Contents

Selected Recent Publications

Overlaying human and mosquito behavioral data to estimate residual exposure to host-seeking mosquitoes and the protection of bednets in a malaria elimination setting where indoor residual spraying and nets were deployed together

PLOS One 15 Sept 2022

To accurately characterize residual malaria transmission, both human and vector behavioral data are needed to identify the place and time where and when humans and malaria vector species interact. Although methods to quantify human exposure to mosquito bites were already developed in 2006, very few studies have since collected empirical data to evaluate these human-vector interactions, and even fewer studies have collected human and mosquito behavioral data at the same time and in the same place.

Here, using both human and vector behavioral data that were collected in parallel in Magude between 2015 and 2017, we 1) estimate the proportion of residual exposure to five host-seeking vector species (i.e. mosquito species that survived the combined deployment of LLIN and IRS and were found carrying sporozoites) experienced by residents of Magude in each of five different environment: outdoors before going indoors, indoors before going to bed, indoors while in bed, indoors after getting up and outdoors after leaving the house; 2) assess the actual personal protection that LLINs conferred to Magude residents against the five different local malaria vector species; 3) estimate the maximum personal protection that LLINs could have conferred if all residents would have used a net to sleep; and 4) characterize the residual exposure to host-seeking mosquitoes that would have remained in each environment even if all residents would have used a net to sleep every night. To our knowledge, this is the first study to characterize the residual exposure to bites of different vector species (five) with distinct host-seeking patterns in an area with combined deployment of LLINs and IRS, and to report the protective efficacy of LLINs against those different vector species during both the low and high malaria transmission season.

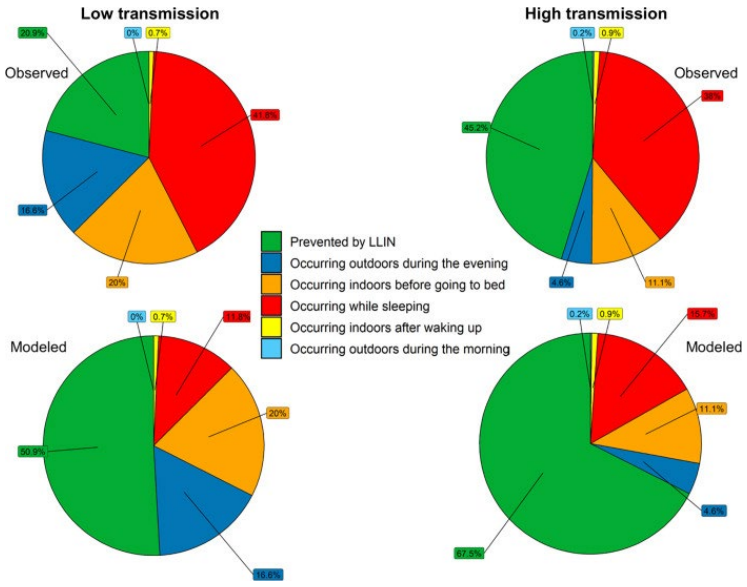


Figure. The proportion of residual exposure to host-seeking vectors are provided at the observed (top) and modeled (bottom) net use (assuming all residents use a net while in bed). Green: exposure prevented by LLINs, dark blue: residual exposure outdoors before going indoors, orange: residual exposure indoors before going to bed, red: residual exposure while in bed, yellow: residual exposure indoors after getting up, light blue: residual exposure outdoors after leaving the house again.

Efficacy of bednets with dual insecticide-treated netting (Interceptor® G2) on side and roof panels against Anopheles arabiensis in north-eastern Tanzania

Parasites and Vectors 15 Sep 2022

This study compared the efficacy of: (i) whole Interceptor® G2 nets (IG2; a dual-active LLIN containing alpha-cypermethrin and chlorfenapyr), (ii) nets with roof panels made of IG2 netting, (iii) nets with side panels made of IG2 netting and (iv) whole untreated nets as test nets.

Results: Mortality was significantly higher in the nets with roof IG2 [27%, P = 0.001, odds ratio (OR) = 51.0, 95% CI = 4.8-546.2), side IG2 (44%, P < 0.001, OR = 137.6, 95% CI = 12.2-1553.2] and whole IG2 (53%, P < 0.001, OR = 223.0, 95% CI = 19.07-2606.0) nettings than the untreated (1%) nets. Mortality was also significantly higher in

the whole IG2 net compared to the net with roof IG2 netting (P = 0.009, OR = 4.4, 95% CI = 1.4-13.3). Blood feeding was 22% in untreated, 10% in roof IG2, 14% in side IG2 and 19% in whole IG2 nets. Exiting was 92% in untreated, 89% in roof IG2, 97% in side IG2 and 94% whole IG2 nets.
Conclusion: The results show that although the roof-treated IG2 net induced greater mortality compared to untreated nets, its efficacy was reduced compared to whole IG2 nets. Therefore, there was no benefit to be gained from restricting dual-active ingredient IG2 netting to the roof of nets.

Effect of long-lasting insecticidal nets with and without piperonyl butoxide on malaria indicators in Uganda (LLINEUP): final results of a cluster-randomised trial embedded in a national distribution campaign

Lancet Infect Dis 26 Sep 2022

LLINEUP was a cluster-randomised trial conducted in 48 districts in eastern and western Uganda. 104 health subdistricts (clusters) without ongoing or planned indoor residual spraying with pirimiphos-methyl (Actellic) were eligible for inclusion in the trial. Clusters were randomly assigned to PBO LLINs (PermaNet 3.0 or Olyset Plus) and conventional LLINs (PermaNet 2.0 or Olyset Net).
In Uganda, PBO LLINs outperformed pyrethroid-only LLINs for 25 months. WHO concluded that PBO LLINs are more effective against malaria than non-PBO LLINs when resistance to pyrethroids is high and issued a conditional recommendation suggesting PBO LLINs should be deployed in areas of pyrethroid resistance.

Anopheles gambiae s.l. swarms trapping as a complementary tool against residual malaria transmission in eastern Gambia

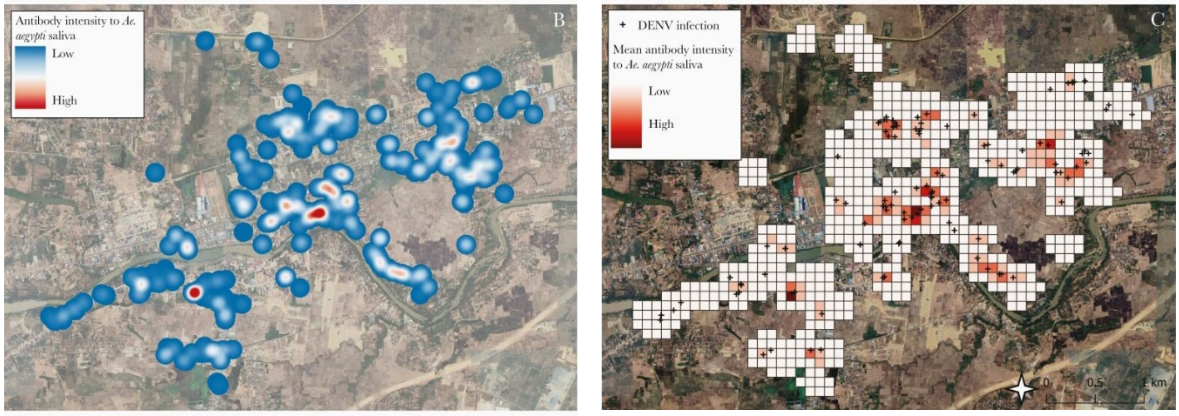
Nature Scientific Reports 12 Oct 2022

The females of *Anopheles gambiae s.l.* mate once in their life and in the swarms formed by males. Trapping swarms of *Anopheles gambiae s.l.* males is a potential new intervention for vector control, alternative to the use of insecticides, as it would disrupt mating. The proof-of-concept pilot study aiming at investigating swarm trapping as a potential vector control intervention, was carried out in 6 villages as in eastern Gambia. Swarms of *Anopheles gambiae s.l.* were identified and their size, height, and duration determined during the baseline year. Swarm trapping by local volunteers was implemented the following transmission season in 4 villages while the other 2 villages were taken as controls. Entomological outcomes were monitored by Human Landing Catches and Pyrethrum Spray Catches. A cross-sectional survey to determine malaria prevalence was carried out at the peak of the malaria transmission season for two consecutive years. At baseline, 23 swarming sites of *Anopheles gambiae s.l.* were identified. Before the intervention, mean indoor resting density per house and malaria prevalence were similar between control and intervention villages. Following the intervention, *Anopheles gambiae s.l.* indoor resting density was 44% lower in intervention than in control villages (adj IRR: 0.0.56; 95% CI 0.47-0.68); the odds of malaria infections were 68% lower in intervention than in control villages (OR: 0.32; 95% CI 0.11-0.97). Swarm trapping seems to be a promising, community-based vector control intervention that could reduce malaria prevalence by reducing vector density. Such results should be further investigated and confirmed by larger cluster-randomized trials.

Development of Inapparent Dengue Associated With Increased Antibody Levels to Aedes aegypti Salivary Proteins: A Longitudinal Dengue Cohort in Cambodia

Journal of Infectious Diseases 17 Oct 2022

In this study the authors use detailed DENV infection histories to show that higher levels of antibodies to *Ae. aegypti* saliva are associated with DENV infection, particularly inapparent dengue infection. While it is intuitive that infection is associated with vector contact, this is the first study in a cohort designed to show an empirical association between infection status and the accumulation of measurable antibody responses to mosquito saliva proteins. These data lay the future groundwork for (1) consideration of saliva-specific antibodies as yet another factor in the complex clinical picture of arboviral immunopathology; (2) development of *Ae. aegypti* mosquito saliva–based biomarkers that can prospectively monitor the risk of DENV disease prior to infection; and (3) mapping human antibody specificity to salivary *Ae. aegypti* proteins to understand its association with the inapparent dengue outcome in a pediatric population.



Building the capacity of West African countries in Aedes surveillance: inaugural meeting of the West African Aedes Surveillance Network (WAASuN)

Parasites & Vectors 21 Oct 2022

The West African *Aedes* Surveillance Network (WAASuN) was created in 2017 at a meeting held in Sierra Leone comprising African scientists working on *Aedes* mosquitoes. *Aedes*-borne arboviral diseases such as dengue, Zika and chikungunya are being reported with increasing frequency across Africa, and despite being vaccine preventable, yellow fever outbreaks continue to persist. As outbreaks of *Aedes*-borne arboviruses continue to increase across Africa, establishing a strong public health entomology infrastructure around *Aedes* mosquitoes is critical to both containing and preventing outbreaks.

Participatory development of practical, affordable, insecticide-treated mosquito proofing for a range of housing designs in rural southern Tanzania

Malaria Journal 5 Nov 2022

Insecticidal mosquito-proof netting screens could combine the best features of insecticide-treated nets (ITNs) and indoor residual spraying (IRS), the two most important front line vector control interventions in Africa today, and also overcome the most important limitations of these methods. This study engaged members of a rural Tanzanian community in developing and evaluating simple, affordable and scalable procedures for installing readily available screening materials on eave gaps and windows of their own houses, and then treating those screens with a widely used IRS formulation of the organophosphate insecticide pirimiphos-methyl (PM).

Compared to unscreened houses, houses with either treated or untreated screens both almost entirely excluded *Anopheles arabiensis* (Relative reduction (RR) ≥ 98%, P < < 0.0001).

Participatory approaches to mosquito proofing houses may be acceptable and effective, and installed screens may be suitable targets for residual insecticide treatments.

Yellow Fever: A Perennial Threat

Archives of Medical Research 7 Nov 2022

Given the focus on increased urbanization and the associated Aedes-borne virus threat, we have included this paper on yellow fever.

The authors argue that the threat of yellow fever will linger far into the 21st century as a leading public health emergency of global concern under the International Health Regulations.

Climate Change Drives the Transmission and Spread of Vector-Borne Diseases: An Ecological Perspective

Biology 7 Nov 2022

Vector-borne diseases (VBDs) are a major threat to human health. Climate change has a significant impact on VBDs. To clarify the complex effects of climate change on VBDs, we concluded the effects of climate on the transmission and spread of VBDs from an ecological perspective and summarized VBD changes in response to climate change, specifically including: the nonlinear effects of local climate (temperature, precipitation and wind) on VBD transmission, especially temperature showing n-shape effects; regional climate (the El Niño–Southern Oscillation and North Atlantic Oscillation) has time-lag effects on VBD transmission through indirect impact on local climate; and the u-shaped effect of extreme climates can lead to the geographical spread of VBDs. In terms of non-climatic factors, land use and human mobility through the interactions with climatic factors, will affect transmission and spread of VBD. We further explored the uncertainty of the impact of climate change on VBDs under the COVID-19 pandemic. A systematic understanding of the impact of climate change on the transmission and spread of VBD can provide insights and suggestions for future research on VBD prevention and control.

Spatial, environmental, and individual associations with Anopheles albimanus salivary antigen IgG in Haitian children

Front Cell Infect Microbiol 8 Nov 2022

IgG serology can be utilized to estimate exposure to Anopheline malaria vectors and the Plasmodium species they transmit. A multiplex bead-based assay simultaneously detected IgG to *Anopheles albimanus* salivary gland extract (SGE) and four *Plasmodium falciparum* antigens (CSP, LSA-1, PfAMA1, and PfMSP1) in 11,541 children enrolled at 350 schools across Haiti in 2016. Logistic regression estimated odds of an above-median anti-SGE IgG response adjusting for individual- and environmental-level covariates. Spatial analysis detected statistically significant clusters of schools with students having high anti-SGE IgG levels, and spatial interpolation estimated anti-SGE IgG levels in unsampled locations. Boys had 11% (95% CI: 0.81, 0.98) lower odds of high anti-SGE IgG compared to girls, and children seropositive for PfMSP1 had 53% (95% CI: 1.17, 2.00) higher odds compared to PfMSP1 seronegatives. Compared to the lowest elevation, quartiles 2-4 of higher elevation were associated with successively lower odds (0.81, 0.43, and 0.34, respectively) of high anti-SGE IgG. Seven significant clusters of schools were detected in Haiti, while spatially interpolated results provided a comprehensive picture of anti-SGE IgG levels in the study area. Exposure to malaria vectors by IgG serology with SGE is a proxy to approximate vector biting in children and identify risk factors for vector exposure.

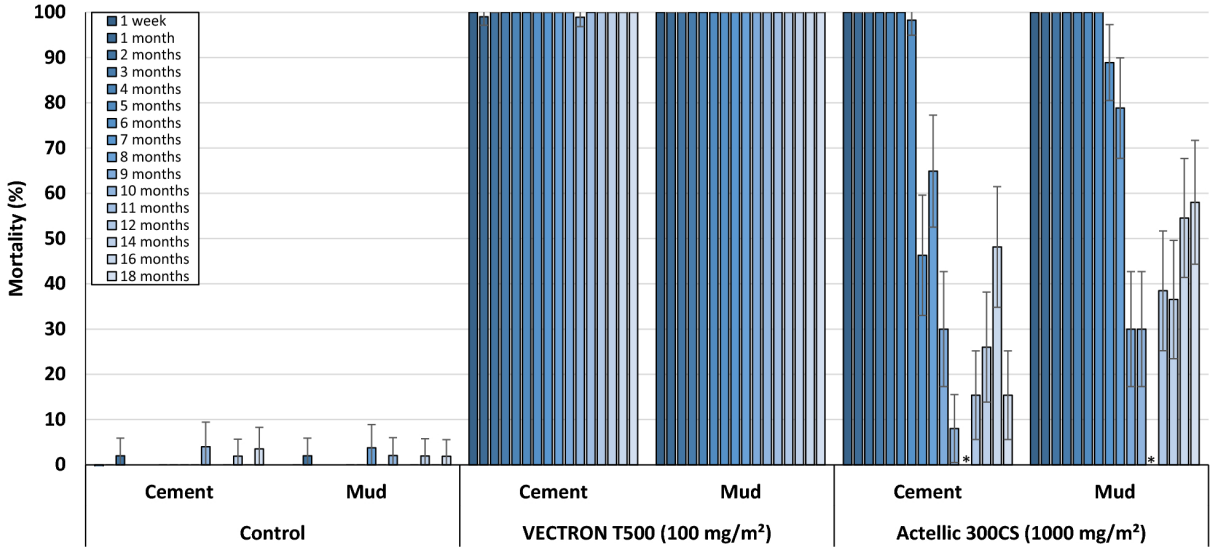
VECTRON™ T500, a new broflanilide insecticide for indoor residual spraying, provides prolonged control of pyrethroid-resistant malaria vectors

Malaria Journal 11 Nov 2022

Broflanilide is a newly discovered insecticide with a novel mode of action targeting insect γ-aminobutyric acid receptors. The efficacy of VECTRON™ T500, a wettable powder formulation of broflanilide, was assessed for IRS against wild pyrethroid-resistant malaria vectors in experimental huts in Benin.

The vector population at Covè was resistant to pyrethroids and organochlorines but susceptible to broflanilide and pirimiphos-methyl. A total of 23,171 free-flying wild pyrethroid-resistant female *An. gambiae s.l.* were collected in the experimental huts over 12 months. VECTRON™ T500 induced 56%-60% mortality in wild vector mosquitoes in both cement and mud-walled huts. Mortality with VECTRON™ T500 was 62%-73% in the first

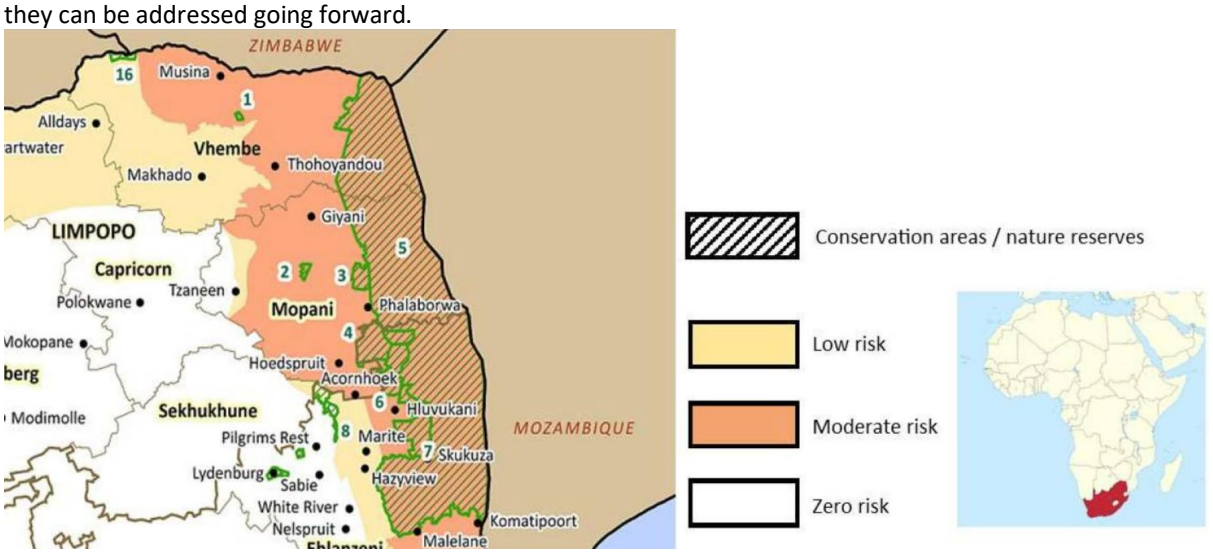
three months and remained > 50% for 9 months on both substrate-types. By comparison, mortality with Actellic® 300CS was very high in the first three months (72%-95%) but declined sharply to < 40% after 4 months. Using a non-inferiority margin defined by the World Health Organization, overall mortality achieved with VECTRON™ T500 was non-inferior to that observed in huts treated with Actellic® 300CS with both cement and mud wall substrates. **Monthly in situ wall cone bioassay mortality with VECTRON™ T500 also remained over 80% for 18 months** but dropped below 80% with Actellic® 300CS at 6–7 months post spraying. Conclusion. VECTRON™ T500 shows potential to provide substantial and prolonged control of malaria transmitted by pyrethroid-resistant mosquito vectors when applied for IRS. Its addition to the current list of WHO-approved IRS insecticides will provide a suitable option to facilitate rotation of IRS products with different modes of action.



Malaria Vector Surveillance and Control in an Elimination Setting in South Africa

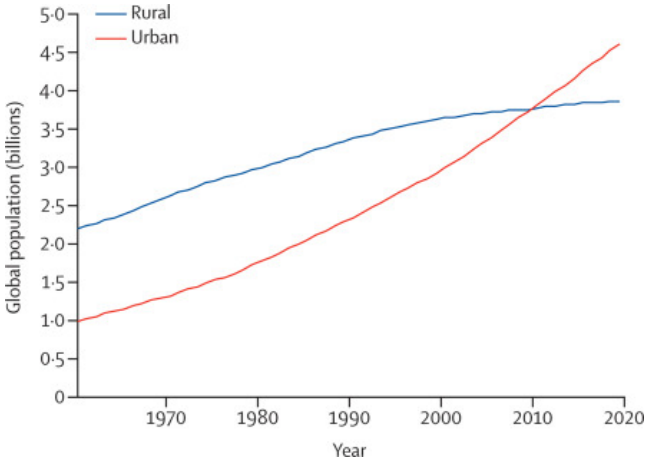
Trop Med & Inf Disease 21 Nov 2022

The WHO specifies that continued measures to prevent the re-establishment of transmission are required in areas where elimination has been achieved. These measures include routine malaria vector surveillance in endemic districts that are free of malaria to assess receptivity and risk of reintroduction, which may prove difficult to justify in the face of competing public health priorities and limited resources. These issues are discussed here within the framework of vector surveillance and control and include recommendations on how they can be addressed going forward.



What sounds like Aedes, acts like Aedes, but is not Aedes? Lessons from dengue virus control for the management of invasive Anopheles

The Lancet Global Health 22 November 2022



The spread of *An. stephensi* holds huge implications for increasing malaria morbidity and mortality. Both *Aedes* aegypti and *An. stephensi* thrive in the same urban environments, and urgent action is needed to seize the opportunity to integrate disease control resources and generate innovative vector-control tools for urban populations, to protect the many millions at risk.

The malaria community must address urbanization and the growing portion of the population that is displaced as a result of climate change and conflict.

Waiting to see if *An. stephensi* takes hold in urban breeding sites across Africa and the Middle East as fast and efficiently as the *Aedes* mosquito cannot be an effective control strategy. With malaria control still achieving impressive amounts of annual funding (a committed US$4·5 billion in 2022), now is the time to engage in a coordinated and integrated high-burden-to-high-impact strategy to simultaneously cut off the rapid development of urban malaria transmission and the spread of dengue virus and other *Aedes*-borne viruses.

Optimisation of laboratory-rearing parameters for Anopheles funestus larvae and adults

Acta Tropica 29 Nov 2022

Anopheles funestus is one of the major malaria vectors in Africa. Unfortunately, scientific investigations, which could improve understanding of this vector species or lead to the development of new control strategies, are currently limited by difficulties in laboratory rearing of the species. In an attempt to optimise laboratory-rearing conditions for *An. funestus*, the effect of an artificial blood-feeding system for adults, different larval diet doses, and a range of other rearing conditions on the life history traits of an existing colony were investigated. In conclusion, these results show that *An. funestus* can be reared using defibrinated bovine blood delivered via an artificial membrane feeding system. The quantity of larval food, optimal larval density, and depth of water used for larval rearing are critical factors influencing colony productivity. These findings can be used to improve current guidelines for rearing *An. funestus* under insectary conditions.

Natural sugar feeding rates of Anopheles mosquitoes collected by different methods in western Kenya

Sci Reports 29 Nov 2022

Attractive targeted sugar baits (ATSBs) are a potential vector control tool that exploits the sugar-feeding behaviour of mosquitoes. We evaluated the sugar-feeding behaviour of *Anopheles* mosquitoes as part of baseline studies for cluster randomised controlled trials of ATSBs. Mosquitoes were collected indoors and outdoors from two villages in western Kenya using prokopack aspirations, malaise tent traps and ultraviolet (UV) light traps. Individual mosquitoes were subjected to the cold anthrone test to assess the presence of sugar. Overall, 15.7% of collected mosquitoes had fed on natural sugar sources. By species and sex, the proportion sugar-fed was 41.3% and 27.7% in male and female *Anopheles funestus,* 27.2% and 12.8% in male and female *An. arabiensis,* and 9.7% and 8.3% in male and female *An. coustani,* respectively**.** Sugar-feeding was higher in unfed than blood-fed mosquitoes and higher in male than gravid mosquitoes. *Anopheles* mosquitoes obtained sugar meals from natural sources during all physiological stages, whether they rest indoors or outdoors. These findings offer a potential avenue to exploit for the control of mosquitoes, particularly with the advent of ATSBs, which have been shown to reduce mosquito densities in other regions.

Long-lasting insecticidal nets provide protection against malaria for only a single year in Burundi, an African highland setting with marked malaria seasonality

BMJ Global Health 1 Dec 2022

The study points to the need for continuous investment in improving the effective lifespan of LLINs or to adapt distribution campaigns to make 'serviceable LLINs' continuously available in the community.

Malaria transmission in Burundian highlands was clearly seasonal and increased non-linearly over the study period. Further, a fast and steep decline of malaria incidence was noted during the first year after mass LLIN distribution ($p<0.0001$). In years 2 and 3 after distribution, malaria cases started to rise again to levels higher than before the control intervention.
This study highlights that LLINs did reduce the incidence in the first year after a mass distribution campaign, but in the context of Burundi, LLINs lost their impact after only 1 year.

The use of drones for mosquito surveillance and control

Parasites and Vectors 16 Dec 2022

The novel use of drones may play a major role in the success of mosquito surveillance and control programmes in the coming decades since the global landscape of mosquito-borne diseases and disease dynamics fluctuates frequently and there could be serious public health consequences if the issues of insecticide resistance and outdoor transmission are not adequately addressed. For controlling both aquatic and adult stages, for several years now remote sensing data have been used together with predictive modelling for risk, incidence and detection of transmission hot spots and landscape profiles in relation to mosquito-borne pathogens. The field of drone-based remote sensing is under continuous change due to new technology development, operation regulations and innovative applications. In this review we outline the opportunities and challenges for integrating drones into vector surveillance (i.e. identification of breeding sites or mapping micro-environmental composition) and control strategies (i.e. applying larval source management activities or deploying genetically modified agents) across the mosquito life-cycle. We present a five-step systematic environmental mapping strategy that we recommend be undertaken in locations where a drone is expected to be used, outline the key considerations for incorporating drone or other Earth Observation data into vector surveillance and provide two case studies of the advantages of using drones equipped with multispectral cameras. In conclusion, recent developments mean that drones can be effective for accurately conducting surveillance, assessing habitat suitability for larval and/or adult mosquitoes and implementing interventions. In addition, we briefly discuss the need to consider permissions, costs, safety/privacy perceptions and community acceptance for deploying drone activities.

Preventive residual insecticide applications successfully controlled Aedes aegypti in Yucatan, Mexico

Nature Scientific Reports 20 Dec 2022

Insecticide-based approaches remain a key pillar for *Aedes*-borne virus (ABV, dengue, chikungunya, Zika) control, yet they are challenged by the limited effect of traditional outdoor insecticide campaigns responding to reported arboviral cases and by the emergence of insecticide resistance in mosquitoes. A three-arm Phase II unblinded entomological cluster randomized trial was conducted in Merida, Yucatan State, Mexico, to quantify the entomological impact of targeted indoor residual spraying (TIRS, application of residual insecticides in *Ae. aegypti* indoor resting sites) applied preventively 2 months before the beginning of the arbovirus transmission season. Trial arms involved the use of two insecticides with unrelated modes of action (Actellic 300CS, pirimiphos-methyl, and SumiShield 50WG, clothianidin) and a control arm where TIRS was not applied. Entomological impact was quantified by Prokopack adult collections performed indoors during 10 min per house. Regardless of the insecticide, conducting a preventive TIRS application led to significant reductions in indoor *Ae. aegypti* densities, which were maintained at the same levels as in the low arbovirus transmission period (Actellic 300CS reduced *Ae.*

aegypti density up to 8 months, whereas SumiShield 50WG up to 6 months). The proportional reduction in *Ae. aegypti* abundance in treatment houses compared to control houses was 50–70% for Actellic 300CS and 43–63% for SumiShield 50WG. Total operational costs including insecticide ranged from US$4.2 to US$10.5 per house, depending on the insecticide cost. Conducting preventive residual insecticide applications can maintain *Ae. aegypti* densities at low levels year-round with important implications for preventing ABVs in the Americas and beyond.

Advances in data-collection tools and analytics for crop pest and disease management

Current Opinion in Insect Science: Special section on IPM in Africa, Dec 2022

Can we leverage advances in the field of crop protection to improve vector control?

Innovative methods in data collection and analytics for pest and disease management are advancing together with computational efficiency. Tools, such as the open-data kit, research electronic data capture, fall armyworm monitoring, and early warning- system application and remote sensing have aided the efficiency of all types of data collection, including text, location, images, audio, video, and others. Concurrently, data analytics have also evolved with the application of artificial intelligence and machine learning (ML) for early warning and decision-support systems. ML has repeatedly been used for the detection, diagnosis, modeling, and prediction of crop pests and diseases. This paper thus highlights the innovations, implications, and future progression of these technologies for sustainability.

WHO News and Publications

WHO Guidelines for malaria

25 Nov 2022

The *WHO Guidelines for malaria* bring together the Organization's most up-to-date recommendations for malaria in one user-friendly and easy-to-navigate online platform.

The *WHO Guidelines for malaria* supersedes 2 previous WHO publications: the *Guidelines for the treatment of malaria*, *third edition* and the *Guidelines for malaria vector control.* Recommendations on malaria will continue to be reviewed and, where appropriate, updated based on the latest available evidence. Any updated recommendations will always display the date of the most recent revision in the MAGICapp platform. With each update, a new PDF version of the consolidated guidelines will also be available for download on the WHO website.

This version of the Guidelines includes updates to the case management of malaria, specifically the addition of new molecules for the treatment of uncomplicated malaria and optimization of the dosage regimen for anti-relapse treatment, along with updates on the use of antimalarial medicines in special risk populations including pregnant women. It replaces the versions published on 16 February 2021, 13 July 2021, 18 February 2022, 31 March 2022 and 3 June 2022.

World malaria report 2022

8 Dec 2022

Each year, WHO's *World malaria report* provides a comprehensive and up-to-date assessment of trends in malaria control and elimination across the globe. It tracks investments in malaria programmes and research as well as progress across all intervention areas: prevention, diagnosis, treatment, elimination and surveillance. The 2022 report is based on information received from 84 malaria-endemic countries in all WHO regions.

The 2022 edition of the report finds that, despite disruptions to prevention, diagnostic and treatment services during the pandemic, countries around the world have largely held the line against further setbacks to malaria control. There were an estimated 619 000 malaria deaths globally in 2021 compared to 625 000 in the first year of the pandemic. In 2019, before the pandemic struck, the number of deaths stood at 568 000. Malaria cases continued to rise between 2020 and

2021, but at a slower rate than in the period 2019 to 2020. The global tally of malaria cases reached 247 million in 2021 compared to 245 million in 2020 and 232 million in 2019.

17th meeting of the Vector Control Advisory Group (VCAG)

The meeting took place from 3-6 Oct 2022 and focused on:

- Aedes SIT & IIT approaches
- Endectocides (BOHEMIA)
- Spatial repellents (AEGIS)
- Interceptor G2
- Royal Guard
- Gene drive (population suppression)

The meeting report is not yet available.

The *report of the 16th meeting* held in March 2022 was published in June and is available online. It covers interventions from three applicants:

- Reduction of pathogen transmission induced by gene drive
- ATSB
- Eave tubes and house screening

Webinars, websites and other resources

IVCC's Annual Report 2021-2022

12 Dec 2022

Ifakara Master Classes in Public Health & Medical Entomology

Hosted by Fredros Okumu (Ifakara Health Institute), the recorded Q and A sessions with experts in the field on various topics are available on YouTube and well worth viewing. Recent topics include:

- ❑ 15 Nov - *The Rise & Fall of Medical Entomology: Reflections from Africa, Asia & The Americas:* Part 2 A MasterClass with Prof. Derek Charlwood.
- ❑ 15 Oct - *The Land of Gambiae Malaria Entomology in the Days Before ITNs* with Prof Graham White
- ❑ 15 Oct - *The Rise & Fall of Medical Entomology: Reflections from Africa, Asia & The Americas:* Part 1 A MasterClass with Prof. Derek Charlwood.

Vector Learning*Xchange*

Vector Learning Xchange webinars

30 Nov 2022 – Can distribution of ITNs theough continuous channels replace mass campaigns?

APMEN Webinar YouTube channel

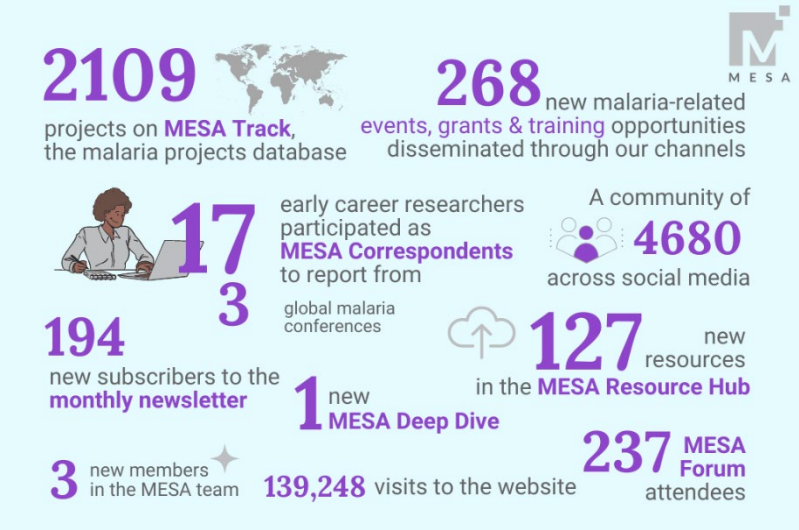
APMEN has launched a webinar series to provide a platform for discussing a variety of topics of interest and sharing information related to malaria elimination. Recorded sessions are available on their YouTube channel. Recent topics include:
11 Oct 2022 – *Improving Accessibility of Malaria Services using Geospatial Data and Technologies*
19 Oct 2022 – *Insecticide Resistance Monitoring and Management*
6 Dec 2022 – *How concerned should we be about simian malaria?*

2023 PMI Malaria Operational Plans (MOPs) now online

The PMI Malaria Operational Plans are detailed 1-year implementation plans for PMI focus countries. Each plan reviews the current status of malaria control and prevention policies and interventions, identifies challenges and unmet needs to achieve PMI goals, and provides a description of planned PMI-funded activities. Each Malaria Operational Plan has been endorsed by the U.S. Global Malaria Coordinator and reflects collaborative discussions with the national malaria control programs and partners in country. Changes to these plans are reflected in revised postings.

MESA Track

MESA Track is a living database containing updated information on malaria projects and research portfolios of countries and institutions. Currently, there are more than 1,900 projects in the database and MESA welcomes any submissions from scientists and research institutions who would like to add their past and ongoing malaria projects to the database.



PATH portfolio in MESA Track

PATH, in collaboration with MESA, has updated its research portfolio in the MESA Track database. The portfolio contains over 80 projects with more than 400 million USD in funding across 57 project sites.

MESA Track Anopheles stephensi Deep Dive synthesis report

Following the launch of the *Deep Dives on Anopheles stephensi*, in collaboration with the RBM Vector Control Working Group, The MESA team has now published the synthesis report containing an introduction, methodology, results, discussion and conclusion. They therefore carried out a Deep Dive (DD) exercise (landscaping review) to track *An. stephensi* research and investments. This DD is done in collaboration with the Roll Back Malaria Vector Control Working Group (RBM VCWG).

Objectives

1. Describe the geographic scale and scope of ongoing An. stephensi research and other projects.
2. Overview of the distribution of active An. stephensi surveillance or monitoring programmes.
3. Describe the funding sources for projects.
4. Document the list of questions under evaluation.
5. Identify or draw on any overlaps between the urban malaria Deep Dive and the An. stephensi Deep Dive.

In the news and social media

Malaria – Pakistan

17 Oct 2022

Pakistan was hit by devastating floods in June 2022 which resulted in over 33 million people being affected, 81 districts being declared as calamity hit and the health infrastructure being badly impacted.
A rapid upsurge in reported malaria cases was observed after the floods.

Outbreak at a glance: From January through August 2022, more than 3.4 million suspected cases of malaria were reported in Pakistan compared with the 2.6 million suspected cases reported in 2021. Over 170,000 cases were laboratory confirmed, with the majority reported as Plasmodium vivax.

Invasive mosquitoes could unravel malaria progress in Africa

abc News 1 Nov 22

Scientists say an invasive mosquito species was likely responsible for a large outbreak of malaria in Ethiopia earlier this year. In January, health officials in Dire Dawa, a major transportation hub, reported a rapid rise in malaria. Tadesse, lead scientist at the Armauer Hansen Research Institute in Addis Ababa, jumped in with his team to investigate. They tracked more than 200 malaria cases, examined nearby mosquito sites and tested invasive mosquitoes for the malaria parasite.

They didn't find many of the mosquitoes that usually spread malaria in Africa. Instead, they found high densities of the invasive mosquitoes. Tadesse and colleagues concluded the invasive mosquitoes were "strongly linked" to the outbreak.

Abt Associates Awarded Contract to Prevent Malaria through Vector Control

The U.S. Agency for International Development (USAID), the lead agency for the U.S. President's Malaria Initiative (PMI), has named Abt Associates as the lead in a new, five-year, $809 million contract, Prevention of Malaria through Vector Control (PMVC), to further PMI's global commitment to end malaria.

Under the PMVC contract, Abt and its partners will work with country governments to integrate indoor residual spray campaigns with distribution of insecticide treated nets--two proven, life-saving malaria vector control interventions—as well as new tools adopted by PMI such as larval source management. PMVC activities will also include comprehensive entomological monitoring, which is the backbone of vector control decision-making, conducted in partnership with local research institutions. Abt will align its approach with the principles for effective programming and equitable partnerships in USAID's Local Capacity Strengthening Policy throughout all activities, to support national malaria programs and other local actors as they increasingly lead the work of malaria prevention in their countries.

IVCC and Duke University welcome major new financial incentive for vector control product innovation

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In a major step forward for vector borne disease control, the Vector Expedited Review Voucher (VERV), championed by IVCC following a policy proposal by Duke University, has been signed into US Law. IVCC and Duke University began work on VERV in 2015.

VERV is modelled on the US Food and Drug Administration's Priority Review Voucher program legislated in 2007 (Sec. 524 FDA Amendments Act), which offers a priority review of a second product as a reward for new treatments targeting selected diseases. The Vector Expedited Review Voucher offers registrants of vector control tools a similar financial incentive, a voucher, in reward for registration of novel public health insecticides that can combat malaria and other vector-borne diseases.

Further details about the Vector Expedited Review Voucher (VERV) are available at:
www.ivcc.com/vector-control/vector-expedited-review-voucher-verv/

Note: This issue covers papers published in print or online between 15 September and 31 December 2022. Selected news items and other updates from early January 2023 are also included.