

Global Vector Control Response to invasive *Anopheles stephensi*: Consensus Statement

Background

The RBM Partnership to End Malaria (RBM) Vector Control Working Group (VCWG) and Multi-Sectoral Working Group (MSWG) aim to raise awareness and catalyze action amongst its partners to prevent the spread and impact of the invasion of *Anopheles stephensi*. The work of these RBM Working Groups is designed to support the World Health Organization (WHO) in its role to coordinate an effective response to prevent further spread of the vector and reduce potential impact where it now exists. In the last decade, the urban malaria vector *An. stephensi* has invaded Africa and Sri Lanka and seems to be spreading, given new reports of its detection. The area already invaded by *An. stephensi* has not been clearly delineated to date, as surveillance efforts targeted at this vector are only starting to be scaled up. *Anopheles stephensi*-mediated malaria transmission in urban and peri-urban areas may undermine significant progress made against malaria in the past two decades. Various initiatives are being coordinated by WHO, UN-Habitat and others to better understand the extent and origin of the *An. stephensi* invasion and explore optimal approaches for surveillance and control. For example, a regional initiative against *An. stephensi* in Africa was launched by WHO in September 2022 with the aims of i) increasing collaboration, ii) strengthening surveillance, iii) improving information exchange, iv) developing guidance, and v) prioritizing research. The WHO also coordinated development of the Global Framework for the Response to Malaria in Urban Areas that emphasizes the role of city leaders, health programmes and urban planners in responding to urban malaria, including the threat posed by *An. stephensi* [1].

The RBM VCWG and MSWG seek to complement the work of WHO, UN-Habitat and others by facilitating the exchange of knowledge and best practices to address this invasive species to build a common understanding and identify gaps in our collective response. The RBM Working Groups are uniquely positioned to support this objective via their diverse membership, including malaria control programmes, representatives of other ministries, the private sector, implementing partners, and research and academic organisations. Following the initial WHO Vector Alert[2], the RBM VCWG convened online meetings to build a common understanding and identify where there may be gaps in a collective response [3]It is recognised that a response to *An. stephensi* is not a stand-alone initiative and must be developed and implemented within Africa's broader public health and vector control context. There are unique aspects to this challenge that require new approaches, including enhanced surveillance, deployment of additional vector control approaches to what are currently deployed for typical Africa malaria vectors, and consideration of the roles of different partners and funding sources. Each RBM partner can make an important contribution towards the response against invasive *An. stephensi* drawing on principles of the WHO Global Vector Control Response 2017-2030 (GVCR) [4].

First detected in Djibouti in 2012 and Sri Lanka in 2017, *An. stephensi* has been detected in Ethiopia, Kenya, Nigeria, Puntland, Somalia, Sudan and Yemen (updated detections can be found on the WHO Malaria Threat App [5]). The epidemiological impact has not been defined but, based on experiences from the native range of the vector and from some sites in Africa, could be significant. Malaria in Djibouti was nearing elimination before *An. stephensi* was detected in 2012. By 2018 there were more than 100,000 suspected malaria cases

amongst a national population of less than 1 million [6]. Mathematical modelling suggests that over 126 million persons may be at risk of *An. stephensi*-transmitted urban malaria across Africa [7] and that yearly *Plasmodium falciparum* malaria cases in Ethiopia could increase by 50% (95% confidence intervals 14–90%) if no additional interventions are implemented against *An. stephensi* [8]. Negative impacts of *An. stephensi* invasion and establishment may already be seen in Ethiopia. Dire Dawa, a city in eastern Ethiopia reported an unusual dry season malaria outbreak in 2022 and 97% of the adult mosquitoes caught were *An. stephensi* [9].

WHO *An. stephensi* initiative

In September 2022, WHO launched the *An. stephensi* Initiative with five primary activities[10]:

Aims of the WHO initiative to support an effective response to *An. stephensi* on the African continent
 Source: WHO (2022) (18).



- 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.
- 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.
- 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.
- 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 (17). This guidance will be reviewed and, where appropriate, updated based on best practices and other evidence identified as part of the regional initiative.
- 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.

WHO recently released a second “Vector Alert” that supersedes the 2019 alert. This new release includes new data on the presence of the vector and lessons learned in recent years, particularly regarding surveillance. It also provides additional guidance to national malaria control programmes on specific responses to the spread of *An. stephensi* in Africa, as well as technical details on surveillance, analysis, and reporting [11].

RBM Working Groups' Role

The RBM Partnership can complement the WHO initiative in several important ways. RBM Working Groups are intended as platforms to convene partners to share best practices; coordinate dialogue between national programs, product manufacturers, academia and implementers, find innovative solutions and stimulate appropriate research and development; and facilitate communication among a diverse membership, providing unique opportunities for networking around specific areas of interest.

This document aims to provide examples of potential areas of VCWG and MSWG engagement with malaria

control programmes, representatives of other ministries, the private sector, implementing partners, and research and academic organisations towards a more effective response against *An. stephensi*. The WHO GVCB (Figure 1), through its pillars of action, foundations and enabling factors, provides a framework for vector control generally and here for the collective action against *An. stephensi*.

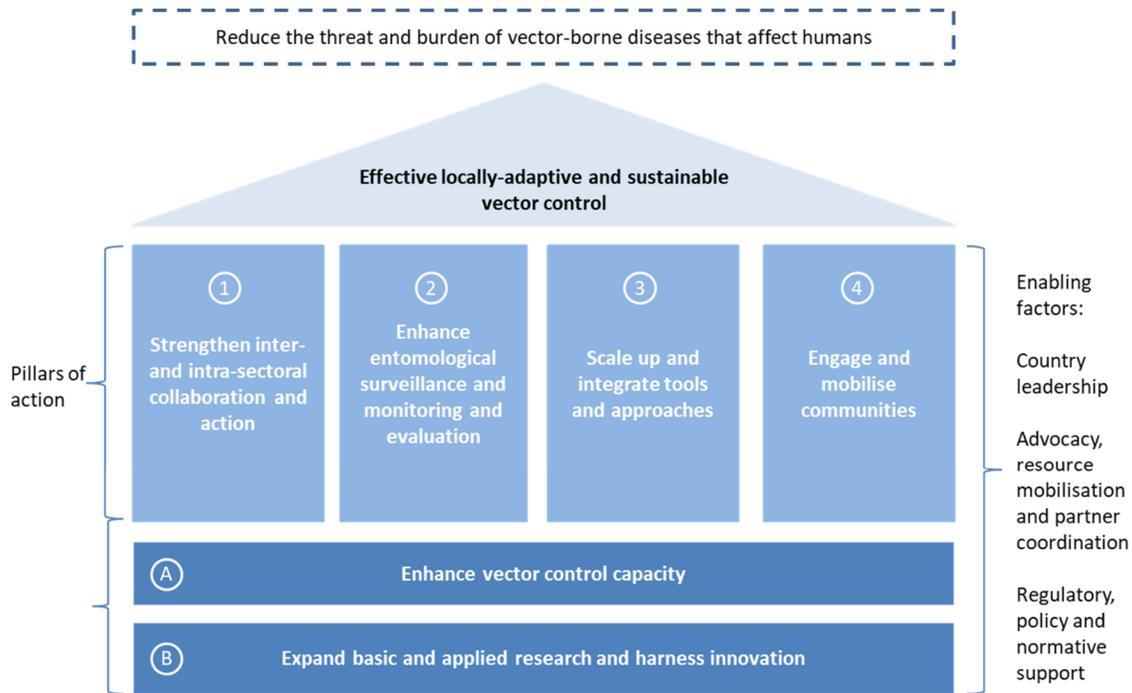


Figure 1: WHO Global Vector Control Response 2017-2030 Framework[12].

Pillars of action

1. Strengthening inter- and intra-sectoral action and collaboration.

The response to *An. stephensi* requires strong inter- and intra-sectoral collaboration coordinated by the Ministry of Health. An important opportunity for intra-sectoral collaboration is between malaria and *Aedes* control programmes. *An. stephensi* has been found to co-locate with *Aedes aegypti* in artificial container habitats providing an opportunity for integrated vector control against both vector species, as recommended by the WHO Global Arbovirus Initiative [13].

Opportunities for strengthened inter-sectoral collaboration include:

- Collaboration with city or municipal authorities responsible for housing, water and sanitation, and solid waste management could allow a more effective response to *An. stephensi*, which is typically found in urban areas.
- The zoonophilic nature of *An. stephensi* [14], different from typically anthropophilic African malaria vectors *An. gambiae* s.l. and *An. funestus* provides an incentive to link with the agricultural sector and strengthen One Health Initiatives [15].
- *An. stephensi* is an invasive species, therefore, we can draw on invasive species management approaches outside the health sector. This includes a focus on dispersion along transportation corridors and vector control in ports of entry, as included in the International Health Regulations[16].

The RBM Multi-Sectoral Working Group can help facilitate a multisectoral approach, by sharing guidelines and best practices, and through supporting project formulation and access to financing [17].

2. Enhancing vector surveillance and monitoring and evaluation of interventions.

The 2019 WHO "Vector Alert" suggests several measures to expand and strengthen surveillance for *An. stephensi* throughout the region, including molecular analysis and insecticide resistance monitoring [1]. The VCWG can facilitate networking between regional and international universities/research institutes and national programs to support morphological and molecular identification of *An. stephensi* and insecticide resistance monitoring. Likewise, the VCWG partners can support capacity for improved surveillance.

3. Scaling up and integrating tools and approaches.

The WHO Vector Alert recommends immediate actions to control invasive *An. stephensi* [1]. The unique ecology of *An. stephensi* requires an approach that goes beyond the current core malaria interventions of LLINs and IRS, and supports greater use of larval source management (LSM). Data are being generated to support changes in WHO GMP policy about prioritising interventions supported by funds from the Global Fund and others. Where local funding supports vector control interventions that may have national registration but not WHO policy tailored to *An. stephensi* e.g. treatment of livestock or disinfection of transportation hubs, sharing of best practices on optimal deployment is needed. Where local data, decision-making and funding support additions to LLINs and IRS, the VCWG will support the sharing of best practices and evidence generation for additional interventions. In particular, the VCWG will support information sharing on new and existing products, delivery approaches, use of technology to support delivery, surveillance and monitoring, and best practices towards scale-up of these approaches through technical assistance and on-line information exchange platforms.

4. Engaging and mobilising communities.

Community engagement and mobilisation for malaria prevention should be extended to *An. stephensi*. The VCWG can support in several ways, including information sharing on social and behaviour change communication, advocating for the importance of human behaviour for effective control, identifying and collating information on social science experts who can support research and programs, and sharing best practices from community-based source reduction programs for *Aedes* that could be adopted for integrated control.

Foundations

Effective and locally adapted vector control systems rest on two foundational elements:

1. Enhanced human, infrastructural and health system capacity within all locally relevant sectors for vector surveillance and vector control delivery, monitoring and evaluation.

RBM can facilitate networking among the several regional Centers of Excellence, training and research institutions to build human and laboratory capacities for overall vector surveillance and control, including specific needs to address *An. stephensi*.

2. Increased basic and applied research to underpin optimised vector control and innovation for the development of new tools, technologies and approaches.

The RBM VCWG provides a forum for sharing research data and networking, which can support the generation of data to fill knowledge gaps on *An. stephensi* biology, surveillance and control.

Enabling factors

The RBM VCWG and MSWG can also support the three enabling factors defined in the GVCR:

1. Country leadership.

RBM Partnership can support WHO to help countries develop a multisectoral response in the framework of the GVCR, taking into consideration some of the comprehensive national plans that have already been developed.

2. Advocacy, resource mobilisation and partner coordination.

WHO is the overall policy and advocacy lead for the GVCR. The RBM partnership can facilitate advocacy, communications, strategy development and resource mobilisation among its partners such as Ministries of Health, implementing partners, private sector and research and academic organisations. Domestic resource mobilisation using channels such as the Africa Leaders Malaria Alliance, the Southern Africa Development Community, the East Africa Community, West African Health Organization, Economic Community of Central African States and the Inter-Government Authority on Development may also be supported.

Funding for a coordinated multicountry response is essential. RBM through the Country/Regional Support Partner Committee (CRSPC) currently supports national Global Fund proposal development and can help other initiatives where relevant [18]. Where there are sufficient resources, countries should consider including *An. stephensi* into monitoring and response in their Global Fund allocation or in the Prioritised Above Allocation Request.

The RBM MSWG is leading the development of integrated multisectoral projects such as the Healthy Cities, Healthy People Initiative, led by UN-Habitat, Commonwealth Local Government Forum and Oshun Partnership[19]. Urban settings are diverse in nature and contextualising the use of multiple interventions is needed. In addition, there is a need to focus on finding catalytic financing to support local resource mobilisation.

3. Regulatory, policy and normative support.

The WHO Vector Alert recommends that: *International Health Regulations (IHR 2005) should be enforced to ensure that any points of entry are free of vectors to minimise the risk of any further spread of An. stephensi. Enact or introduce by-laws to regulate water storage practices and construction work, especially in transportation hubs to avoid the creation of potential breeding sites.*

RBM, especially through the MSWG can help ensure that national response strategies include points of entry that have not traditionally been the focus of NMCPs. RBM VCWG will support countries to access products relevant for *An. stephensi* control. This includes advocacy to National Regulatory Authorities to prioritise submissions made by manufacturers for registration of products that fall within intervention classes deemed appropriate for *An. stephensi* control, particularly if products are WHO pre-qualified or registered with a Stringent Regulatory Authority elsewhere.

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