regulatory measures, enforcement of quality standards and public awareness campaigns.

f. Targeted interventions for vulnerable populations:

- Implement targeted interventions for vulnerable groups, such as young children and pregnant women, who face a higher risk of severe malaria and mortality.
- Adapt interventions to address changing transmission dynamics, particularly in urban areas experiencing lower transmission rates, with mortality concentrated in rural and remote communities, by tailoring strategies to the specific needs and contexts of these populations.

In conclusion, the strategies outlined above provide a comprehensive framework for accelerated reduction of malaria mortality, while intensifying preventive tools and striving for long-term interruption of transmission in high-transmission settings in Africa. By addressing socioeconomic factors, strengthening health care infrastructure, enhancing surveillance and action at all levels, improving programme coordination and accountability, addressing biological threats and implementing targeted interventions for vulnerable populations, countries can make significant progress in reducing malaria-related deaths.

Key elements, such as strong political commitment, leadership and accountability, coupled with effective public health systems and community engagement, play critical roles in achieving success. In addition, the integration of evidence-based interventions, robust surveillance systems and adaptive strategies tailored to local contexts is essential for sustained progress.

By implementing these strategies collectively and consistently, countries can ultimately save lives and improve the health and well-being of communities affected by this devastating disease.

Updates on High burden to high impact (HBHI) approach

Dr Maru Aregawi

Unit Head, High Burden to High Impact

Global Malaria Programme

Malaria Policy Advisory Group (MPAG) Meeting

4-5 and 7 March 2024, Palais des Congrès, Yaoundé, Cameroon

World Health Organization

Outline

1. MPAG Subcommittee on HBHI
2. Progress since last October MPAG Meeting
3. Conceptual framework on Accelerated Malaria Mortality Reduction

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I. MPAG Subcommittee on HBHI

1. Prof Evelyn Ansah **(Lead)**
2. Dr Caroline Jones
3. Dr Kachur, Stephen P.
4. Dr Arantxa Roca Feltrer

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I. MPAG Subcommittee on HBHI

The role of the subcommittee will be to advice and provide feedback to GMP on the HBHI approach, in particular, with concrete and strategic suggestions, taking onto account the catalytic role of GMP in support of countries to own and implement the HBHI approach.

The Subcommittee met and agreed on two important issues

1. Consolidation of the two HBHI evaluation reports (RBM and WHO-led evaluations) to be at the Ministerial Conference
2. Conceptual framework on Accelerated malaria mortality

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II. Progress after October MPAG meeting

Progress since November 2023

- Field Manual for malaria in emergency
  - Task-force in-person meeting (5-8 Dec)
  - Three virtual meeting to incorporate feedback
- Developed 12 HBHI country profiles
- Drafted the declaration for the ministerial conference
- Concept not on accelerated mortality reduction
- Combined HBHI evaluation report (with RBM)
- Continuation of the 1,7 mRCTR OR in high burden countries

Next priorities

- Finalization and editing of the Field manual
  - Publication in Q2
- Update epidemic preparedness and response in the latest surveillance manual
- Refinement of the HBHI approach following the recommendations (with RBM)
- Plan for expansion of HBHI approach to the 2nd tier HBHI countries
- Develop implementation and M&E framework of the declaration of the Ministerial Conference (with RBM)
- Initiate (pilot) Malaria Mapping in one country
- Continuation of the 1,7 mRCTR OR in high burden countries (End of Project, 2024)

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III. Conceptual framework for Accelerated Malaria Mortality Reduction

Background

- **The challenges of conflating malaria mortality and incidence** in HBHI countries
  - **Infection ≠ Incidence ≠ severe malaria ≠ malaria death**
- Nearly impossible to interrupt transmission and avoid **malaria episodes** because of the:
  - Complex epidemiology in SSA
  - Sub-optimal effect of the current preventive tools and lack of one effective bullet

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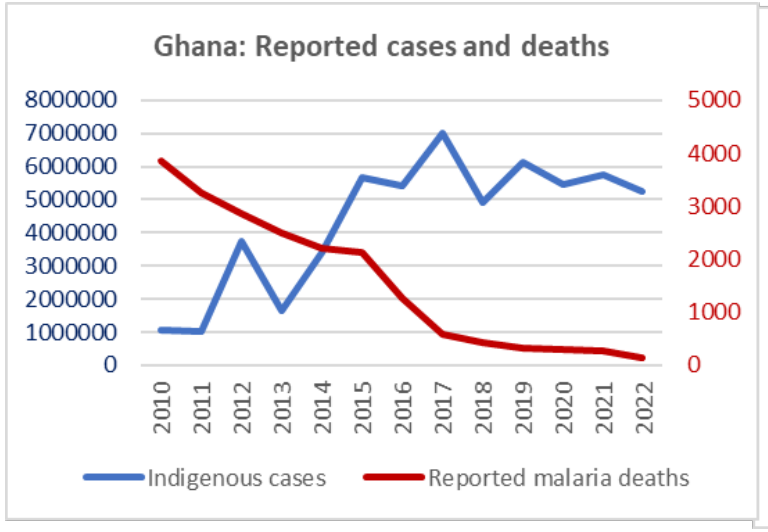
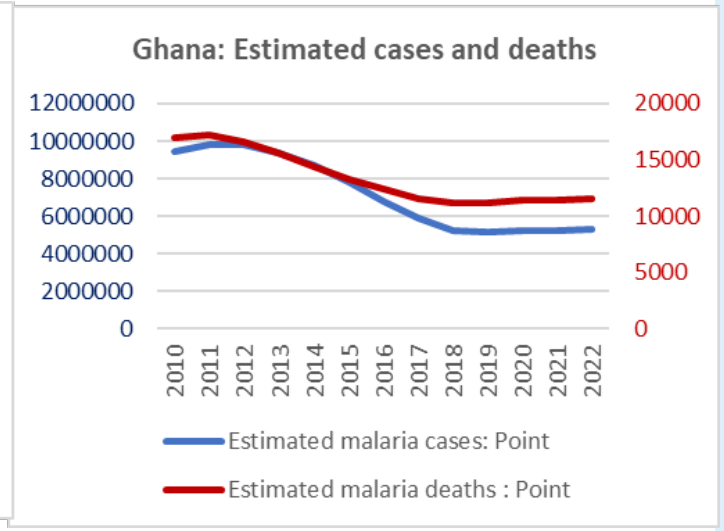
Cntd…….. Accelerated malaria mortality reduction





This demonstrates that even if a country faces **high transmission** and incidence, **malaria mortality can be minimized** or avoided by providing strong leadership and accountability, optimizing the elements of health systems that critically drive malaria mortality.

1. Strong political commitment, leadership and accountability
2. Strong health system: Early diagnosis and treatment through strong PHC and CHW
3. Strong surveillance and referral systems
4. Community-Based Health Insurance (CBHI)

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Strategic shift for HBHI countries: Accelerated malaria mortality reduction

Rationale

- **With existing tools & health care capacities,** ending malaria mortality, while striving for long-term transmission interruption, is a feasible strategic public health approach to which regional and national authorities can commit. This requires
    - Refocusing policy, leadership and commitments, optimizing health system, surveillance & local data use, CHWs.
- E.g. Strategic public health approach preventing mortality from
    - COVID-19
    - Tuberculosis
    - HIV/AIDS

Therefore, it is essential to shift the paradigm away from **conflating targets for malaria mortality and incidence in HBHI countries**, instead acknowledging the complexities of **malaria mortality drivers** and setting realistic expectations for interrupting transmission and preventing malaria episodes in sub-Saharan Africa.

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Drivers of malaria mortality

Drivers of malaria mortality

- The main drivers of malaria mortality in HBHI countries are multifaceted:
  - Socioeconomic factors: infrastructure, roads, education…
  - Health systems including access to health care,
  - Programmatic and leadership deficiencies
  - Population vulnerability due to age and immunity levels
  - Emerging biological threats

Addressing these drivers requires targeted and strategic interventions tailored to the specific needs of the respective high-burden areas by maximizing use of local data, knowledge, coordination and accountability.

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Strategies for accelerated malaria mortality reduction (AMMR)

1. **Mortality mapping involving communities, academia and NMCPs**
   - Quantitative and qualitative analysis
2. **Socioeconomic interventions:**
   - **Identify and target populations at high risk of malaria mortality** due to poverty, limited infrastructure, lack of education and awareness
   - **Implement tailored interventions to improve access** to early diagnosis and treatment, expand coverage of key interventions and promote proper care-seeking behavior.
3. **Strengthening health care infrastructure:**
   - Improve access to health care facilities, esp. in rural and remote areas
   - Enhance capacity of health care workers to manage severe cases
   - Strengthen referral systems
   - Establish sustained community-based interventions with CHWs targeting high mortality risk populations.

Addressing these drivers requires targeted and strategic interventions tailored to the specific needs of the respective high-burden areas maximizing use of local data, knowledge and coordination.

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Strategies for accelerated malaria mortality reduction (AMMR)

4. **Strengthening surveillance and action at all levels**
   - National and subnational level data management and analysis
   - Generate local evidence for understanding the main drivers of malaria mortality within the local context
5. **Coordination and accountability**
   - Develop **mitigation strategies** fit to local context based on the mapping
   - Proactive steps to **mitigate programmatic deficiencies**, such as stockouts of diagnostics and medicines, and other supplies
   - Strengthen mechanisms for **leadership and accountability** on
     - Procurement and supply management (**PSM**)
     - Regulation and support of the **private sector** to ensure adherence
     - Establish or integrate **mortality audit and accountability** schemes at the community level, supported by robust health facility and community data.
     - Regular **review and analysis of malaria-related deaths**, with a focus on identifying gaps and weaknesses

Addressing these drivers requires targeted and strategic interventions tailored to the specific needs of the respective high-burden areas maximizing use of local data, knowledge and coordination.

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Strategies for accelerated malaria mortality reduction (AMMR)

6. **Targeted interventions for vulnerable populations:**
   - Targeted interventions for vulnerable groups, such as young children and pregnant women, who face a higher risk of severe malaria and mortality
   - Adapt interventions to address changing transmission dynamics, e.g. Urban
7. **Addressing emerging biological threats**
   - Monitor and respond to emerging biological threats
   - Combat the proliferation of fake and substandard medicines through regulatory measures, enforcement of quality standards and public awareness campaigns.

Dynamic measures fit to the changing epidemiology:

- **Children under 5 and Pregnant women**
- **Rural and remote communities where mortality is concentrated**
- **Areas affected by emergencies**
- **Epidemics in areas with unstable transmission due to sustained control efforts**

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Schematic presentation of the Mortality Mapping

https://app.mindmanager.com/#publish/Y1NrkUIXXCbaOcYjAcoeNM8xCD6KYXFkK0KYrJ_V

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Next steps

1. Consolidation of the conceptual framework
2. Mortality Mapping in one HBHI country to generate feasibility
3. Developing SOP for Mortality Mapping
   - Qualitative (Systems and bottleneck analysis)
   - Quantitative (in collaboration with local and international academia)
4. Country level mortality mapping (All HBHI countries)
5. Country-level mitigation strategies for drivers of malaria mortality
6. Country level Implementation
7. Monitoring and Evaluation schemes

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Next steps

Concept note consolidation

Consolidation of the conceptual framework

Mortality Mapping in one HBHI country

- Polit Mortality mapping in one HBHI country
- Generate qualitative and quantitative evidence on drivers on mortality
- Develop mitigation strategies

Developing SOP for Mortality Mapping

- Detailed steps on qualitative analysis
- Quantitative measurements on effect size of each driver of mortality
- Prioritization of drivers to be tackled

Country level mortality mapping (All HBHI countries)

1. Initiate mortality mapping in each of the respective HBHI country
2. Involve local and external academia to ensure validity and quality of the mapping
3. Determine and prioritize drivers of mortality

Develop Mitigation strategies for AMMR

- Develop mitigation strategies for each of the driver, guided by the mortality mapping
- Outline the systems and coordination mechanisms to ensure implementation and accountability
- Develop communication strategies

Implement Accelerated mortality reduction (AMMR)

- Follow the national strategies developed for AMMR
- Engage political and sectoral leadership in the implementation
- Monitor progress
- Dynamically assess and update the status of the drivers and adjust strategies accordingly
- Evaluation of the AMMR

World Health Organization

Thank you

World Health Organization

Malaria Policy Advisory Group Meeting

4–5 March 2024, Yaoundé, Cameroon
Background document for Session 4

World Health Organization

Update on subnational tailoring of malaria interventions and strategies

Strategic Information and Response Unit

Background information on subnational tailoring

Definition

Subnational tailoring (SNT) is the use of local data and contextual information to determine the appropriate mix of interventions and strategies for a given area to achieve optimum impact on transmission and burden of disease at the strategic level or within a specific resource envelope. SNT can also be used to inform how new tools can be most effectively integrated within previously planned mixes of interventions, or for dynamic resource mobilization as additional funding opportunities become available.

SNT stems from the collective commitment to surveillance – a key pillar of the *Global technical strategy for malaria 2016–2030 (1)* – and the use of local data for decision-making by malaria programmes and partners to achieve malaria elimination. It is also aligned with one of the "High burden to high impact" (HBHI) response elements, which advocates for the use of strategic information to drive impact. This is rooted in the basic principles of good public health, i.e. that health policies should be informed by the best possible evidence derived from the best available data and information.

Process

Mixes of interventions and strategies that are considered in the local response include not only those aimed at diagnosis, treatment and prevention, but also other major programmatic and health system actions required to reach the goal of malaria elimination, for example, actions required to strengthen the health workforce, improve access to and quality of care, strengthen surveillance systems, achieve social and behaviour change, and expand the engagement of communities.

As such, the process requires system-wide and multi-stakeholder participation, anchored to the broad principles of health sector priority-setting. Analytically, mixed methods approaches (qualitative and quantitative) are used. Descriptive, statistical, geospatial and mathematical modelling approaches all play a role.

The following essential steps are involved in the development and monitoring of prioritized malaria control and elimination programmes, as implemented under the SNT process:

- **Establish a national SNT team**, led by the national malaria control programme (NMCP) but including other government departments and national, regional and global partners. This team is responsible for the whole process – from data assembly and analysis to strategy development, resource mobilization and prioritization, and implementation.
- **Determine the criteria for tailoring interventions and strategies**. The national team compiles all interventions and strategies under consideration and develops the criteria to be used to tailor each of them, building on the World Health Organization's (WHO) normative guidance and adapting it to the local context as needed.

- **Stratify malaria risk and its determinants**. Ecological, interventional, systemic, social and other determinants are stratified at operational units of relevance and in ways that respond to the specific question at hand, based on the agreed upon criteria from the previous step. As such, the process of stratification depends on the specific intervention or strategy under discussion and moves away from the use of epidemiological metrics alone. Statistical and geospatial methods are useful here.
- This information is then used to **develop various scenarios of intervention mixes** that have been tailored through the stratification process. **The impact of these scenarios is estimated using mathematical models**. At this point, the scenarios may be further refined.
- A consensus-based approach informed by the evidence is used to **select the final mix of interventions and strategies** and used to inform a strategic plan. This strategic plan is then costed and used for resource mobilization.
- Once there is clarity on the available domestic and donor-dependent resources, the costed strategic plan is used to **further inform rational prioritization of investments to maximize impact** if the resources are insufficient. This is usually the most challenging part of the process. The Global Malaria Programme is currently developing a document entitled "Guiding principles for prioritizing malaria interventions in resource-constrained country contexts to achieve maximum impact", which will be used to support countries through this decision-making process. Further stratification of determinants and mathematical modelling are helpful at this point to guide and assess the impact of the various prioritization decisions.
- During the budgeting process, it is expected that sufficient capacity to **monitor the impact of the deployed intervention** packages will be set aside so that the response can be honed over time and resources reprioritized as needed.

Principles

The principles adopted in the SNT process are aligned with the broader concepts of health priority-setting, with the aim of selecting the best possible options for addressing the most important health needs in the best way with the resources available.

WHO defines priority-setting in the following way: "Priority-setting determines the strategic directions of the national health plan. Led by citizens who are the principals and decision-makers, priority-setting is a shared responsibility between the ministry of health (MoH) and the entire health stakeholder community" *(2)*.

In short, the following principles underpin the malaria SNT process:

- **Ownership:** Countries set their own strategies for the response to malaria, and provide strong leadership responsible for strengthening their institutions and providing transparency in the investments. The development of strategic plans and investment priorities should involve wide participation of and feedback from all stakeholders. Health priority-setting is inherently political. As such, it must reflect societal values and goals and involve compromise among stakeholders.
- **Evidence-informed and context-specific:** The choice of interventions and strategies should be underpinned by strong evidence of their effectiveness within a given context. WHO plays a key role in developing evidence-based normative guidance that is flexible and responsive to the context. The aim is for the SNT process to guide the mixes of interventions that will result in the greatest impact.
- **Alignment:** External donor support must align behind these plans and objectives and prioritize the use of local delivery systems, including local partners, in support of the health system.

- **Harmonization**: Globally, donors coordinate, simplify procedures and share information to avoid duplication in the malaria response. Countries should provide efficient mechanisms for coordinating implementation activities.
- **Investment for results**: Countries and donors should agree to focus on real and measurable impact on development and invest in local systems that collect the required information.
- **Mutual accountability**: Measuring impact also requires all stakeholders (donors, countries, implementation partners) to be accountable for the results.
- **Capacity development**: Countries are fully responsible for improving national systems and capacities. To build the ability of countries to manage their own future, however, donors should support countries' capacities in the development of sound strategic and operational plans, delivery systems, and surveillance, monitoring and evaluation processes.

Updates on SNT implementation

Direct support to countries

Since 2018, the Strategic Information and Response Unit has worked in close collaboration with WHO regional and country offices to respond to country requests for support in the implementation of the SNT process, specifically to inform single or multiple intervention strategic planning, resource mobilization, funding requests, budget negotiations, optimization of intervention implementation, and so on. In many countries, the application of SNT has sparked the integration of data use as part of countries' regular decision-making processes, as well as an interest in conducting surveillance assessments. The Strategic Information and Response Unit is actively engaged in the provision of this support through the implementation of digital solutions activities and surveillance assessments.

Table 1. List of countries for which the Strategic Information and Response Unit, in collaboration with the WHO regional and country offices and technical partners, has provided analytical support on SNT and related analyses between 2018 and 2024

2018–2020	2021–2023	2024
WHO Regional Office for Africa		
HBHI Phase I countries: • Burkina Faso • Cameroon • Democratic Republic of the Congo • Ghana • Mali • Mozambique • Niger • Nigeria • Uganda • United Republic of Tanzania E-2020 countries: • Comoros	Continued support in all HBHI Phase I countries Other countries: • Benin • Burundi • Central African Republic • Congo • Côte d'Ivoire • Ethiopia • Gambia • Guinea • Guinea-Bissau • Liberia • Madagascar • Malawi • Sao Tome and Principe • Senegal	• Burkina Faso • Côte d'Ivoire* • Guinea* • Liberia • Nigeria* • Sierra Leone * Countries that have requested additional support for urban microstratification as a prioritization strategy

2018–2020	2021–2023	2024
	• Sierra Leone • South Sudan • Togo • Zambia	
WHO Regional Office for the Eastern Mediterranean		
	• Afghanistan • Pakistan • Somalia • Sudan • Yemen	• Yemen
WHO Regional Office for South-East Asia		
	• Indonesia	

SNT implementation transition to WHO regions

As more countries become interested in using data to inform their strategic or budgetary decisions, the decentralization of SNT support from the Global Malaria Programme to the WHO regions will be key. Below is a summary of the current activities and needs for the regions, covering most of the countries that have implemented the SNT process:

- **WHO Regional Office for Africa**: In response, to the learnings from the implementation of SNT in the HBHI countries, one of the special initiatives of the WHO Regional Office for Africa's new strategy for Ending Disease in Africa 2023–2030 *(3)* is the use of precision public health to inform decisions related to disease eradication, elimination and control. As a result, the Precision Public Health Office was set up in 2023 as a cross-cutting team within the Universal Health Coverage, Communicable and Noncommunicable Diseases (UCN) Cluster to support all disease programmes, including malaria. One of the main objectives of the Precision Public Health Office is to improve countries' use of data and analytics to inform SNT of malaria interventions, in close collaboration with the Tropical and Vector Borne Diseases Programme. Discussions between the Global Malaria Programme and the Precision Public Health Office are ongoing to ensure a sustainable transition of activities.
- **WHO Regional Office for the Eastern Mediterranean**: The Regional Office has been heavily involved in the coordination and implementation of SNT activities in very complex environments. The SNT products in countries such as Sudan and Yemen have directly impacted the countries' strategic and prioritization plans in recent years, despite the conflicts experienced in both countries. The implementation of SNT activities has been coupled with the training of local WHO and NMCP personnel, who have actively participated in the data collection, management, analysis and interpretation process for decision-making. There is enormous potential for SNT efforts in the Region to be sustainable. However, there is a need to design a plan and allocate the necessary human resources and funding to support the sustainable transition of SNT activities to the Region.

Country-level capacity development

The provision of SNT support by WHO is inherently intended to showcase the SNT process in practice so that NMCPs can experience it first-hand and continue its implementation. There are several factors that can determine whether countries that undergo SNT once in collaboration with WHO can independently implement the process moving forward. Some factors include:

- the NMCP's leadership, technical and analytical capacities;
- availability and structuring of relevant high-quality data to inform decisions;
- presence of strong local analytical partners and robust collaboration with local or external partners with the capacity to conduct complex geospatial and mathematical modelling;
- existence of robust coordination mechanisms so that all malaria stakeholders are aligned under the leadership of the NMCP and within the broader national health sector;
- donors' flexibility to adapt funding to the country's needs;
- availability of resources earmarked for local capacity development and exit plans from international partners to build local capacities.

Specific activities and resources are required to tackle and strengthen these factors and build the necessary capacities at the local level to ensure a sustainable data use culture for decision-making.

The Strategic Information and Response Unit has been involved in the following activities to develop capacity with the resources available:

- **direct training of NMCP and WHO country office technicians** in the partial or complete implementation of the analytical activities required to inform the SNT process;
- **representation on the Advisory Board and participation in training workshops** organized by the Applied Malaria Modeling Network (AMMnet);
- **incidence estimation workshops to inform the epidemiological stratification of malaria-endemic countries in Africa (see Table 2)**: In 2023, the Strategic Information and Response Unit organized two workshops in July and September 2023, with participation of 22 NMCP staff and local universities. As part of the transition of activities to the WHO Regional Office for Africa, a third workshop took place in November 2023, fully led by the Region with administrative and technical support from the Strategic Information and Response Unit. The Strategic Information and Response Unit and the WHO Regional Office for Africa have followed up on all requests for further support from countries that attended the workshop;

Table 2. Participation in incidence estimation workshops in 2023

Workshop 1 **Saly, Senegal – July 2023**	**Workshop 2** **Cotonou, Benin – Sep 2023**	**Workshop 3** **Kigali, Rwanda – Nov 2023**
1 Central African Republic	10 Benin	23 Eritrea
2 Chad	11 Burkina Faso*	24 Ethiopia
3 Congo	12 Cameroon	25 Kenya
4 Equatorial Guinea	13 Côte d'Ivoire*	26 Madagascar
5 Guinea*	14 Democratic Republic of the Congo	27 Malawi
6 Guinea-Bissau*		28 Nigeria*
7 Mozambique*	15 Gambia	29 South Sudan
8 Niger	16 Ghana	30 Uganda
9 Senegal	17 Liberia*	31 United Republic of Tanzania
	18 Mali*	
	19 Sao Tome and Principe*	32 Zambia
	20 Sierra Leone*	33 Zimbabwe
	21 South Sudan	
	22 Togo	

*Countries that requested further support on stratification or SNT after the workshop

- **establishment of integrated national malaria data repositories (see Table 3):** The national malaria repository is a data warehouse of all available malaria-related information, built on top of the malaria module that primarily focuses on routine data; the repository assembles both routine and non-routine data, providing malaria programmes with all the information required to take decision-based actions.

  The implementation of the malaria repository involves multiple stages. A number of countries have successfully established repositories that are integrated with their regular health management information systems and include various additional modules such as entomology, surveys, funding and more. Two countries are currently in the early stages of development. Angola is set to receive support for its repository development, which will be modelled on the installation in Mozambique.

Table 3. Support for the establishment of integrated national malaria data repositories

Established repositories in advanced stages of development*	Repositories initiated	Planned support
1 Burkina Faso 2 Cameroon 3 Ghana 4 Guinea 5 Mozambique 6 Nigeria 7 Uganda 8 United Republic of Tanzania	9 Kenya 10 Niger 11 Côte d'Ivoire 12 Democratic Republic of the Congo	13 Angola 14 Senegal

*This an ongoing process with continuous development of additional modules and dashboards.

SNT manual

The SNT manual is intended to provide an overview of the vision and key concepts underpinning SNT of malaria interventions for decision-making. It will also provide practical guidance on indicators and associated methods to inform the criteria for SNT of interventions and strategies and resource prioritization, building on the WHO guiding principles for prioritizing malaria interventions in resource-constrained country contexts to achieve maximum impact.

The manual will be drafted jointly by the Global Malaria Programme and the WHO regions, in collaboration with Dr Abdisalan Noor at the Harvard T.H. Chan School of Public Health, Harvard University. There will be a consultative process to request feedback from malaria-endemic countries and partners engaged in activities to support SNT.

The proposed plan of work is as follows:

- first version by the end of May 2024
- second version after internal review by the end of June 2024
- external review by partners between July and August 2024
- final version for MPAG review by the end of September 2024
- receive guidance from the Malaria Policy Advisory Group in October 2024
- final version by end of November

References

1. Global technical strategy for malaria 2016–2030, 2021 update. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/342995, accessed 7 October 2023).
2. Strategizing national health in the 21st century: a handbook. Geneva: World Health Organization; 2016 (https://iris.who.int/handle/10665/250221, accessed 7 October 2023).
3. Ending disease in Africa: vision, strategies and special initiatives, 2023. Brazzaville: World Health Organization Regional Office for Africa; 2023 (https://iris.who.int/handle/10665/373549, accessed 7 December 2023).

Subnational tailoring of malaria interventions and strategies

UPDATE

MALARIA POLICY AND ADVISORY GROUP (MPAG) MEETING

4TH-5TH MARCH 2024

YAOUNDÉ, CAMEROUN

Dr. Beatriz Galatas

Strategic Information and Response Unit

Global Malaria Program

World Health Organization

Outline

1. SNT description, concepts and process

- What?
- Why?
- How?
- Principles

2. Updates on SNT implementation activities

- Direct support to countries
- Transition to WHO regions
- Capacity development
- Integrated national data repositories

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All maps presented in this presentation serve as examples and should not be used or interpreted outside of this explanatory context.

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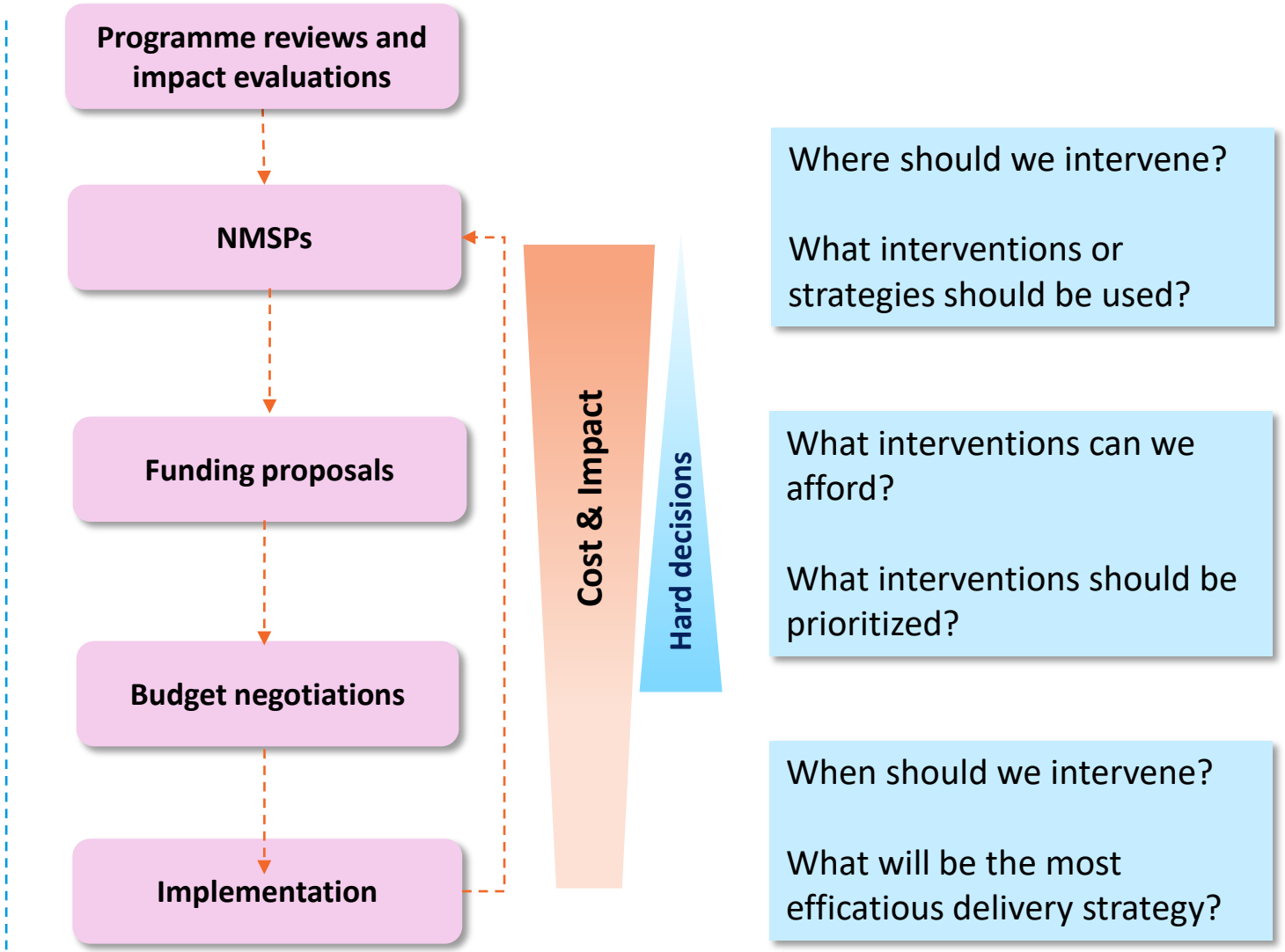
What?

Subnational tailoring of malaria interventions (SNT)

The use of local data and contextual information to determine the appropriate mixes of interventions and strategies, for a given area, for optimum impact on transmission and burden of disease



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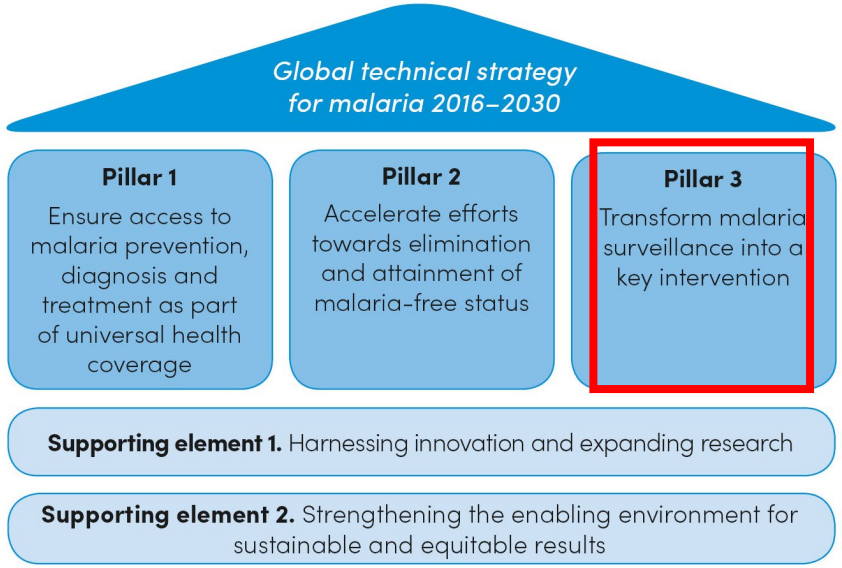
Why?

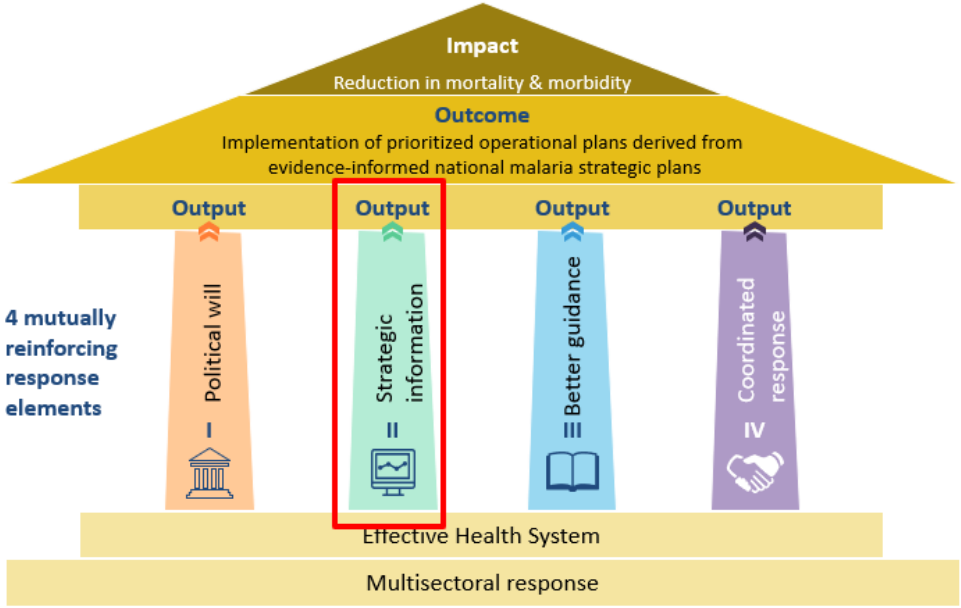
Anchored on the basic principles of good public health - that **health policies should be informed by the best possible evidence derived from the best available data and information.**

Global Technical Strategy



A key pillar of the GTS is the use of **surveillance and local data for decision making by malaria programs and partners** to achieve malaria elimination

High Burden to High Impact



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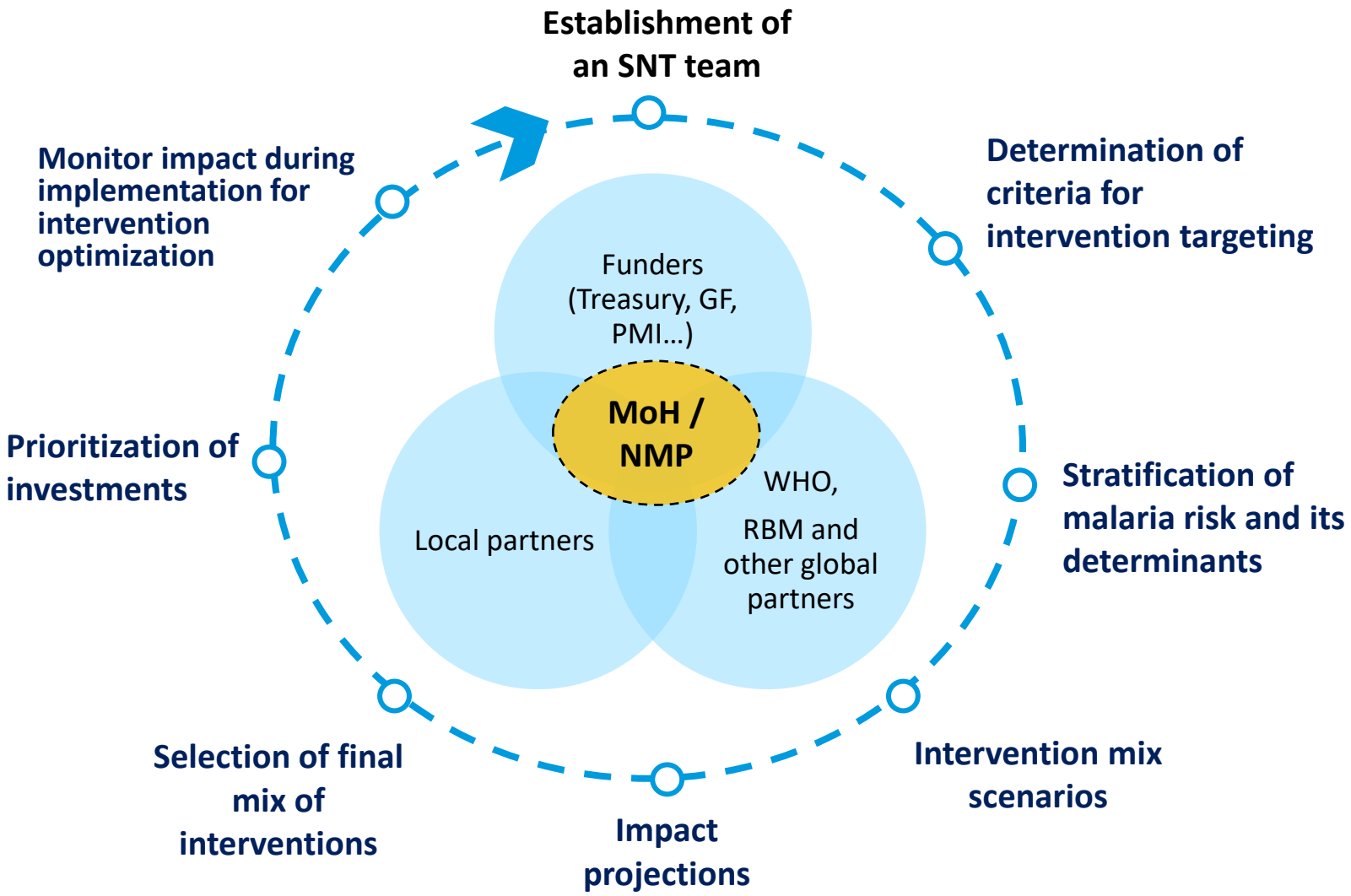
How?

The process requires a system-wide and multi-stakeholder participation anchored on the broad principles of health sector priority setting



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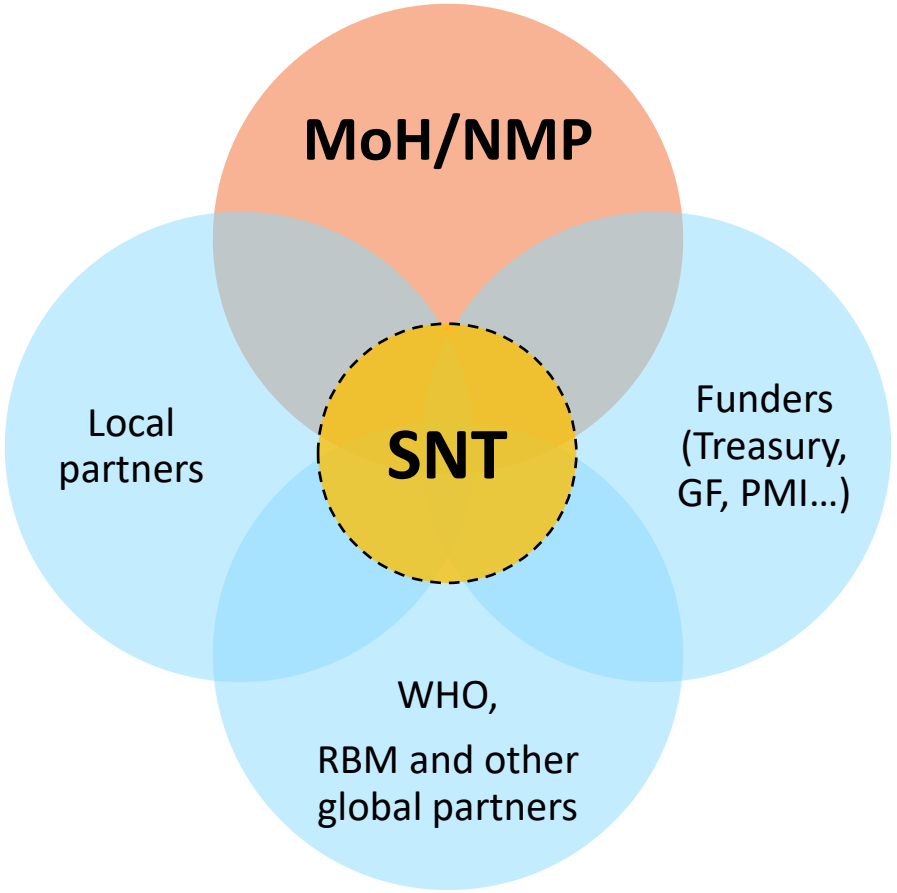
How?

Establishment of an SNT team

Lead by NMCP but includes other government departments, national, regional and global partners with consent from the NMCP. This team is responsible for the whole process, from **data assembly, analysis, strategy development, resource mobilization and prioritization, and implementation**.



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Determination of criteria for intervention targeting

The national team compiles all **interventions and strategies under consideration and develops the criteria** to be used for tailoring each one of them building on the WHO normative guidance

WHO recommended interventions and targeting criteria adapted to country context

	Transmission (Incidence, Prevalence, Mortality, *etc*)	Age distribution of burden	Seasonality	Entomo-logical indicators	Environment and urbanicity	Vulnerable populations, conflict, emergencies	*etc*[1]
ITNs	+			+	+	+	
IRS	+		+	+			
LSM	+			+	+		
SMC	+	+	+				
MDA	+	+				+	
IPTp	+						
PMC	+	+	+				
Vacc.	+	+					
iCCM	+					+	
Surv.	+	+					
***etc*[2]**							

1- Health system capacity, access to care, EPI coverage, previous exposure to interventions, community acceptability …
2- Targeted improvements of case management, surveillance systems, intervention-specific delivery strategies …

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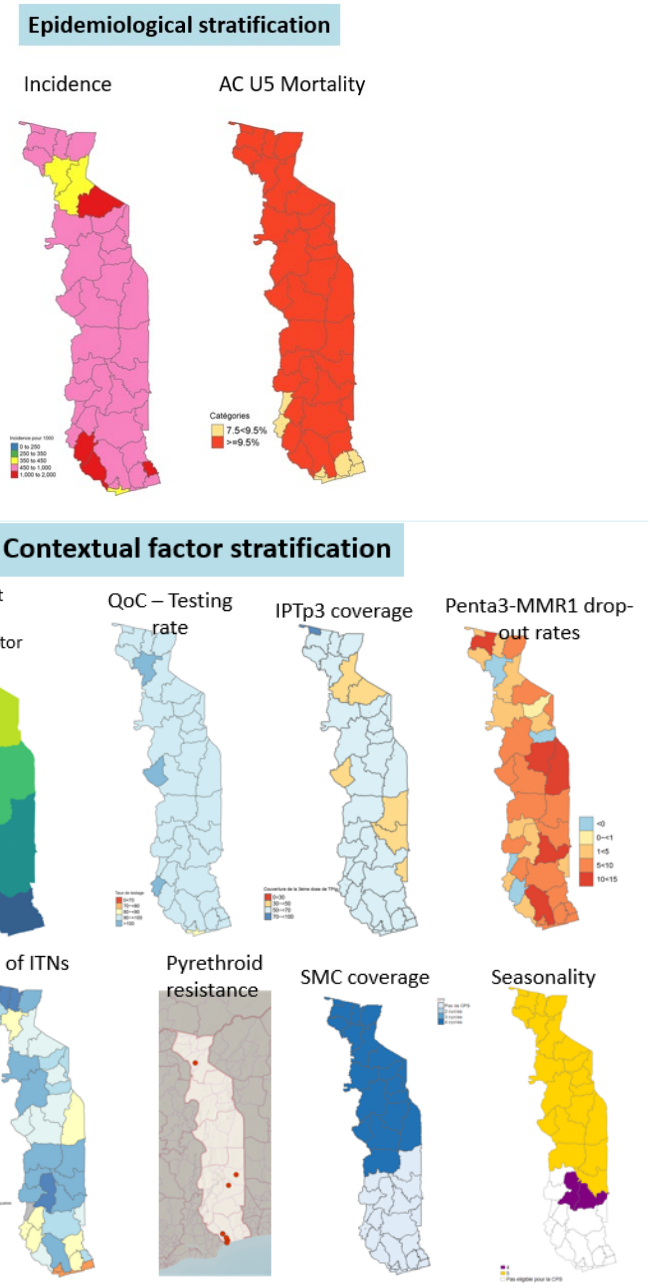
Stratification of malaria risk and its determinants

Ecological, interventional, systemic, social and other **determinants are stratified at operational units of relevance and in ways that answer the specific question at hand based on the agreed upon criteria**. As such the process of stratification depends on the specific intervention or strategy under discussion and moves away the use epidemiological metrics alone**. Here statistical and geospatial methods are useful**.



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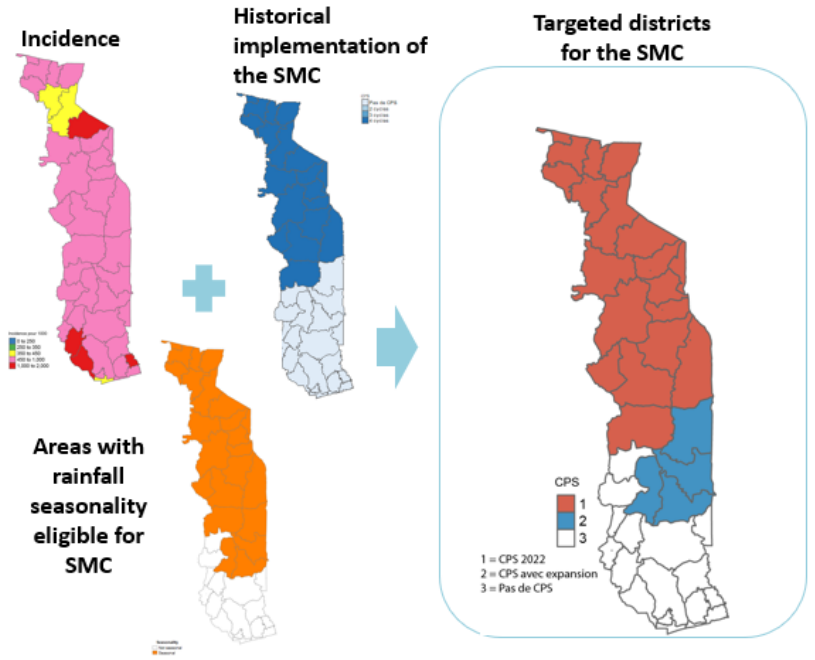
Intervention mix scenarios

Stratified layers required to inform intervention or strategy-specific criteria are used to develop various scenarios of intervention mixes

	Transmission (Incidence, Prevalence, Mortality, *etc*)	Age distribution of burden	Seasonality
SMC	+	+	+



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How?

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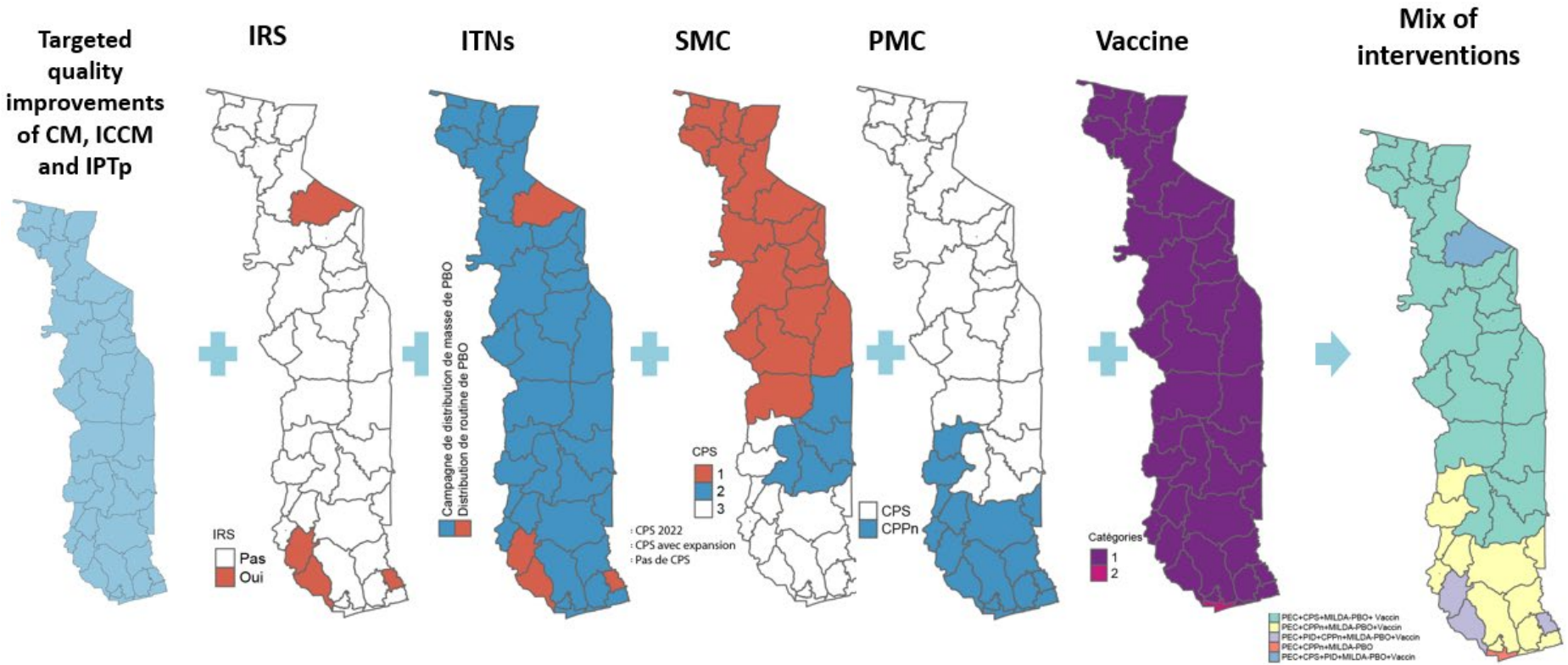

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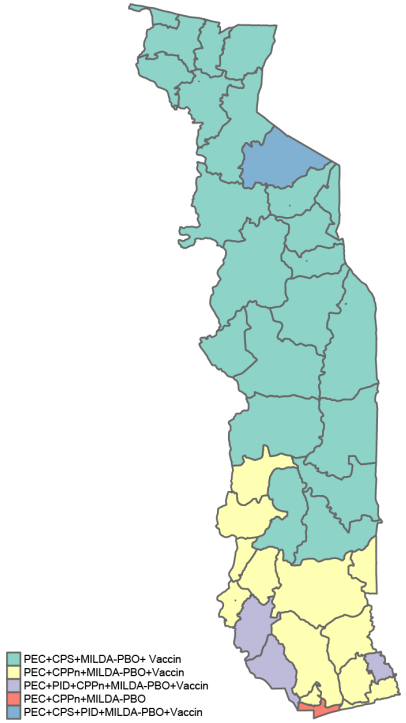
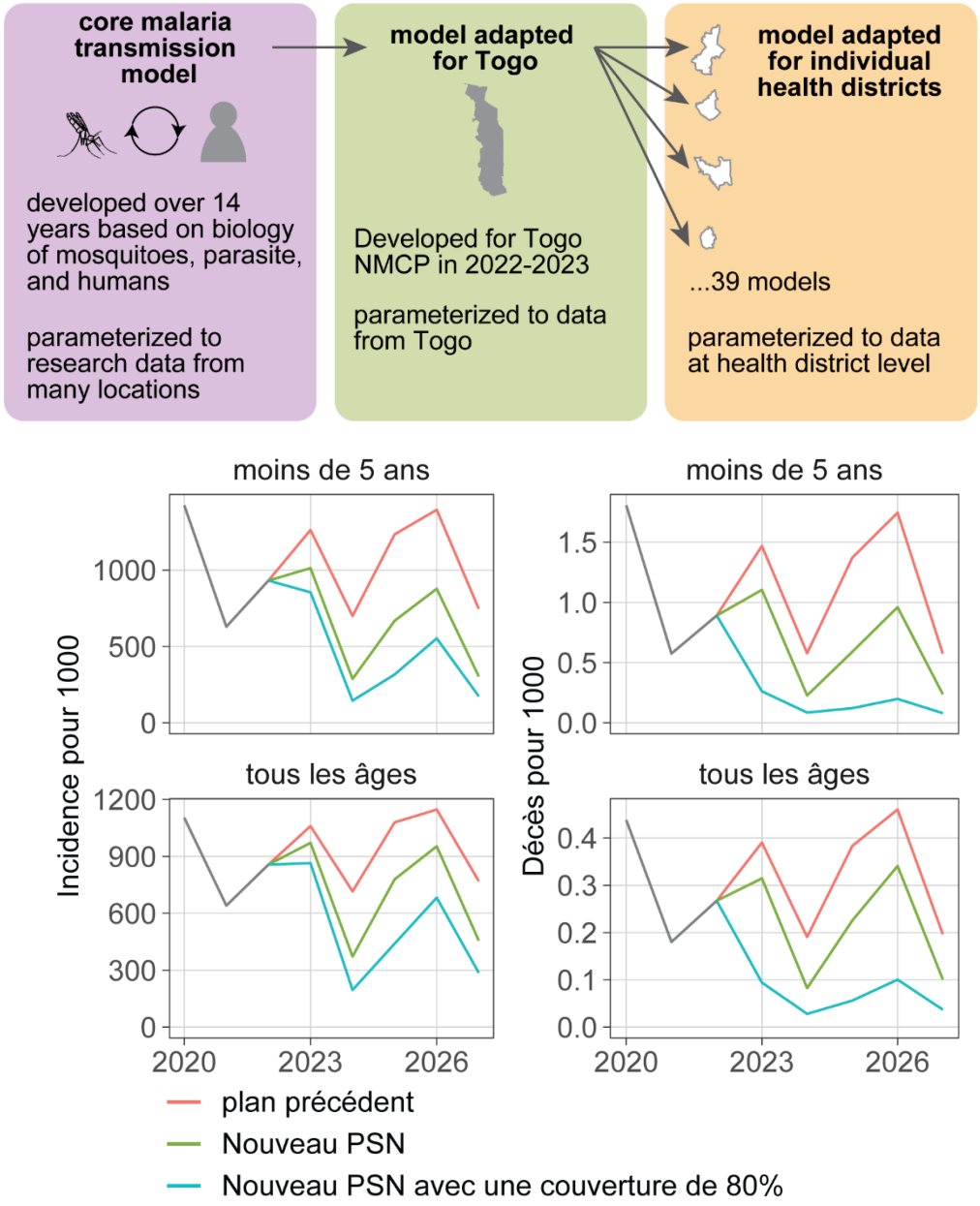
How?

Impact projections

The impact of these scenarios is estimated using mathematical models . At this point further refinements may be made to the scenarios. **A consensus based approached** informed by the evidence is used to select the final mix of intervention and strategies.





How?

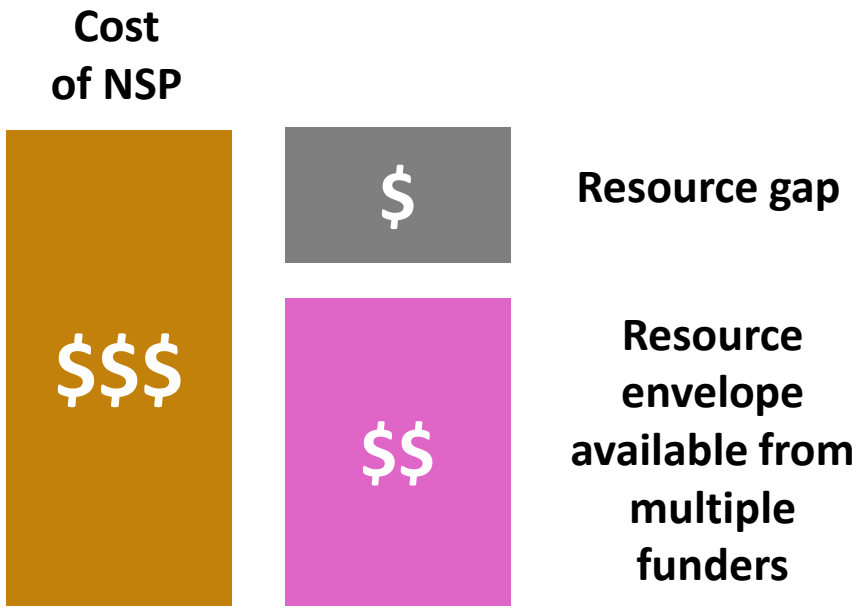
Impact projections

The impact of these scenarios is estimated using mathematical models . At this point further refinements may be made to the scenarios. **A consensus based approached** informed by the evidence is used to select the final mix of intervention and strategies.

Costing of agreed-upon plan

This plan is then costed and is used for resource mobilization.

Mathematical modeling is helpful as an advocacy tool for additional resource mobilization



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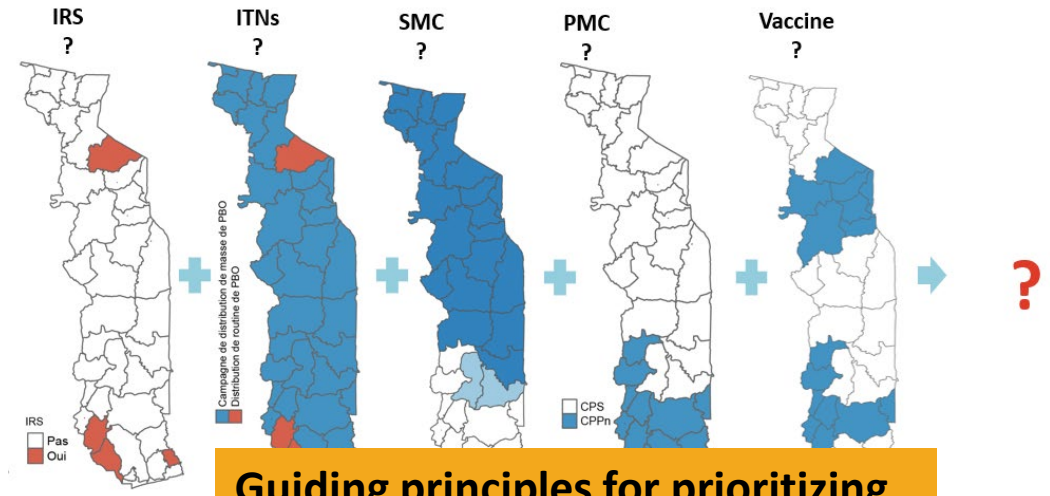
Prioritization of investments

Once there is clarity **in the available resources, the costed strategic plan is used as the basis to further inform rational prioritization of investments to maximize impact** if the resources are insufficient.

This is usually the most challenging part of the process.

Mathematical modeling is helpful at this point to assess the impact of the various prioritization decisions.



Guiding principles for prioritizing malaria interventions in resource-constrained country contexts to achieve maximum impact:

	Transmission						*etc*[1]
ITNs	++			++	+	+	++
~~IRS~~							
LSM	+			+	+		
SMC	++	+	++				++
~~MDA~~						+	
IPTp	+						
PMC	+	+	+				
Vacc.	++	+					
iCCM	+					+	++
Surv.	+	+					

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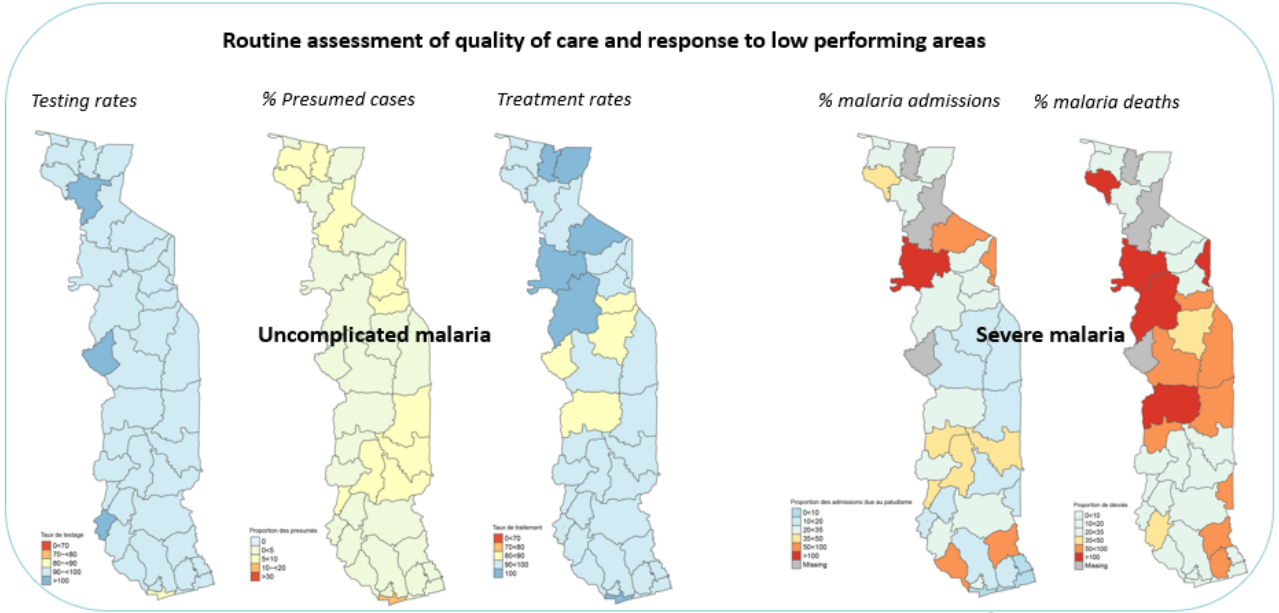
Monitor impact during implementation for intervention optimization

During the budgeting process it is expected that sufficient **capacity to monitor the impact of the deployed intervention packages are set aside** so that the response is sharpened over time and resources are reprioritized as needed.



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Principles

*'Priority-setting determines **the strategic directions of the national health plan**. Led by citizens who are the principals and decision-makers, priority-setting is a shared responsibility between the ministry of health (MoH) and the entire health stakeholder community.'* (WHO definition)

Ownership

Countries set their own strategies for the response to malaria, provide strong leadership responsible for strengthening their institution and for providing transparency in the investments.

Evidence-informed

The choice of interventions and strategies should be underpinned by strong evidence of their effectiveness within a given context.

Alignment

External donor support aligns behind these plans and prioritizes the use of local delivery systems

Harmonization

Globally, donors coordinate, simplify procedures and share information to avoid duplication in the malaria response.

Invest for results

Countries and donors agree to focus on real and measurable impact on development and invest in local systems that collect the required information.

Mutual accountability

Measuring impact also requires that all stakeholders are accountable for results.

Capacity development

To build the ability of countries to manage their own future, donors should support countries capacities in the development of sound strategic and operational plans, delivery systems and surveillance, monitoring and evaluation processes.

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Updates on SNT implementation

1. Direct support to countries
2. Transition to WHO regions
3. Capacity development
4. Integrated national data repositories

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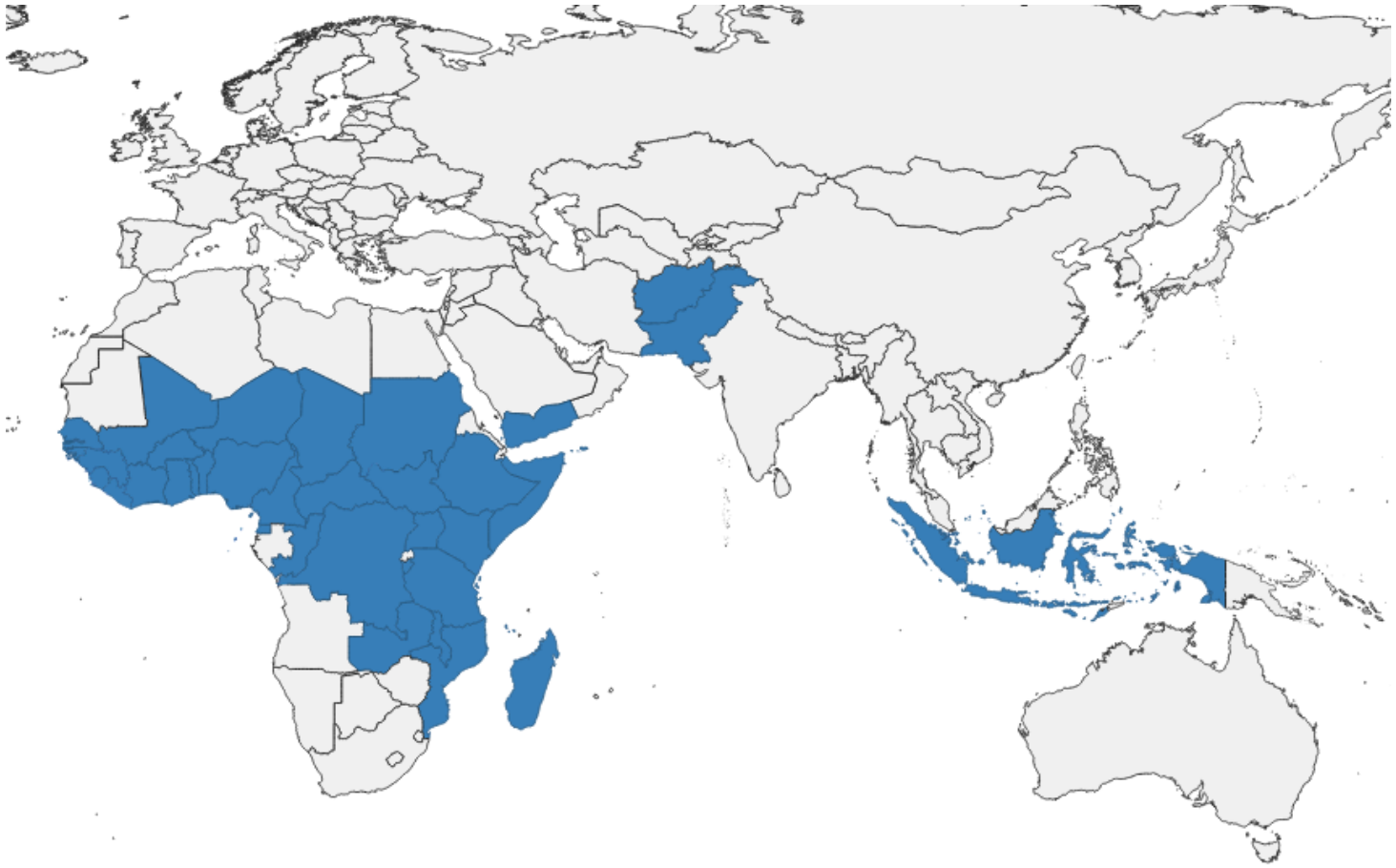
Summary of support GMP-SIR (2018-2024)

- Full SNT process
- Intervention-specific targeting support
- Retrospective analysis
- Malaria clinical incidence stratification support



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Transition to WHO regions

WHO Regional Office for Africa

- **Precision Public Health Office** was set up in 2023 as a cross-cutting team within the Universal Health Coverage, Communicable and Noncommunicable Diseases (UCN) Cluster
- **May 2023**, SIR visit to AFRO for transition planning
- **Regular discussions** between SIR, the Tropical and Vector Borne Diseases Programme and PPH Office to ensure a sustainable transition of activities

WHO Regional Office for the Eastern Mediterranean

- Regional Office under the leadership of Dr. Ghasem Zamani has been heavily involved in the coordination and implementation of SNT in very complex environments (e.g. Sudan or Yemen).
- Implementation of SNT has been coupled with training of local WHO and NMCP personnel who have actively participated in the data collection, management, analysis and interpretation process for decision-making
- **There is enormous potential** for SNT efforts in the Region to be sustainable.
- There is a **need to design a plan and allocate the necessary human resources and funding** to support the sustainable transition of SNT activities to the Region.

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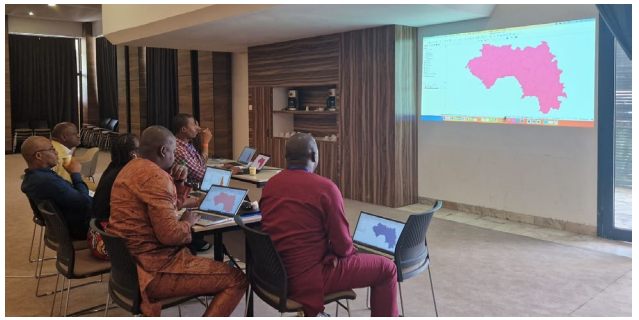
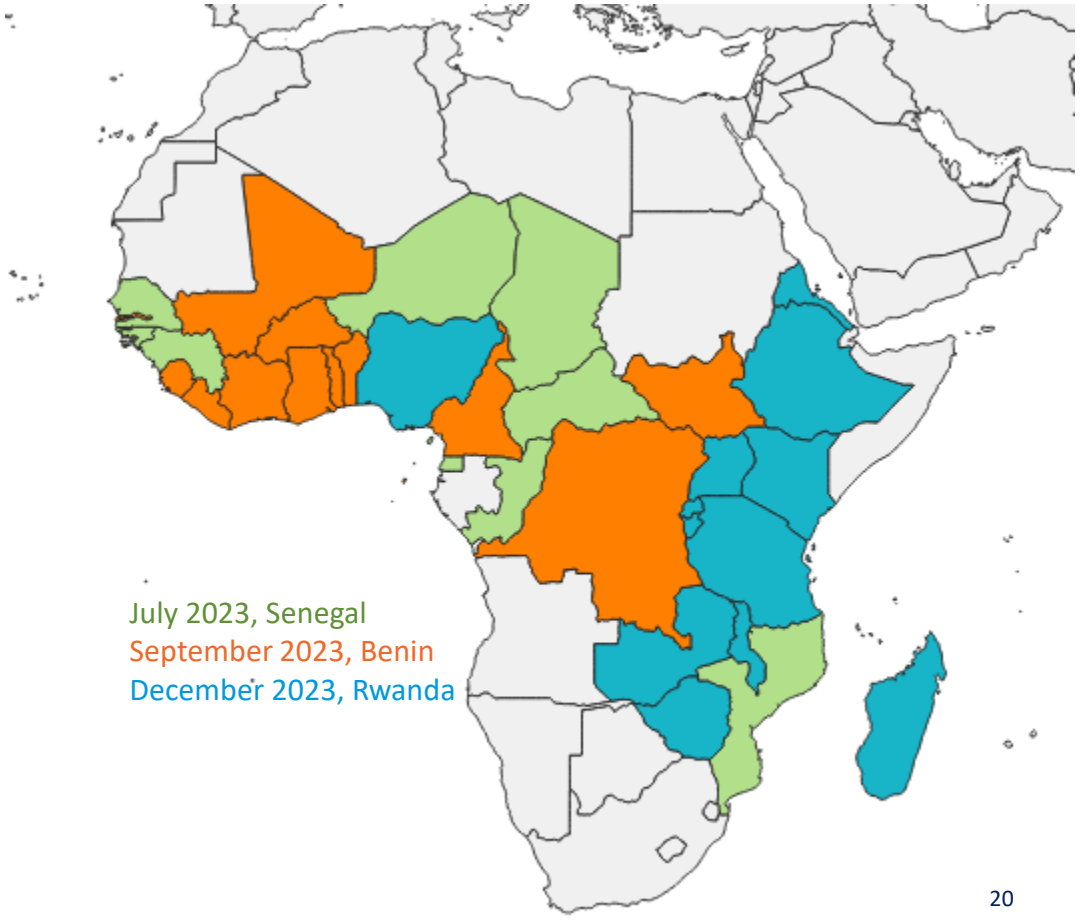
Capacity development

- **Direct training of NMCP and WHO country office technicians** in the partial or complete implementation of the analytical activities required to inform the SNT process

- **Representation on the Advisory Board and participation in training workshops** organized by the Applied Malaria Modeling Network (AMMnet)

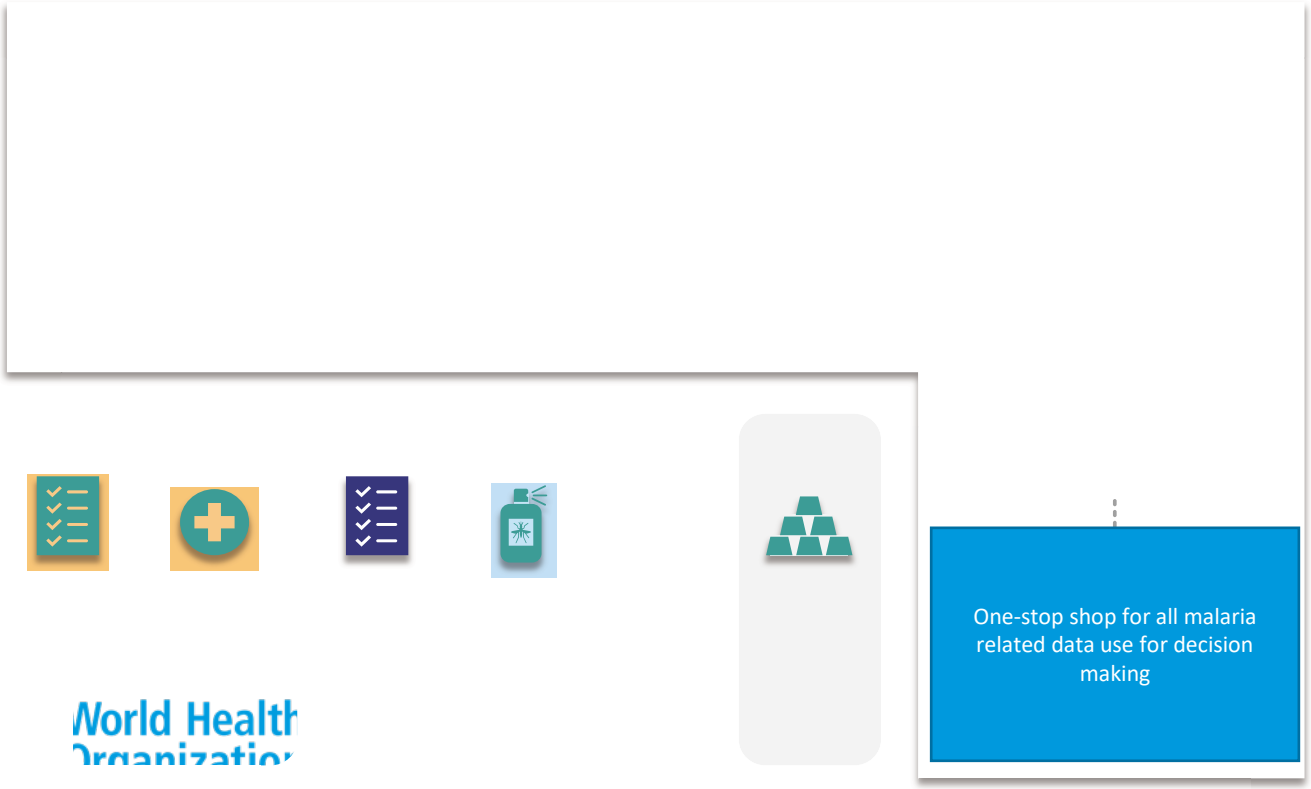
- **Clinical malaria incidence estimation workshops**
  - ✓ **Data collection and management** in Excel and QGIS
  - ✓ **Estimation of crude and adjusted incidence** using the step-wise adjustment approach recommended by WHO
  - ✓ Understand the **strengths and limitations** of each of the adjustments proposed, and identify ways to adapt the estimation methodology to your context
  - ✓ **Produce maps and other graphics** to present the results of your analysis
  - ✓ Identify **next steps and areas of improvement** to continue to estimate incidence locally
  - ✓ Understand how estimated incidence can be used for **subnational decision-making** in combination with additional indicators

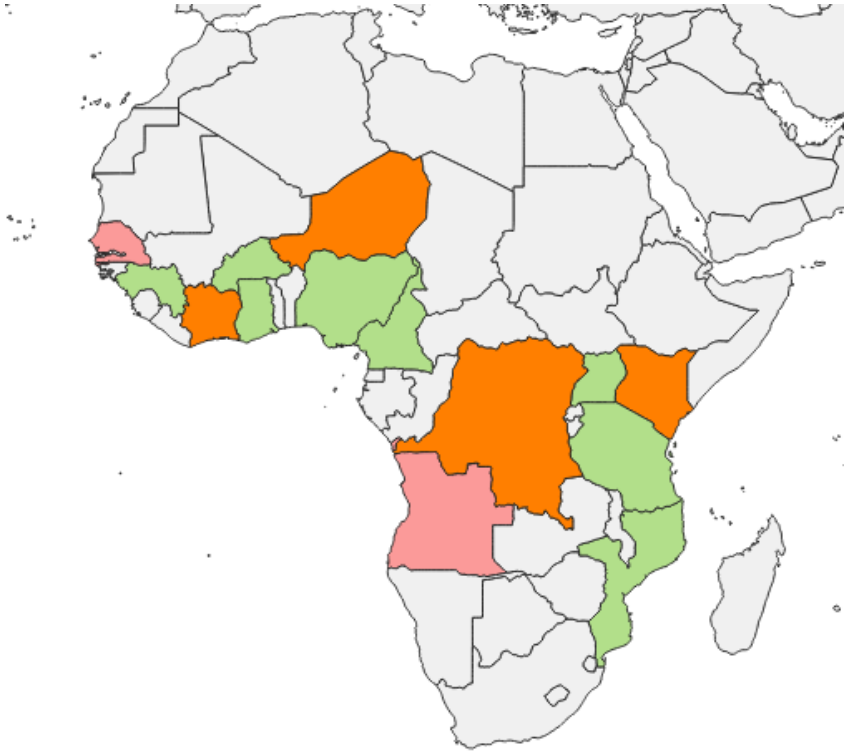




Integrated national data repositories

- Data warehouse of all available malaria-related information
- Assembles both routine and non-routine data, providing malaria programs with all the information required to take decision-based actions





Established or in advance stages
Repositories initiated
Planned support

SNT manual

What?

- Intended to provide an **overview of the vision and key concepts** underpinning SNT of malaria interventions for decision-making.
- It will also provide **practical guidance on indicators and associated methods to inform the criteria for SNT** of interventions and strategies and resource prioritization, building on the WHO guiding principles for prioritization

Who?

- It will be **drafted jointly** by the Global Malaria Programme and the WHO regions,
- In collaboration with **Dr Abdisalan Noor** at the Harvard T.H. Chan School of Public Health, Harvard University.
- There will be **a consultative process to request feedback** from malaria-endemic countries and partners engaged in activities to support SNT.

When?

- **1st version**: end of May 2024
- Internal review
- **2nd version** after internal review: end of June 2024
- External review by partners: July and August 2024
- **3rd version** for MPAG review: end of September 2024
- Receive guidance from the Malaria Policy Advisory Group in October 2024
- **Final version** by end of November

World Health Organization

Acknowledgements

National malaria control programs

Dr. Daniel Ngamije

Dr. Abdisalan Noor

SIR unit

WHO regional and country offices

World Health Organization

Thank you

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World Health Organization

Malaria Policy Advisory Group Meeting
4–5 March 2024, Yaoundé, Cameroon
Background document for Session 4

Guiding principles for prioritizing malaria interventions in resource-constrained country contexts to achieve maximum impact

In line with the goals of the *Global technical strategy for malaria 2016–2030 (1)* and with Sustainable Development Goal 3, to ensure healthy lives and promote well-being for all at all ages, the World Health Organization (WHO) Global Malaria Programme continues to promote the principle of leaving no one behind and to ensure access to effective malaria interventions for all those in need.

Due to the heterogeneous distribution of malaria transmission and its determinants, subnational tailoring (SNT) provides an analytical framework to facilitate the targeting of each population with appropriate intervention packages for maximum impact to inform national strategic planning and prioritization based on resources available. The WHO Global Malaria Programme recommends the use of subnational data on disease epidemiology and other relevant local contextual factors to facilitate the process of SNT. Once the strategies and intervention mixes have been defined, programmes can proceed to the prioritization of interventions for effective programming, based on available resources.

In response to ever increasing financial constraints, the WHO Global Malaria Programme and Regional Offices, in consultation with selected national malaria programme managers and technical partners,[1] have developed these guiding principles for prioritizing interventions in resource-constrained countries to achieve maximum impact for national malaria control programmes. Prioritization is the process of subnationally selecting the most impactful mixes of interventions for implementation and de-prioritizing others because of financial constraints, considering equity and programmatic feasibility. This process requires difficult choices to be made to minimize the negative impact of withholding some interventions included in the national strategic plan. It differs from optimization – the process during planning and implementation by which programmes ensure that the strategies and effective interventions deployed achieve the maximum impact with the most efficient use of available resources.

Prioritization must be guided by the basic principles of primary health care and universal health coverage: patient-centredness, community empowerment, self-determination, accessibility, acceptability, equity, quality, intersectoral collaboration, value and sustainability, accountability and transparency. It should be aligned with the broader national health prioritization processes and the development of health benefit packages, consistent with the principles of country ownership, cost-effectiveness, financial risk protection and political acceptability *(2)*.

The guiding principles for prioritizing (or de-prioritizing) can be applied to interventions targeting the same populations or different vulnerable groups at risk of malaria in the same or different geographical areas. For example, in a district that is eligible for seasonal malaria chemoprevention (SMC), case management and vector control should be prioritized over introducing or scaling up SMC. In addition, vector control could be de-prioritized in an area with low baseline transmission, and funds could be

[1] The review and inputs received to improve the contents of this document are gratefully acknowledged. Special appreciation is given to the managers of the national malaria control programmes of Burkina Faso, Cameroon, Democratic Republic of the Congo, Nigeria, Rwanda, Uganda and Zambia, the African Leaders Malaria Alliance, Bill & Melinda Gates Foundation, the Global Fund to Fight AIDS, Tuberculosis and Malaria, RBM Partnership to End Malaria and the United States President's Malaria Initiative. The document has been further enriched based on the advice received from the WHO Malaria Policy Advisory Group at its 24th meeting on 30 October–1 November 2023.

invested to support introduction of SMC in a different eligible area, because the net benefit (impact) would be higher with the limited resources available.

Prioritization decisions must be informed by a good understanding of the baseline (historical) transmission intensity and knowledge of the main determinants of current disease burden in a given area, as the current situation may reflect the impact of interventions already being deployed. The magnitude of change from the baseline that is likely due to the interventions will help to determine the level of risk of resurgence and, by extension, the potential impact of the decision to remove the interventions, particularly in areas where the underlying environmental and socioeconomic factors driving malaria remain the same. The baseline period is considered the time before preventive interventions were scaled up.

This document provides guiding principles for prioritizing high-impact interventions, in particular early diagnosis and treatment, insecticide-treated nets (ITNs), indoor residual spraying (IRS), malaria vaccines and chemoprevention options with specific focus on areas of moderate to high transmission[2], in situations where resources are limited. While several principles in this document may also apply to areas of low to very low transmission, specific guidance for prioritizing malaria interventions under resource constraints should be developed for these settings, as well as for countries nearing malaria elimination.

Prioritization of interventions

In the face of limited resources, the following principles should guide the prioritization of malaria interventions:

1. The primary objective is to prevent and minimize malaria-related deaths. This is assured by providing access to early diagnosis and effective treatment of all malaria cases, irrespective of the malaria transmission intensity. Providing prompt access to malaria diagnosis and treatment by maintaining existing services across all levels of the health care delivery system, including at community level, should be prioritized and guaranteed for all as a basic human right. Scaling back access to early diagnosis and treatment is not an option under any level of financial constraint. Surveillance of antimalarial drug resistance and histidine-rich protein 2 (HRP2) deletions is essential for selecting effective medicines and diagnostics for malaria case management.
2. Investments in improving epidemiological and entomological surveillance, and the quality and effectiveness of interventions should not be reduced as part of prioritization, as these are essential to inform the timely investments required to achieve impact. This includes resources to secure the coverage and competence of health workers to provide quality care, and social behaviour change communication to increase public awareness on care seeking and increase the acceptance and use of interventions. National malaria control programmes should always consider what needs to be prioritized from the malaria budget to ensure optimization of implementation, assuring timely and effective access to malaria interventions (e.g. procurement, training, supervision and surveillance) and the enabling health services components that depend on the national health development plan (e.g. staff salary, supply management and distribution, private sector engagement, institutionalization of community health workers).

[2] In this document, the following WHO definitions of levels of malaria transmission are used:
- high: > 450 cases per 1000 population per year or *Plasmodium falciparum* prevalence rate (PR) > 35%
- moderate: 250–450 cases per 1000 population per year or *P. falciparum/P. vivax* PR = 10–35%
- low: 100–250 cases per 1000 population per year or *P. falciparum/P. vivax* PR = 1–10%
- very low: < 100 cases per 1000 population per year or *P. falciparum/P. vivax* PR = > 0 and < 1%

3. Chemoprevention for pregnant women, i.e. intermittent preventive treatment, should be prioritized in the ante natal care service at health facility level , and scaling it back is not an option in the case of resource constraints.
4. Expansion of case management of acute febrile illnesses at the community level to reach the unreached should be prioritized in remote areas, in all transmission settings; it should be considered, as the expansion of community services is dependent on the primary health care system, the level of community engagement and the degree of institutionalization of community health workers. Similarly, new investments to improve malaria case management in the private sector should be part of the national private sector engagement strategy *(3)*.
5. Malaria vector control interventions recommended for large-scale deployment are: i) ITNs that are prequalified by WHO; and ii) IRS with a product prequalified by WHO *(4)*. The choice of which of these two interventions to deploy should be informed by contextual data, such as insecticide susceptibility, vector behaviour and intervention use, as well as relative cost-effectiveness. WHO does not recommend co-deployment of both IRS and ITNs.
6. The vector control strategy selects at subnational level the most effective interventions at a scale and frequency that optimizes impact. When funding is insufficient, trade-offs must be made between the choice of effective interventions and coverage targets, as more effective ITN or IRS products are often more expensive per unit compared to the existing pyrethroid-only nets. Surveillance of insecticide resistance is essential for selecting effective vector control interventions, and programmes should deploy products that contain active ingredients that are effective against their vector populations.
7. For countries or parts of countries where deployment of ITNs is considered to be the appropriate choice, the priority is to ensure access of pregnant women and children under 5 years of age through routine ITN distribution in all malaria risk areas.
8. If resources are constrained, all areas with very low current and historical malaria transmission (e.g. < 1% *P. falciparum* prevalence rate) can be excluded from ITN campaigns. This applies to most urban areas, with the exception of areas where *Anopheles stephensi* has been reported. In urban areas, other appropriate means of vector control, including larviciding, should be considered, based on micro-stratification *(5)*.
9. Decisions on ITN replacement in areas where vectors are resistant to pyrethroids should be guided by the following principles *(4)*:
    a. Pyrethroid-chlorfenapyr, pyrethroid-PBO and pyrethroid-pyriproxyfen should be prioritized over pyrethroid-only ITNs. Programs should consider targeting the pyrethroid-chlorfenapyr ITNs to areas with the highest transmission with the aim of maximizing impact. Pyrethroid-PBO ITNs, and potentially pyrethroid-pyripropxyfen ITNs could then be distributed elsewhere, e.g. areas of low and moderate transmission.
    b. Resistance status of malaria vectors, cost of ITNs, and durability of the ITNs should be monitored to inform future procurement decisions. Funding gaps that impede effective coverage with ITNs that control pyrethroid-resistant vectors should be identified and this information should be shared with potential funders. The situation should be reassessed on a regular basis as the market prices of ITNs evolve and price and availability have a major impact on programmatic coverage.
10. At current prices, IRS is relatively more expensive than ITNs per population at risk protected. Under resource-constrained conditions, scaling up IRS should not be considered. IRS should be maintained in countries that are prone to epidemics, as part of preparedness and response. For areas with stable transmission, countries need to carefully consider the resource implications of sustaining IRS instead of transitioning to ITNs. If countries are unable to

maintain their IRS campaigns at the right times with effective coverage, in areas of pyrethroid resistance, it may be advisable to switch to pyrethroid-chlorfenapyr, pyrethroid-PBO or pyrethroid-pyriproxyfen ITNs and invest in social and behaviour change communication to ensure the effective use of ITNs.

11. When changes are made in vector control strategies that lead to decreased/suboptimal intervention coverage of either IRS or ITNs, or when a vector control intervention such as IRS is withdrawn, establishment of strong surveillance and response capacity should be prioritized to mitigate a potential malaria increase.
12. WHO recommends the RTS,S/AS01 and R21-Matrix M malaria vaccines for the prevention of *P. falciparum* malaria in children living in malaria-endemic areas, prioritizing areas of moderate to high transmission. Decisions on expansion to low transmission settings should be considered at country level, based on the overall malaria control strategy, affordability, cost-effectiveness and programmatic considerations, such as whether it would simplify delivery to include such areas. At country level, vaccine introduction is led by the national immunization programme with technical support of partners; the vaccine should be considered complementary to other malaria control interventions and part of a lifesaving multi-intervention approach to prevent malaria. R21-Matrix M has been prequalified by WHO and it is expected that with two malaria vaccines available, supply will be sufficient to meet demand. During the period of constrained supply of RTS,S/AS01, a framework was developed and endorsed by WHO for prioritizing the allocation of limited malaria vaccine doses *(6)*.
13. There is no evidence to inform when to scale back SMC and countries should do their utmost to maintain the intervention. However, if resources are not available, scale-down should be based on the principle of "least harm", de-prioritizing areas where incidence was lowest at the pre-SMC baseline. Deployment of effective ITNs, expansion of case management, and better epidemiological and entomological surveillance, preparedness and response should be prioritized in these areas.
14. New chemoprevention strategies should not be prioritized over and above case management and vector control in any given population. Geographical or age expansion of SMC, community deployment of intermittent preventive treatment of malaria in pregnancy, perennial malaria chemoprevention, post-discharge malaria chemoprevention and intermittent preventive treatment of malaria in school-aged children should not be implemented at scale if resources to ensure access to case management and coverage of effective vector control are limited.

These guiding principles provide a framework for country decision-making to define the most appropriate mix of malaria interventions for specific geographical areas or risk groups when resources are constrained. This process should be complemented at national level by a budget optimization analysis to estimate the health impact of the different scenarios under consideration.

Prioritization is an iterative process, and it will need to be continuously revised as costs and funding opportunities change over time; as malaria epidemiology changes due to various factors, including man-made and natural disasters; when surveillance does not show the expected impact; when assessment of programme performance shows changing requirements to ensure the effectiveness of interventions; when new tools and knowledge become available; or as new threats emerge. Accordingly, the WHO Global Malaria Programme will ensure that these guiding principles are reviewed on an annual basis, as required, to maintain their accuracy and to support malaria programmes in their decision-making processes.

Mobilizing additional resources is a continuous effort that should be pursued during and after the prioritization planning, based on the evidence-informed national strategic plan. In addition to planning operations based on existing/known resources, national programmes are encouraged to conduct further analyses to identify priority interventions that could be funded should additional resources

become available. Such scenario planning will provide the basis to support resource mobilization efforts, including for domestic resources.

References

1. Global technical strategy for malaria 2016–2030, 2021 update. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/342995, accessed 11 February 2024).

2. Principles of health benefit packages. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/340723, accessed 11 February 2024).

3. Towards better engagement of the private sector in health service delivery: a review of approaches to private sector engagement in Africa. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/352905, accessed 11 February 2024).

4. WHO guidelines for malaria, 16 October 2023. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/373339, accessed 11 February 2024).

5. Global framework for the response to malaria in urban areas. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/363899, accessed 11 February 2024).

6. Framework for the allocation of limited malaria vaccine supply. Geneva: World Health Organization; 2022 (https://www.who.int/publications/m/item/framework-for-allocation-of-limited-malaria-vaccine-supply, accessed 11 February 2024).

Annex. Additional reading

ITN ownership and usage to achieve personal and community protection

Lines J, Chitnis N, Paintain L. How insecticide-treated nets (ITNs) work: the biological mechanisms by which ITNs give personal- and community-level protection against malaria, version v1. Zenodo. 2022. doi:10.5281/zenodo.6393253.

Interventions recommended for large-scale deployment: insecticide-treated nets. In: WHO guidelines for malaria, 16 October 2023. Geneva: World Health Organization; 2023:42–3 (https://www.who.int/teams/global-malaria-programme/guidelines-for-malaria , accessed 11 February 2024).

ITN requirements at population level

Insecticide-treated nets: practical info. In: WHO guidelines for malaria, 16 October 2023. Geneva: World Health Organization; 2023:62–3 (https://www.who.int/teams/global-malaria-programme/guidelines-for-malaria , accessed 11 February 2024).

ITN campaigns and continuous distribution

Koenker H, Yukich J, Erskine M, Opoku R, Sternberg E, Kilian A. How many mosquito nets are needed to maintain universal coverage: an update. Malar J. 2023;22(1):200. doi:10.1186/s12936-023-04609-z.

Insecticide-treated nets: practical info. In: WHO guidelines for malaria, 16 October 2023. Geneva: World Health Organization; 2023:62–3 (https://www.who.int/teams/global-malaria-programme/guidelines-for-malaria , accessed 11 February 2024).

Access to ITNs or IRS at optimal coverage levels

Co-deploying ITNs and IRS: practical info. In: WHO guidelines for malaria, 16 October 2023. Geneva: World Health Organization; 2023:75 (https://www.who.int/teams/global-malaria-programme/guidelines-for-malaria , accessed 11 February 2024).

No scale-back of vector control in areas with ongoing malaria transmission

No scale-back in areas with ongoing local malaria transmission: practical info. In: WHO guidelines for malaria, 16 October 2023. Geneva: World Health Organization; 2023:73 (https://www.who.int/teams/global-malaria-programme/guidelines-for-malaria , accessed 11 February 2024).

SMC distribution strategies

Seasonal malaria chemoprevention with sulfadoxine–pyrimethamine plus amodiaquine in children: a field guide, second edition. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/368123 , accessed 11 February 2024).

Guiding principles for prioritizing malaria interventions in resource-constrained country contexts to achieve maximum impact:

presentation of revised version

25th meeting of the WHO Malaria Policy Advisory Group

4-5 March 2024

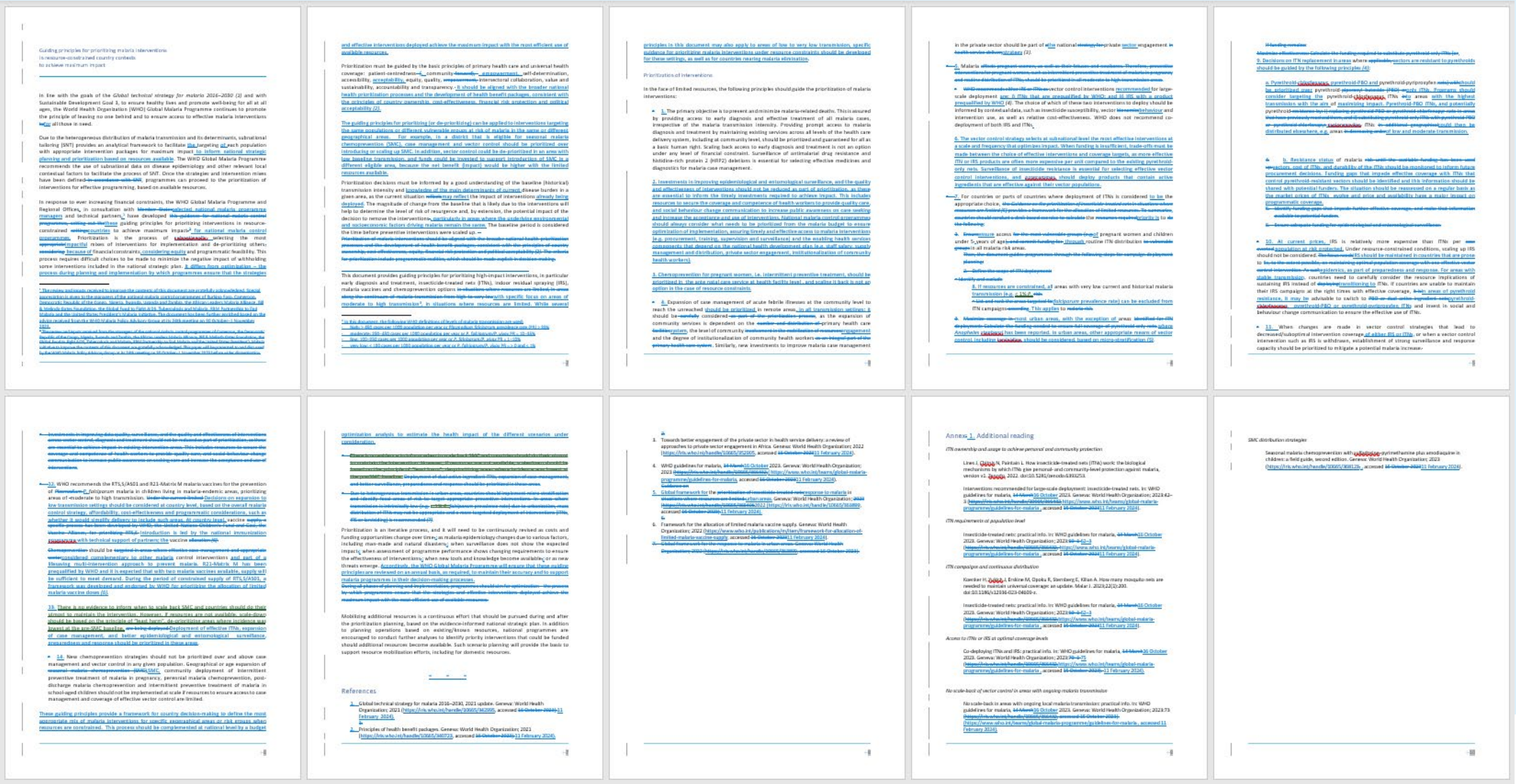
World Health Organization

Outline of the presentation

- Process of updating the guidance
- Need for and structure
- New contents:
  - Interventions to never scale back
  - Replacement of ITNs in areas with pyrethroid resistance
  - Considerations for scaling-up and scaling down interventions
- Position on malaria vaccines
- Next steps for finalization and regular updates
- Contributors

World Health Organization

Tracked changes compared to version (14) presented & reviewed by MPAG in October 2023



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Process of development and updating

Review by MPAG in Nov-December 2023

July – August (ver 1-11)

Originators

- WHO/GMP core group
- WHO/GMP senior management team
- WHO Regional Malaria Advisers

- *Over 15 contributors, iterative*

September (ver 12)

Technical Partners (Round 1)

- ALMA
- BMGF
- Global Fund
- RBM
- USAID - PMI

Over 25 contributors, one round

October (ver 14)

NMCP and ALL (Round 2)

- NMCP of Cameroon, Democratic Republic of Congo, Nigeria, Rwanda, Uganda and Zambia
- BMGF
- Global Fund
- USAID-PMI
- WHO/GMP senior management team
- WHO Regional Malaria Advisers

- *Over 30 contributors, one round*

Jan-February (ver 15-26)

NMCP and ALL (Round 3)

- NMP of Burkina Faso, Central African Republic, Congo, Côte d'Ivoire, Equatorial Guinea, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mozambique, Sao Tomé and Principe, Senegal, Sierra Leone, South Sudan, Tchad
- NMCP of Rwanda, Tanzania, Uganda and Zambia
- BMGF
- Global Fund
- USAID-PMI
- WHO/GMP senior management team
- WHO Regional Malaria Advisers

- *Over 30 contributors, iterative*

World Health Organization

MPAG advice

- Clarify target audience
- Clarify settings
- Consult additional NMPs
- Align with SNT guidance
- Emphasize surveillance
- Baseline data needs
- Build capacity of NMPs

Target audience = National decision-makers:

- National Malaria Program (NMP) Managers
- National Malaria Advisory Committees
- Technical development partners of NMPs
- Funding agencies supporting NMPs

Specific focus on areas with moderate to high malaria transmission

WHO definitions of levels of malaria transmission :

- high: > 450 cases per 1000 population per year or *P. falciparum* prevalence rate (PR) > 35%
- moderate: 250–450 cases per 1000 population per year or *P. falciparum/P. vivax* PR = 10–35%
- low: 100–250 cases per 1000 population per year or *P. falciparum/P. vivax* PR = 1–10%
- very low: < 100 cases per 1000 population per year or *P. falciparum/P. vivax* PR = > 0 and < 1

WHERE AND WHEN TO USE

Operational Unit
(district or equivalent)

WHO recommended interventions with clear targeting **criteria***

(transmission setting, age group, seasonality, efficacy, access etc.)

- LLIN, IRS, LSM,
- IPTp, IPTi, SMC,
- CM (Public HF, iCCM, private)

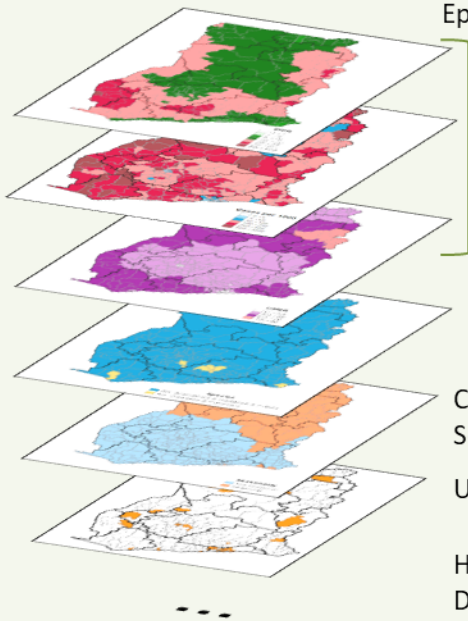
for each intervention, WHO has:

- Recommendation
- Good practice statement
- Country adaptation
- Additional considerations for targeting

Malaria Strategic Plan development

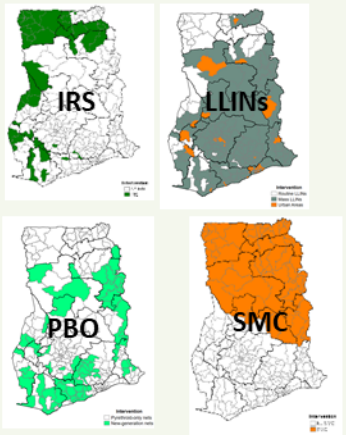
Stratification: Hierarchical ordering of one or multiple layers of information to make decisions

Indicators



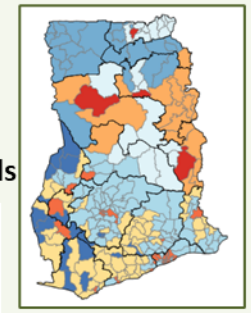
- Epidemiology
  - *Incidence*
  - *Prevalence*
  - *Mortality*
- Entomology
- Climate & Seasonality
- Urbanization
- Health systems
- Drug resistance
- Conflict zones
- Land use
- etc

Intervention targeting: For each intervention, identify the operational unit that meets criteria + operational feasibility

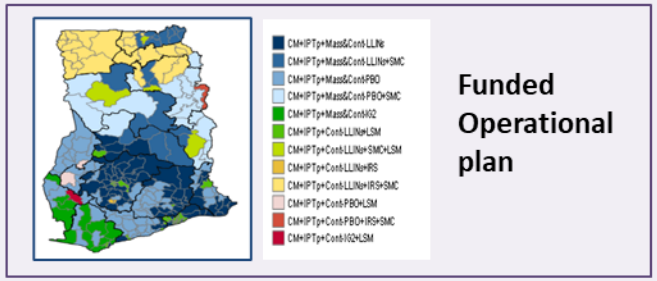


Mathematical models used to evaluate different scenarios and quantify impact of sub-nationally tailored intervention mixes

National Strategic Plan Intervention Mix Map & informed goals



Resource allocation and prioritization



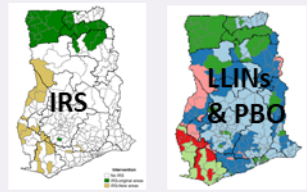
Funded Operational plan

Mathematical models may be used for resource prioritization through cost-effectiveness analysis of different scenarios

Prioritization: Prioritizing intervention to achieve maximum impact within a resource envelope

Implications:

- Less commodities
- Reduced coverage targets,
- Higher efficiency threshold
- Equity



Costing of national strategic plan

How much it costs

$$$

How much there is available

$

WHY – the need

Applications of NMCP to Global Fund GC7 window 1 and 2 (submitted in Q1-Q2 2023), faced a significant funding gap compared to Global Fund country allocations.

Several countries applying to window 1 requested frontloading of interventions in years 1 & 2, leaving gaps in essential services in year 3.

Adjustments in case management led to bigger gaps in vector control

The estimated malaria funding gap for Global Fund windows 1 and 2 is approximately USD 1 billion to sustain essential services (case management in the public sector, ITNs in moderate to high transmission areas and SMC) without considering needs for optimal product selection and full programme support, which make the gap significantly higher

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New version maintains same general structure

Framing to
GTS for malaria and SDG3
and sub-national tailoring

Clarity on definition

Core Principles: PHC and UHC, equity, values, baseline transmission, country ownership, cost-effectiveness, financial risk protection, political acceptability

Prioritizing high-impact interventions: early diagnosis and treatment, insecticide-treated nets (ITNs), indoor residual spraying (IRS), malaria vaccines and chemoprevention

Prioritization as iterative and dynamics process,
always ensure optimization and resource mobilisation based on evidence-based national strategic plan

Document lean & clean (4 pages)

Contents based on WHO guidelines and guidance

Additional reading

- *ITN community protection*
- *ITN requirements*
- *ITN distribution strategies*
- *ITN and IRS optimal coverage*
- *Scale-back vector control*
- *SMC distribution strategies*

World Health Organization

What is new

World Health Organization

The new version presents more clearly interventions which should never scale back at any level of financial constraints:

1. prompt access to malaria diagnosis and effective treatment maintained in existing services across all levels of the health care delivery system, including the community level;
2. investments in epidemiological and entomological surveillance, and to ensure quality and effectiveness of interventions;
3. access to intermittent preventive treatment of pregnant women as part of antenatal care services at health facility level;
4. access of pregnant women and children under 5 years of age to insecticide-treated nets (ITNs) through routine distribution;
5. indoor residual spraying (IRS) as part of preparedness and response in countries prone to malaria epidemics.

What is new: WHO documents as references

Decisions on ITN replenishment in areas where vectors are resistant to pyrethroids:

- With a view of maximising impact, pyrethroid-chlorfenapyr ITNs should be prioritized, followed – in order of preference – by pyrethroid-PBO ITNs or pyrethroid-pyriproxyfen ITNs. The deployment of pyrethroid-only should ideally be avoided.
- To inform this prioritization, available resources, resistance status of malaria vectors, cost of ITNs should be taken into account, and durability of the ITNs should be monitored to inform future procurement decisions. Funding gaps that impede effective coverage with ITNs that control pyrethroid-resistant vectors should be identified and this information should be shared with potential funders. The situation should be reassessed on a regular basis as the WHO guidelines for new ITN types and the market prices of ITNs evolve; price and availability have a major impact on programmatic coverage.

Prioritizing interventions under resource constraints

Conditional scale-up	No scale-up	Conditional scale down	Scale down
Expanding community case management in remote areas as part of national PHC strategy Improving malaria quality of care as part of national private sector engagement strategy Expanding SMC or new chemoprevention strategies not prioritized over case management and vector control Introducing malaria vaccine in the context of comprehensive national malaria control plans	Scaling-up IRS should not be considered	Scaling down ITN campaign in most urban areas, except where *An.stephensi* is reported Scaling down IRS in areas of stable transmission demands switch to ITNs considering pyrethroid resistance and SBCC to promote ITN use Decreasing ITN or IRS coverage demands increased investments in surveillance and response Scale-down SMC where incidence was lowest at baseline and invest in ITNs, case management, surveillance and response	Excluding ITN campaigns areas with current and historical very low transmission (e.g. < 1% *P. falciparum* prevalence rate)

World Health Organization

Malaria vaccines

WHO recommends the RTS,S/AS01 and R21-Matrix M malaria vaccines for the prevention of *P. falciparum* malaria in children living in malaria-endemic areas, prioritizing areas of moderate to high transmission.

Decisions on expansion to low transmission settings should be considered at country level, based on the overall malaria control strategy, affordability, cost-effectiveness and programmatic considerations, such as whether it would simplify delivery to include such areas. At country level, vaccine introduction is led by the national immunization programme with technical support of partners; the vaccine introduction should be considered in the context comprehensive malaria control plans and part of a lifesaving multi-intervention approach to prevent malaria. R21-Matrix M has been prequalified by WHO and it is expected that with two malaria vaccines available, supply will be sufficient to meet demand.

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PROCESS FOR FINALISATION AND FURTHER UPDATES

New WHO guidance

New WHO guidance

2nd MPAG review	April	May	June 2024	December 2024	Annual updates
	Finalisation of the document	Publication and dissemination	Systematic collection of feedback from end users (NMCP and technical partners)	Revised version	Regular updates based on new WHO guidance

World Health Organization

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Malaria Policy Advisory Group Meeting
4–5 March 2024, Yaoundé, Cameroon
Background document for Session 4

Biological threats to malaria vector control interventions

Control of the anopheline mosquito vector of malaria is faced with two key biological threats: i) the evolution and spread of insecticide resistance, and ii) the spread of efficient mosquito vectors such as *Anopheles stephensi* and *An. albimanus*.

Insecticide-based vector control is a cornerstone in the fight against malaria, yet insecticide resistance in malaria vectors poses a constant threat. In recognition of this threat, the World Health Organization (WHO) released the *Global plan for insecticide resistance management in malaria vectors (1)* in 2012. Among other priorities, this plan highlighted the need for strengthened surveillance for insecticide resistance and improved data management, including the establishment of a global database. WHO therefore launched the Malaria Threats Map in 2017 (https://apps.who.int/malaria/maps/threats/) to enable interactive and visual exploration of the WHO insecticide resistance database and the use of these data for decision-making. In addition, a framework was published to guide the development of national plans for monitoring and managing insecticide resistance and to support associated budgeting and fund-raising efforts *(2)*.

Insecticide resistance data are now submitted on a regular basis to WHO by most of its Member States. In addition to being made available in the Malaria Threats Map, these data are summarized once a year in the World Malaria Report. In 2018, WHO also undertook an in-depth analysis of the available insecticide resistance data with the aim of enhancing the evidence base to provide informed communications, advocacy and policy development for malaria control and elimination *(3)*. The *World malaria report 2023 (4)* highlighted that, to date, 78 of the 88 countries that reported insecticide resistance monitoring data to WHO between 2010 and 2020 have confirmed resistance to at least one insecticide, while 29 of these countries have confirmed resistance to the four insecticide classes historically used most widely: pyrethroids, organophosphates, carbamates and organochlorines. Further evolution and spread of resistance to recently introduced insecticides needs to be monitored and managed. Therefore, in 2022, WHO released updated and consolidated guidance for monitoring resistance in *Anopheles, Aedes* and *Culex* mosquitoes, which includes discriminating dosages and test procedures for chlothianidin, flupyradifurone, chlorfenapyr and pyriproxyfen *(5)*. Further expansion to include discriminating dosages and test procedures for broflanilide and isocycloseram is planned for 2025.

In addition to the prequalification and recommendation of repurposed or new insecticides for use in indoor residual spraying and on insecticide-treated nets, other new options for resistance management will soon become available. New interventions, such as spatial repellents/emanators, attractive targeted sugar baits, eave tubes and endectocides, will be assessed for their public health value in 2024 and 2025. Provided that their evaluations support WHO recommendations and prequalification, some or all of these interventions will also contribute to closing existing coverage gaps in areas where mosquito vectors predominantly bite outdoors and are not effectively controlled by indoor residual spraying or insecticide-treated nets alone. WHO is playing a key role in supporting the evaluation of these and other innovations and in facilitating market access, as demonstrated by the evolution of the vector control evaluation and guidelines development process *(6)*.

Invasive anopheline mosquitoes pose another potential threat to malaria control efforts, with the invasion of the African continent by *An. stephensi* as the most recent example. In this case, the vector was originally native to parts of Asia and the Arabian Peninsula, where it is a major malaria vector in rural and urban areas. In 2012, it was detected in Djibouti, followed by Ethiopia, Sudan and Sri Lanka

(2016) and Somalia (2019). In response, WHO published a vector alert on *An. stephensi (7)* and extended the Malaria Threats Map to include invasive vectors. Furthermore, the identification key for female Afrotropical *Anopheles* mosquitoes was expanded to include *An. stephensi (8)* and was translated into French and Arabic. Subsequently, and presumably due to increased surveillance resulting from the above actions, WHO received further reports of the presence of *An. stephensi* in Nigeria (2020), Yemen (2021), Kenya, Ghana and Eritrea (2022). To step up WHO's response, a regional initiative aimed at stopping the spread of *An. stephensi* in Africa was launched in September 2022 *(9)*; the vector alert was updated to provide further guidance on surveillance and response *(10)*; and an educational video was published *(11)*. The WHO initiative seeks to determine whether the vector can be eliminated from areas of Africa that have already been invaded by increasing collaboration, strengthening surveillance, improving information exchange, developing evidence-based guidance and prioritizing research to identify the most effective ways to respond to this invasive vector. Like all challenges, the invasion by *An. stephensi* provides opportunities. An obvious one to explore is the potential for integration of *An. stephensi* surveillance and control with that of *Aedes* spp., as both thrive in urban and peri-urban settings. WHO's *Global vector control response 2017–2030 (12)* provides the framework for investigating these and other integration opportunities to provide effective, locally adapted, sustainable vector control.

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1. Global plan for insecticide resistance management in malaria vectors. Geneva: World Health Organization; 2012 (https://iris.who.int/handle/10665/44846, accessed 20 February 2024).
2. Framework for a national plan for monitoring and management of insecticide resistance in malaria vectors. Geneva: World Health Organization; 2016 (https://iris.who.int/handle/10665/254916, accessed 20 February 2024).
3. Global report on insecticide resistance in malaria vectors: 2010–2016. Geneva: World Health Organization; 2018 (https://iris.who.int/handle/10665/272533, accessed 20 February 2024).
4. World malaria report 2023. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/374472, accessed 20 February 2024).
5. Manual for monitoring insecticide resistance in mosquito vectors and selecting appropriate interventions. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/356964, accessed 20 February 2024).
6. Norms, standards and processes underpinning development of WHO recommendations on vector control. Geneva: World Health Organization; 2020 (https://iris.who.int/handle/10665/338030, accessed 20 February 2024).
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8. Coetzee M. Key to the females of Afrotropical *Anopheles* mosquitoes (Diptera: Culicidae). Malar J. 2020;19:70. doi:10.1186/s12936-020-3144-9.
9. WHO initiative to stop the spread of *Anopheles stephensi* in Africa, 2023 update. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/372259, accessed 20 February 2024).
10. Vector alert: *Anopheles stephensi* invasion and spread in Africa and Sri Lanka. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/365710, accessed 20 February 2024).

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12. World Health Organization, UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. Global vector control response 2017–2030. Geneva: World Health Organization; 2017 (https://iris.who.int/handle/10665/259002, accessed 20 February 2024).

Biological threats to malaria vector control interventions

Malaria Policy Advisory Group
Yaoundé, Cameroon

4 March 2024

Dr Jan Kolaczinski, Unit Head, Vector Control & Insecticide Resistance

World Health Organization

Content

- Insecticide resistance
- *Anopheles stephensi*
- Response commonalities

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MALARIA

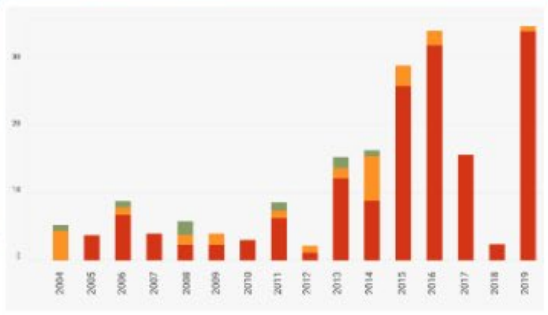
THREATS MAP

Explore data about the major biological threats to malaria control and elimination.

Maps

Explore individual studies and site-level data for all the threats.

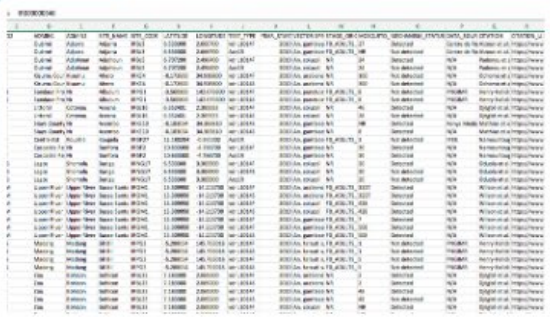
ENTER MAP



Dashboards

View summaries of the threats at different geographical levels.

VIEW DASHBOARDS



Data download

Download the data behind the MTM for your own analysis.

DOWNLOAD DATA

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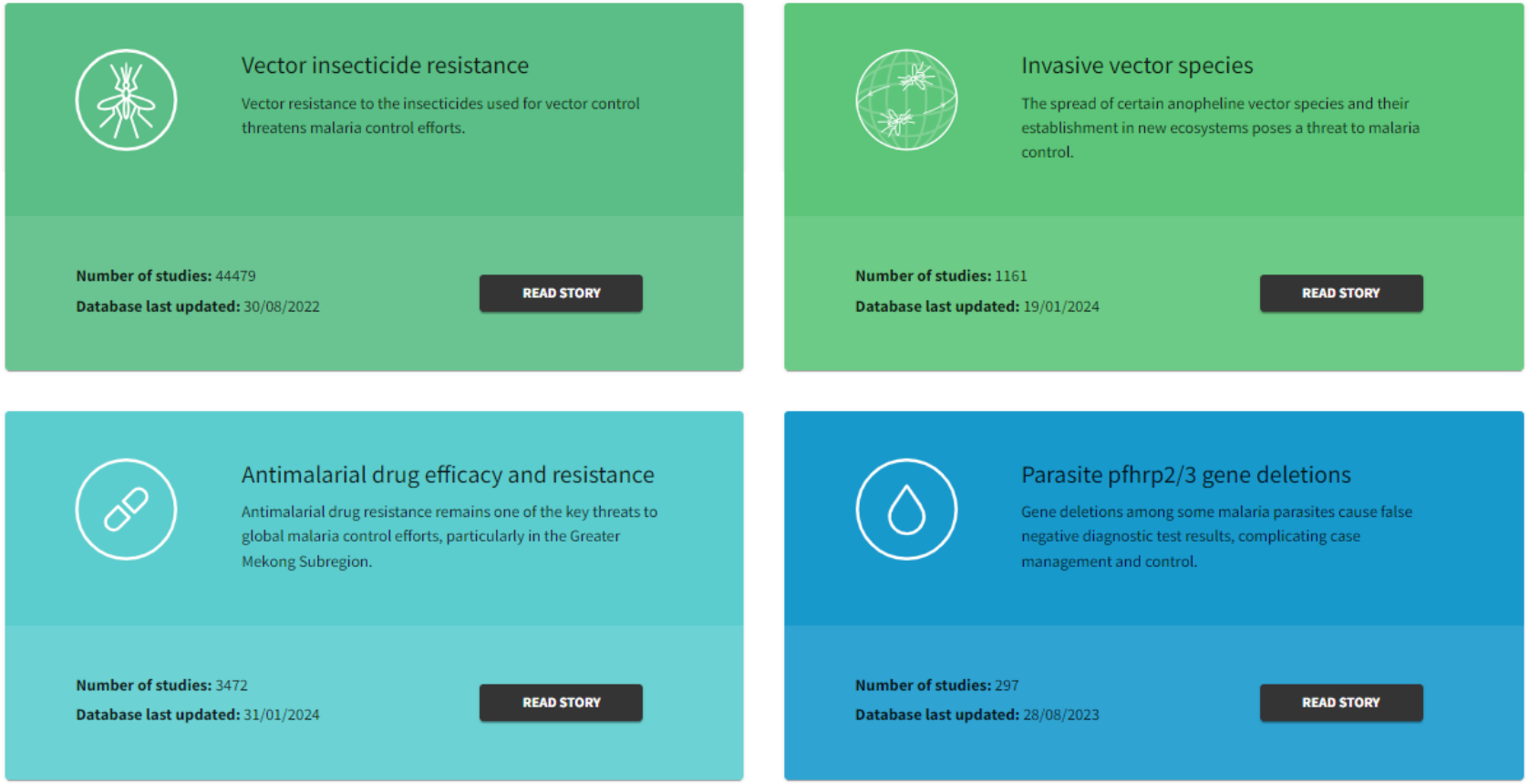
https://www.who.int/teams/global-malaria-programme/surveillance/malaria-threats-map

The Malaria Threats Map is a comprehensive platform on the four biological threats to malaria control and elimination.



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https://www.who.int/teams/global-malaria-programme/surveillance/malaria-threats-map

Insecticide Resistance

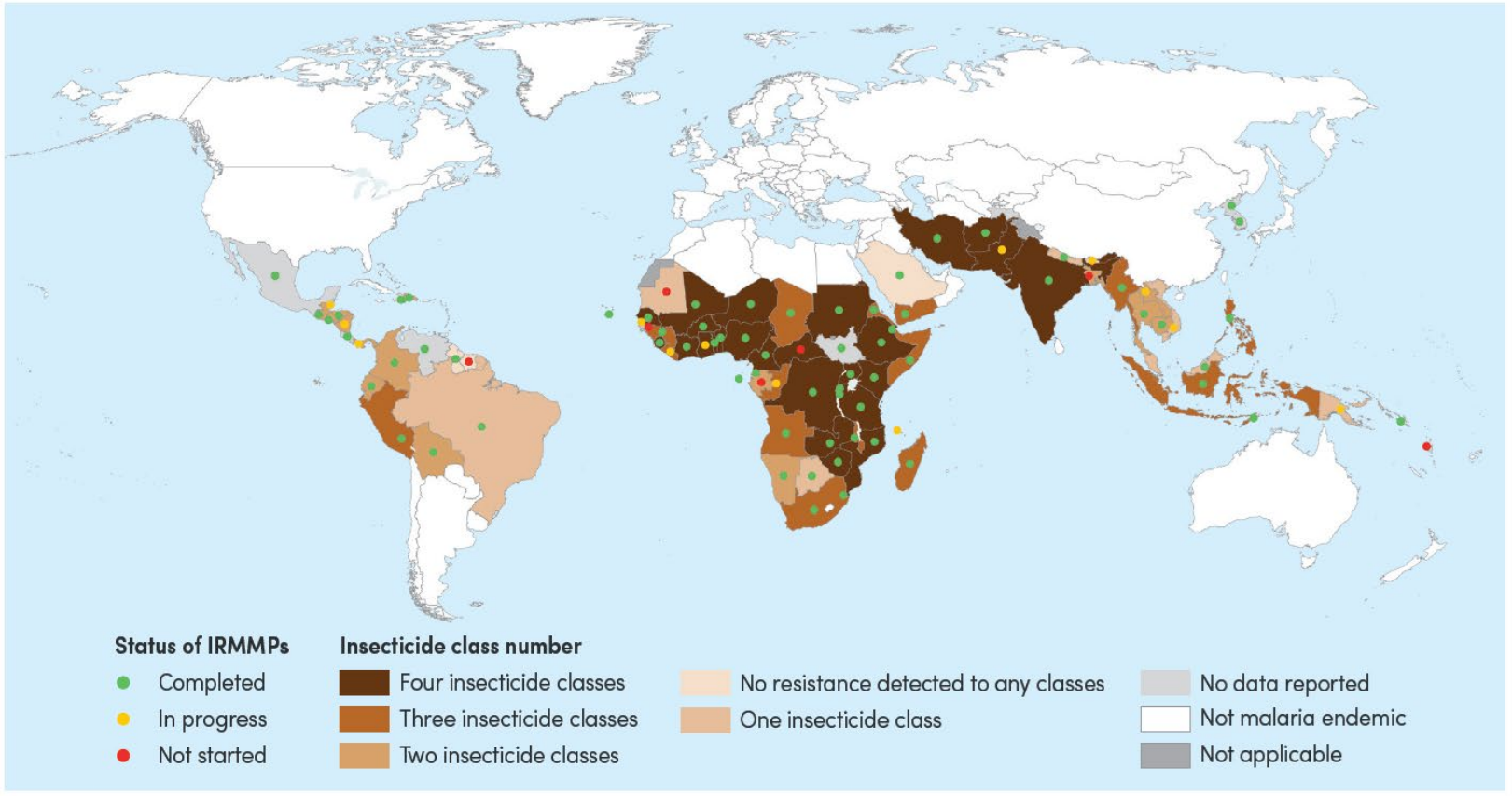
Insecticide resistance in at least one malaria vector in 88 countries reporting to WHO:

Pyrethroids: 87%

Organochlorines: 82%

Carbamates: 69%

Organophosphates 60%



NMP: national malaria programme.

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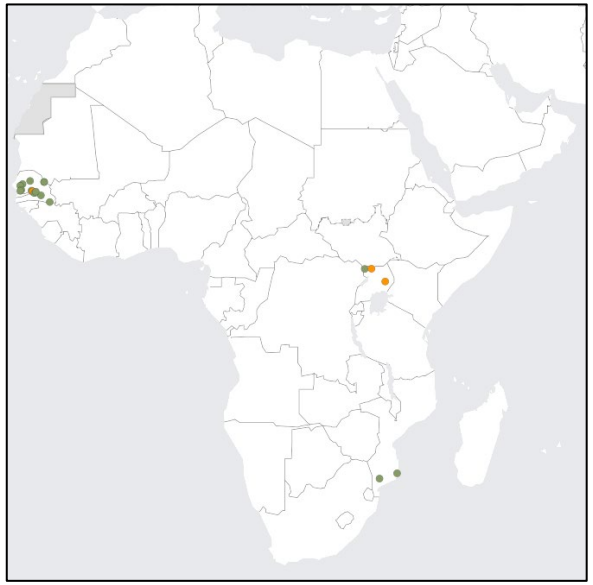
Source: World Malaria Report 2023.
Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023

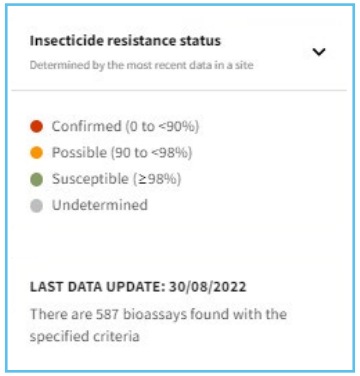
New active ingredients used in vector control:

Chlorfenapyr



Clothianidin

Broflanilide



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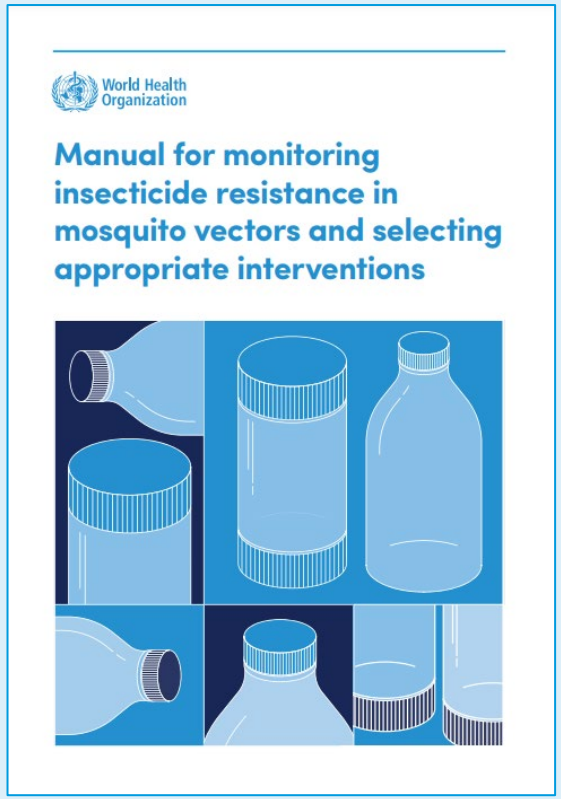
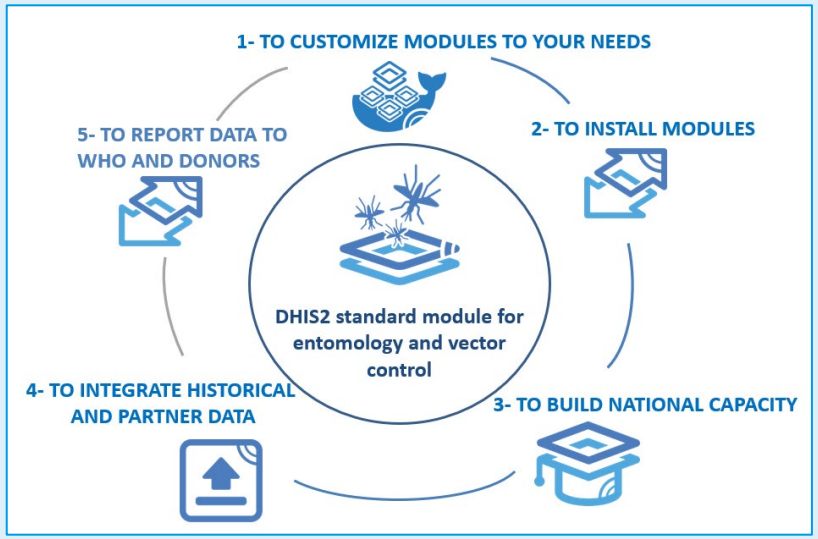
Guidance & Tools





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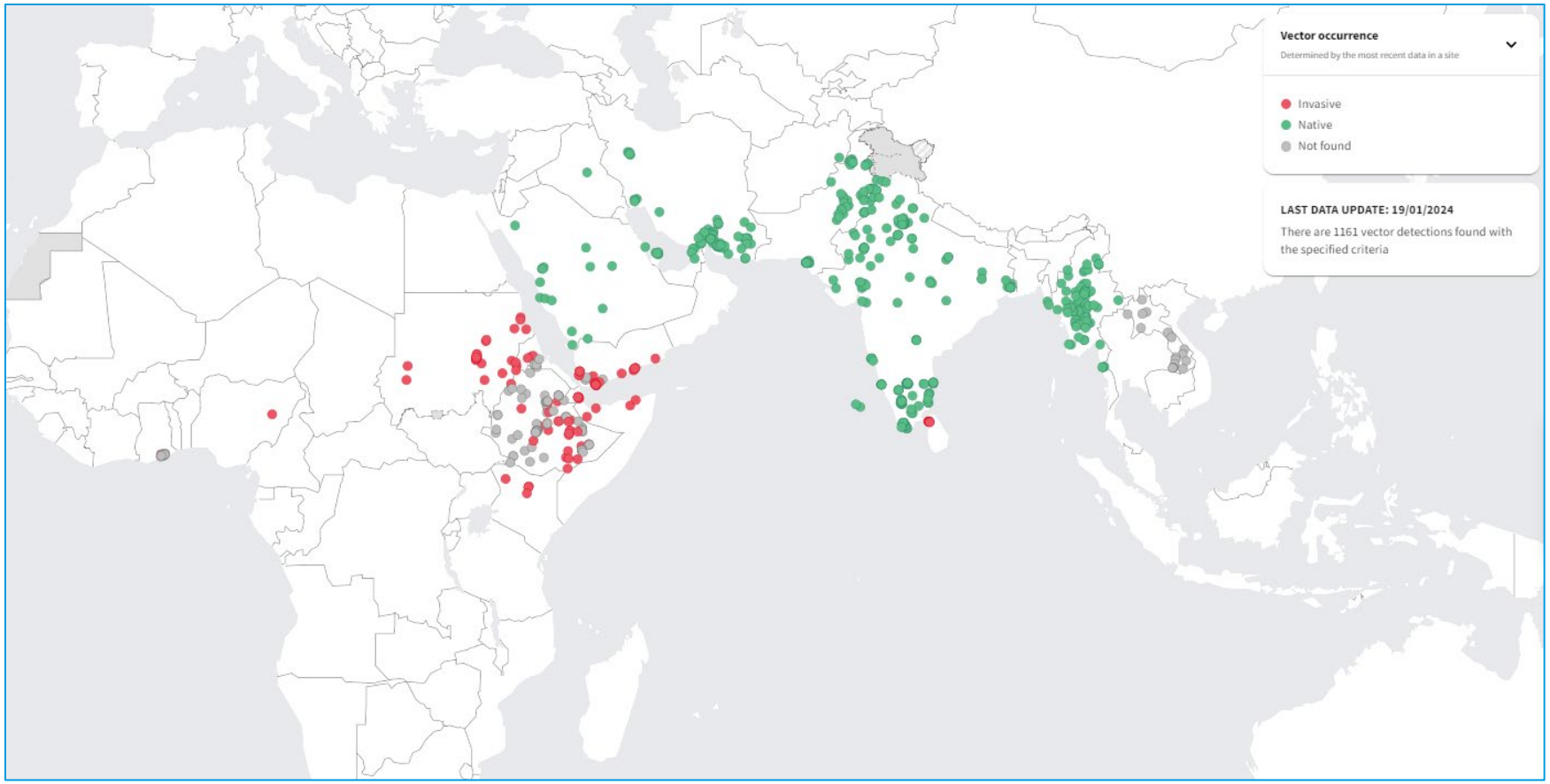
https://www.who.int/teams/global-malaria-programme/prevention/vector-control/insecticide-resistance
https://www.who.int/teams/global-malaria-programme/prevention/vector-control/dhis-data-collection-and-collation-tools

Invasive vectors: *Anopheles stephensi*



- Major malaria vector in south Asia
- First reported in Africa in 2012
- Flexibility in larval site choice; adapts to urban breeding sites
- Host preference for cattle/goats
- Good vector for *P. falciparum* and *P. vivax*
- Resistant to many insecticides used in public health

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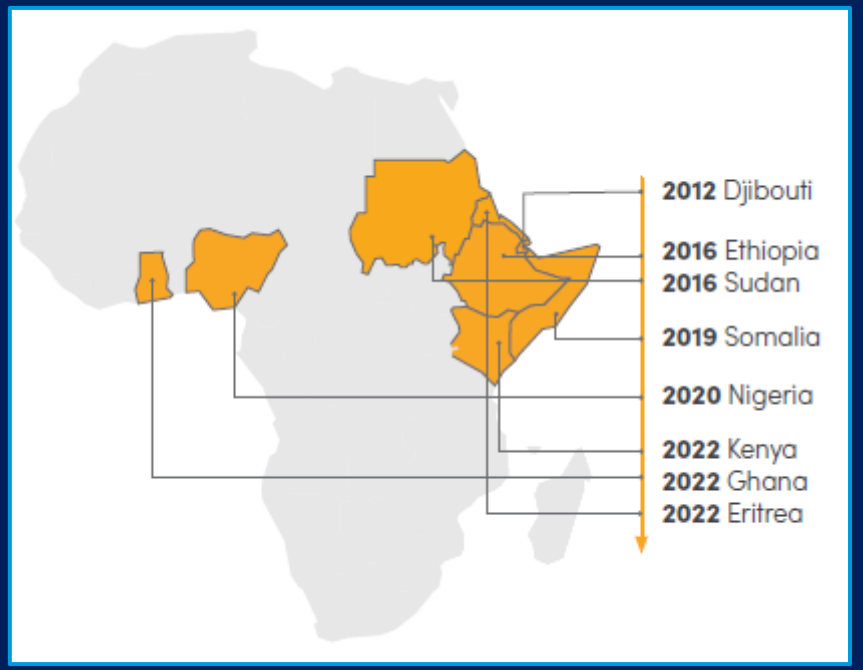
WHO response to date

- Vector Alert issued in 2019 (updated 2023)
- Data collection templates developed
- Malaria Threats Map expanded to support monitoring
- Identification key expanded to include *An. stephensi*[*] & translated into Arabic and French
- Quarterly *An. stephensi* calls since 2020
- WHO response initiative launched (2022)
- Partners convening in Ethiopia (March 2023)
- Deep dive into successes and failures of *An. stephensi* surveillance and control (2023)



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[*] Coetzee, M. (2020) Key to the females of Afrotropical *Anopheles* mosquitoes (Diptera: Culicidae) Malaria J 19:70

WHO Initiative

To support an effective response to *An. stephensi* on the African continent through:

Increasing COLLABORATION

National malaria control programmes, researchers, funders, and other actors conducting surveillance, research and control of *An. stephensi* must collaborate effectively to ensure that knowledge is shared, resources are used optimally, and key activities are prioritized. As *An. stephensi* has the potential to spread quickly, cross- border collaboration is essential, and countries should work together to ensure an effective regional approach.

Prioritizing RESEARCH

It will be important to evaluate the impact of vector control interventions, and particularly new tools, against *An. stephensi.* Conducting research focused on *An. stephensi* will enable programmes to find better ways of responding to this invasive vector and of integrating control efforts with those targeted at other mosquito vectors.

Strengthening SURVEILLANCE

Entomological surveillance can determine the extent of the spread of An. stephensi and its role in transmission; it is essential to target specific control measures and assess their impact. Human malaria case surveillance should be used to investigate the potential impact of the vector's presence on malaria, particularly in urban areas. Such surveillance might provide an indication of the presence of An. stephensi in areas where it has not yet been detected.

Developing GUIDANCE

National malaria control programmes need evidence-based guidance on the appropriate ways to conduct surveillance, implement control measures, develop by-laws, and devote resources to their response to *An. stephensi*. WHO provided an initial set of recommendations in its 2019 vector alert. This guidance will be reviewed and, where appropriate, updated based on best practices and other evidence identified as part of the regional initiative.

Improving INFORMATION EXCHANGE

Information on the presence of *An. stephensi*, as well as on successes and failures in attempts to control the vector, needs to be documented and shared widely and rapidly – at both national and international levels – to determine best practices and inform the response across invaded areas.

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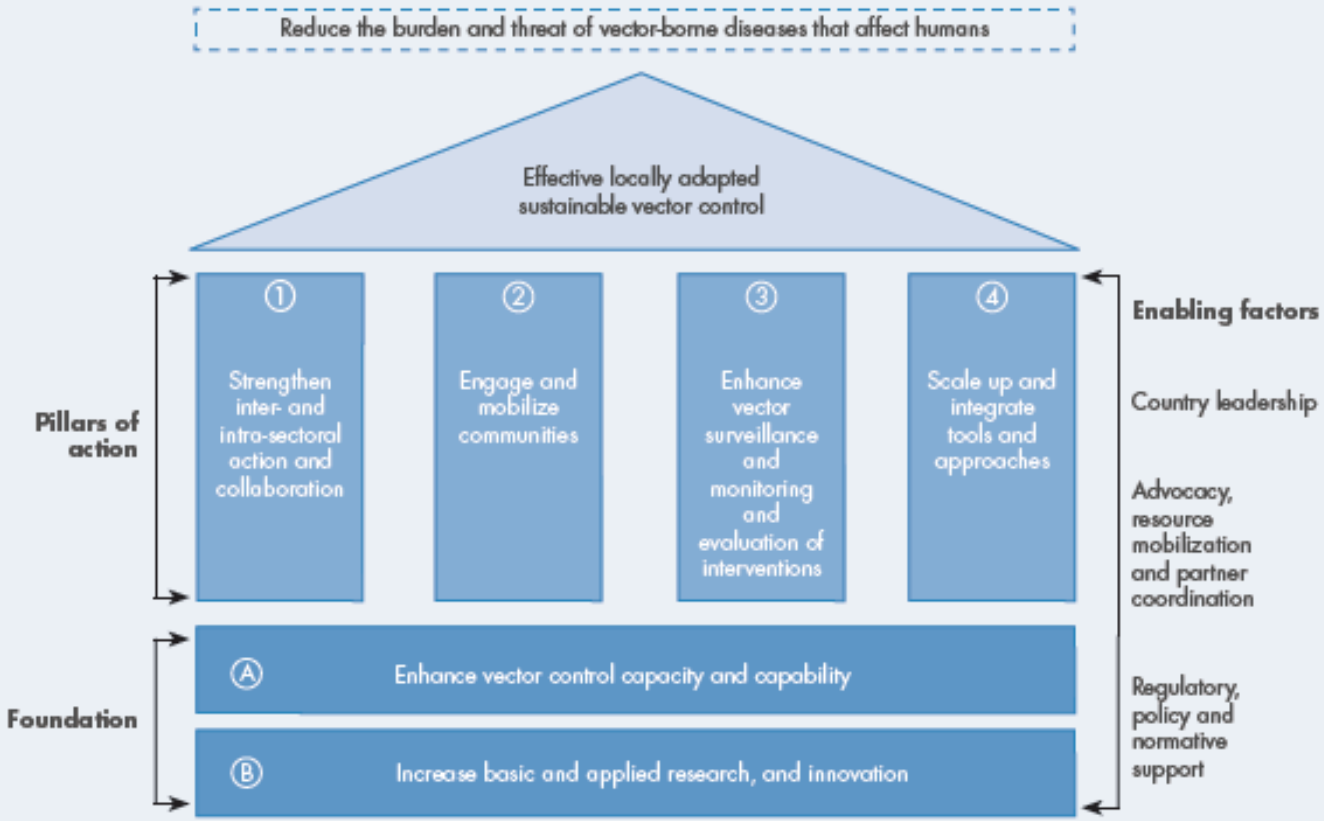
RESPONSE FRAMEWORK



World Health Organization

Source: Global Vector Control Response 2017-2030. [Resolution WHA70.16]
Available from: https://www.who.int/publications/i/item/9789241512978

Insecticide Resistance & Invasive Vectors – Response Commonalities

Step Up Surveillance

» Where and what is the problem?
» Which interventions* work?
» Does intervention effectiveness vary depending on context and/or over time?

Foster Innovation

» Improve on existing interventions and develop new ones
» Evaluate these for their epidemiological and entomological impact
» Get new interventions to the market / facilitate market entry

Purchase & Deploy New Interventions

» Purchase and scale up new technologies with demonstrated impact
» As part of price negotiations: i) recognize innovation & ii) ensure & maintain quality
» Investigate trade-offs between interventions and between coverage & impact

Explore Integration

» Many vector-borne disease are co-endemic providing potential opportunities for integrated control (e.g. IRS for leishmaniasis and malaria control)
» The invasion of urban environments in Africa by *An. stephensi* provides potential opportunities for integration of surveillance and control with that of Aedes spp.

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* Interventions is used as an umbrella term for tools, technologies and approaches

Thank you

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