

Selected Scientific Publications (between 1 April and 31 July 2023)	1
<i>Highlights</i>	1
<i>LLINs</i>	2
<i>IRS</i>	3
<i>ATSBs</i>	4
<i>New vector control tools and approaches</i>	5
<i>Larval control</i>	6
<i>Anopheles stephensi</i>	7
<i>Vector control in urban and emergency settings</i>	7
<i>Odds & Ends</i>	8
WHO News and Publications	10
Webinars, websites and other resources	11
In the news and social media	12

Selected Scientific Publications (between 1 April and 31 July 2023)

Highlights

[Overcoming insecticide resistance in Anopheles mosquitoes by using faster-acting solid forms of deltamethrin](#)

Resistant mosquitoes can be killed with an insecticide to which they are resistant without altering the molecular composition of the insecticide.

[How many mosquito nets are needed to maintain universal coverage: an update](#)

Recent work indicates that ITN retention times are less than two years in most countries...tailored quantification approaches for mass campaigns and continuous distribution strategies are warranted.

[Efficacy of partial spraying of SumiShield, Fludora Fusion and Actellic against wild populations of Anopheles gambiae s.l. in experimental huts in Tiassalé, Côte d'Ivoire](#)

The results of this study suggest that partial spraying may be a way to reduce the cost of IRS without substantially compromising IRS efficacy.

[SC Johnson, Kenya Announce Partnership to Accelerate Efforts to Eradicate Malaria](#)

LLINs

[Impacts of dual active-ingredient bed nets on the behavioural responses of pyrethroid resistant *Anopheles gambiae* determined by room-scale infrared video tracking](#)

Malaria Journal 23 April 2023

Here, behaviours were compared including timings of net contact, willingness to refeed and longevity post-exposure to two next-generation nets, PermaNet® 3.0 and Interceptor® G2 in comparison with a standard pyrethroid-only net (Olyset Net™) and an untreated net. These are the first results to provide an in-depth description of the behaviour of susceptible and resistant *Anopheles gambiae* strains around next-generation bed nets using a room-scale tracking system to capture multiple behaviours. Overall, these findings expand our knowledge of how mosquitoes interact with ITNs, particularly with regards to the impact of the new chemistries on the vector. These results indicate that the effects of a range of ITNs on mosquito behaviour is remarkably consistent with no major alterations in mosquito responses by mosquitoes with different pyrethroid susceptibilities. It is also clear that reduced ITN contact is not the reason for observed lower mortality in resistant strains. Ongoing work in multiple field sites will continue to explore the effects of new ITNs on the behaviour of wild mosquito populations and may provide new insights into the entomological mode of action of next generation nets.

[Differential impact of dual-active ingredient long-lasting insecticidal nets on primary malaria vectors: a secondary analysis of a 3-year, single-blind, cluster-randomised controlled trial in rural Tanzania](#)

Lancet Planet Health 8 May 2023

We aimed to evaluate the effectiveness of three dual active-ingredient LLINs compared with standard pyrethroid LLINs against pyrethroid-resistant malaria vectors in rural Tanzania. Dual active-ingredient LLINs had the greatest effect on *Anopheles funestus* s.l, the most efficient vector in the study area, with comparatively weak effect on *An arabiensis*. Chlorfenapyr pyrethroid LLINs were the most effective intervention against the main malaria vector *An funestus* s.l over 3 years of community use, whereas the effect of piperonyl-butoxide pyrethroid LLIN was sustained for 2 years. The other vector, *An arabiensis*, was not controlled by any of the dual active-ingredient LLINs. Additional vector control tools and strategies targeted to locally prevalent vector species evading dual active-ingredient LLINs should be deployed to further reduce malaria transmission and achieve elimination.

[Pyrethroid-treated bed nets impair blood feeding performance in insecticide resistant mosquitoes](#)

Sci Reports 21 June 2023

This work explores how both insecticide resistant and susceptible *Anopheles gambiae* s.l. mosquitoes interact with pyrethroid nets (PermaNet 2.0 or Olyset net) or an untreated net (UTN) while attempting to blood feed on a human arm.

Our results suggest that the success of the pyrethroid nets at reducing malaria cases over these last decades might be because they are, at best, only weakly repellent. In fact, 86% of mosquitoes in our study entered the arena despite the presence of the PermaNet or Olyset net. Neither displayed sufficient spatial repellent properties to significantly affect the motivation to enter and search for the blood source, even at this close range. Not only did most mosquitoes enter the arena, but the presence of insecticide did not influence the timing of events prior to feeding (e.g., time taken to enter the arena, first net contact, first time probing and inserting the proboscis into the human arm).

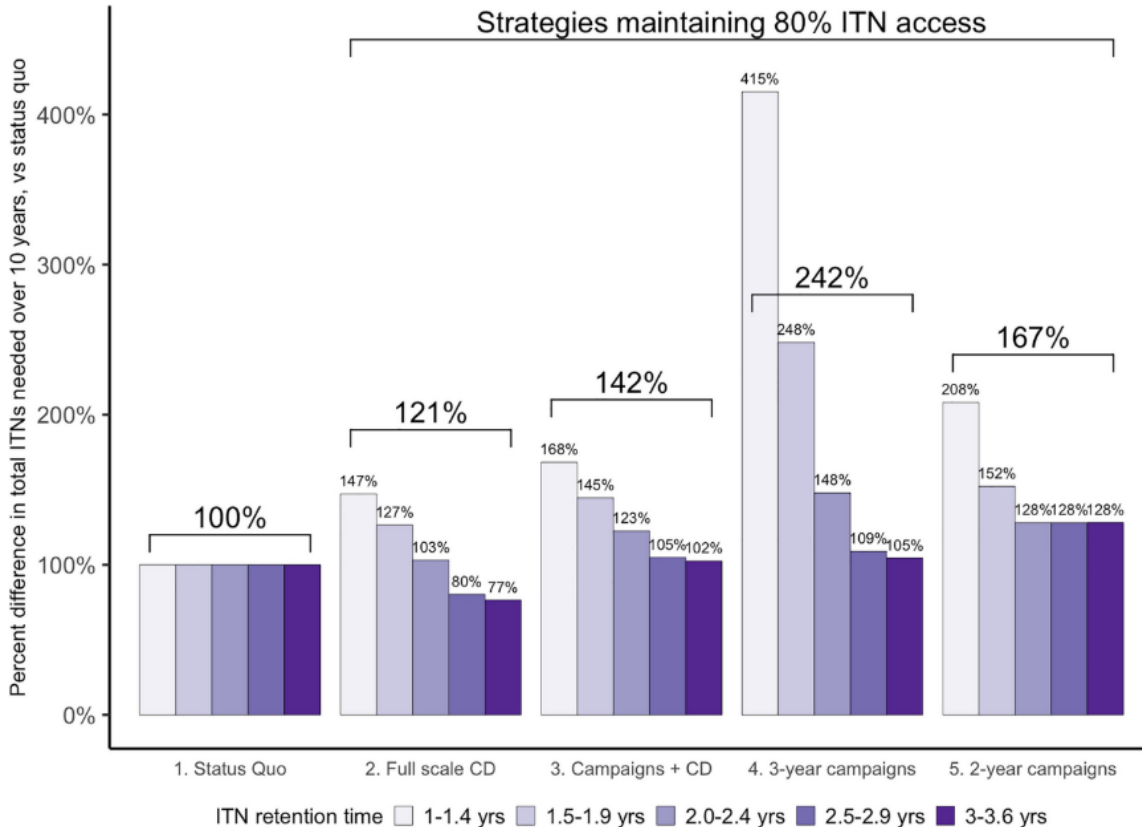
Conclusion: Standard ITNs still retain functionality against insecticide resistant mosquitoes by reducing blood feeding success and should still be utilised over untreated nets to help reduce the transmission potential of resistant mosquitoes.

[How many mosquito nets are needed to maintain universal coverage: an update](#)

Malaria Journal 30 June 2023

Recent work indicates that ITN retention times are less than two years in most countries, raising key questions for quantification approaches and delivery frequency for ITN distribution. This paper models several quantification approaches for five typical ITN distribution strategies, estimates the proportion of the population with access to an ITN, and presents recommended quantification approaches to meet global targets for ITN access and use.

Conclusion—Given variation in ITN retention times across countries, tailored quantification approaches for mass campaigns and continuous distribution strategies are warranted. Continuous distribution strategies are likely to offer more efficient ways to maintain ITN coverage, with fewer nets, where ITN retention times are at least two and a half years. National malaria programmes and their funding partners should work to increase the number of ITNs available to those vulnerable to malaria, while at the same time working to extend the useful life of these critical commodities.



Relative proportions of total ITNs needed over 10 years, compared to status quo (three-yearly campaigns at population/1.8), by scenario and ITN retention time. Grey labels show group average for each scenario

IRS

Efficacy of partial spraying of SumiShield, Fludora Fusion and Actellic against wild populations of Anopheles gambiae s.l. in experimental huts in Tiassalé, Côte d'Ivoire

Scientific Reports 13 July 2023

In this study, two treatments of partial indoor residual spraying (IRS) were tested: spraying only the top half of walls + ceilings or only the bottom half of walls + ceilings. These were compared to fully sprayed applications using the three IRS insecticide formulations.

For Actellic, the mean mortality over the nine-month period was 88.5% for fully sprayed huts, 88.3% for bottom half + ceiling sprayed walls and 80.8% for the top half + ceiling sprayed huts. For Fludora Fusion an overall mean mortality of 85.6% was recorded for fully sprayed huts, 83.7% for bottom half + ceiling sprayed huts and 81.3% for the top half + ceiling sprayed huts. For SumiShield, the overall mean mortality was 86.7%

for fully sprayed huts, 85.6% for the bottom half + ceiling sprayed huts and 76.9% for the top half + ceiling sprayed huts. The results of this study suggest that partial spraying may be a way to reduce the cost of IRS without substantially compromising IRS efficacy.

Using routine health data to evaluate the impact of indoor residual spraying on malaria transmission in Madagascar

BMJ Global Health 14 July 2023

This retrospective observational study uses routine data to evaluate the impacts of IRS overall, sustained IRS exposure over multiple years and level of spray coverage (structures sprayed/found) in nine districts where non-pyrethroid IRS was deployed to complement standard pyrethroid ITNs from 2017 to 2020.

Exposure to IRS overall reduced case incidence by an estimated 30.3%. A third year of IRS reduced malaria cases 30.9% more than a first year and 26.7% more than a second year.

The results reported here bolster the evidence around the effectiveness of non-pyrethroid insecticides for IRS while suggesting that policymakers should consider the benefits of sustaining IRS implementation over multiple years when undertaking decisions to move locations and/or withdraw IRS.

ATSBs

A comparison of the attractiveness of flowering plant blossoms versus attractive targeted sugar baits (ATSBs) in western Kenya

PLoS One 6 June 2023

The current study evaluated the attractiveness of the predominant flowering plants of Asembo Siaya County, western Kenya in comparison to an ATSB developed by Westham Co. Sixteen of the most common flowering plants in the study area were selected and evaluated for relative attractiveness to malaria vectors in semi-field structures. Six of the most attractive flowers were compared to determine the most attractive to local *Anopheles* mosquitoes. The most attractive plant was then compared to different versions of ATSB. The observation that ATSB v1.2 was more attractive to local *Anopheles* mosquitoes than the most attractive natural sugar source indicates that this product may be able to compete with natural sugar sources in western Kenya and suggests this product may have the potential to impact mosquito populations in the field.



Effects of vegetation densities on the performance of attractive targeted sugar baits (ATSBs) for malaria vector control: a semi-field study

Malaria Journal 21 June 2023

This study compared the efficacies of ATSBs (active ingredient: 2% boric acid) in controlled settings with different vegetation densities. Potted mosquito-friendly plants were introduced inside semi-field chambers (9.6 m by 9.6 m) to simulate densely-vegetated, sparsely-vegetated, and bare sites without any vegetation (two chambers/category). All chambers had volunteer-occupied huts. Laboratory-reared *Anopheles arabiensis* were released nightly (200/chamber) and host-seeking females recaptured using human landing catches outdoors and CDC-light traps



indoors. Vegetation significantly reduced the ATSBs efficacies against outdoor-biting and indoor-biting mosquitoes but not resting mosquitoes.

Conclusion-This study has demonstrated that while vegetation densities can indeed influence the performance of ATSBs, the technology is likely to be at least modestly efficacious in sites with varying vegetation densities including sparsely-vegetated and densely-vegetated settings.

[Maximizing the Potential of Attractive Targeted Sugar Baits \(ATSBs\) for Integrated Vector Management](#)

Insects 28 June 2023

Here, we comprehensively review the existing literature to evaluate the potential utility of ATSBs for mosquito control. We highlight milestones in the development of ATSBs, focusing on the selection of toxic ingredients and attractive components, methods of deployment, and efficacy studies. We discuss the potential utilization of ATSBs in combination with other control technologies and identify existing gaps in the ongoing development of this promising technology. We conclude that the deployment of ATSBs in integrated mosquito control programs will help address mosquito control challenges and prevent diseases that result from pathogens transmitted by mosquitoes.

New vector control tools and approaches

[Insecticide resistance management strategies for public health control of mosquitoes exhibiting polygenic resistance: A comparison of sequences, rotations, and mixtures](#)

Evolutionary Applications 5 April 2023

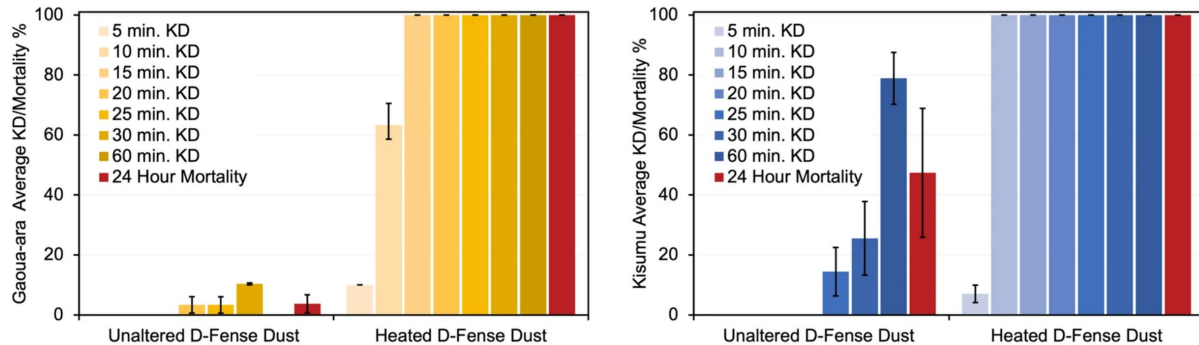
Field trials of insecticide resistance management (IRM) strategies are usually prohibitively expensive with long timeframes, and mathematical modeling is often used to evaluate alternative options. Previous IRM models in the context of malaria control assumed IR to have a simple (monogenic) basis, whereas in natural populations, IR will often be a complex polygenic trait determined by multiple genetic variants. A quantitative genetics model was developed to model IR as a polygenic trait. The model allows insecticides to be deployed as sequences (continuous deployment until a defined withdrawal threshold, termed “insecticide lifespan”, as indicated by resistance diagnosis in bioassays), rotations (periodic switching of insecticides), or full-dose mixtures (two insecticides in one formulation). These IRM strategies were compared based on their “strategy lifespan” (capped at 500 generations). Deploying single insecticides as sequences or rotations usually made little overall difference to their “strategy lifespan”, though rotations displayed lower mean and peak resistances. Deploying two insecticides in a full-dose mixture formulation was found to extend the “strategy lifespan” when compared to deploying each in sequence or rotation. This pattern was observed regardless of the level of cross resistance between the insecticides or the starting level of resistance. Statistical analysis highlighted the importance of insecticide coverage, cross resistance, heritability, and fitness costs for selecting an appropriate IRM strategy. Full-dose mixtures appear the most promising of the strategies evaluated, with the longest “strategy lifespans”. These conclusions broadly corroborate previous results from monogenic models.

[Overcoming insecticide resistance in Anopheles mosquitoes by using faster-acting solid forms of deltamethrin](#)

Malaria Journal 21 April 2023

Herein the potential for heat-activated deltamethrin dispersed on chalk to overcome various resistance mechanisms amongst five West African *Anopheles* strains is investigated, and its long-term sustained lethality evaluated. **Conclusions**-The heat-activated form of commercial deltamethrin D-Fense Dust outperformed the material as purchased, dramatically increasing efficacy against all tested pyrethroid-resistant strains. This increase in lethality was retained for 13 months of storage under ambient conditions in the laboratory. Higher energy forms of commonly used insecticides may be employed to overcome various resistance mechanisms seen in African *Anopheles* mosquitoes through more rapid uptake of insecticide molecules from their

respective solid surfaces. That is, resistant mosquitoes can be killed with an insecticide to which they are resistant without altering the molecular composition of the insecticide.



[Semi-field evaluation of a volatile transfluthrin-based intervention reveals efficacy as a spatial repellent and evidence of other modes of action](#)

PLoS One 11 May 2023

This study investigated a volatile pyrethroid-based spatial repellent (VPSR) developed by Widder Bros., Inc. designed to provide protection from mosquito bites in outdoor spaces. This study assessed the VPSR in replica kitchens within a controlled semi-field environment. Host-seeking was reduced by approximately 40% over the course of nightly releases in chambers containing VPSR devices.



[A randomized, double-blind placebo-control study assessing the protective efficacy of an odour-based 'push-pull' malaria vector control strategy in reducing human-vector contact](#)

Nature Sci Reports 12 July 2023

A randomized double-blind placebo-control study was implemented in western Kenya to evaluate: a 'push' intervention (spatial repellent) using transfluthrin-treated fabric strips positioned at open eave gaps of houses; a 'pull' intervention placing an odour-baited mosquito trap at a 5 m distance from a house; the combined 'push-pull' package; and the control where houses contained all elements but without active ingredients. The transfluthrin-treated fabric strips reduced indoor vector densities (measured using light traps) by 64% (*Anopheles funestus*) and 41% (*An arabiensis*). The 'pull' device did not add any benefit and the eave strips did not reduce outdoor landing rates.

Larval control

[Digitally managed larviciding as a cost-effective intervention for urban malaria: operational lessons from a pilot in São Tomé and Príncipe guided by the Zzapp system](#)

Malaria Journal 6 April 2023

Background-The development of new technologies, and mosquitoes' growing resistance to insecticides used in LLINs and IRS raise renewed interest in LSM.

Methods-A digitally managed larviciding (DML) operation in three of the seven districts of São Tomé and Príncipe (STP) was launched by the Ministry of Health (MOH) and ZzappMalaria LTD. The operation was guided by the Zzapp system, consisting of a designated GPS-based mobile application and an online dashboard, which facilitates the detection, sampling and treatment of mosquito breeding sites. During the operation, quality assurance (QA) procedures and field management methods were developed and implemented.

Results-12,788 water bodies were located and treated a total of 128,864 times. The reduction impact on mosquito population and on malaria incidence was 74.90% and 52.5%, respectively. The overall cost per

person protected (PPP) was US\$ 0.86. The cost varied between areas: US\$ 0.44 PPP in the urban area, and US\$ 1.41 PPP in the rural area. The main cost drivers were labour, transportation and larvicide material.

Conclusion-DML can yield highly cost-effective results, especially in urban areas. Digital tools facilitate standardization of operations, implementation of QA procedures and monitoring of fieldworkers' performance. Digitally generated spatial data also have the potential to assist integrated vector management (IVM) operations. A randomized controlled trial (RCT) with a larger sample is needed to further substantiate findings.

[Mapping Malaria Vector Habitats in West Africa: Drone Imagery and Deep Learning Analysis for Targeted Vector Surveillance](#)

Remote Sensing (Basel) 26 May 2023

Within this study, drone images from two malaria-endemic regions in Burkina Faso and Côte d'Ivoire were assembled and labeled using open-source tools. We developed and applied a workflow using region-of-interest-based and deep learning methods to identify land cover types associated with vector breeding sites from very-high-resolution natural color imagery. This study establishes a framework for developing deep learning approaches to identify vector breeding sites and highlights the need to evaluate how results will be used by control programs.

Anopheles stephensi

[Public health impact of the spread of *Anopheles stephensi* in the WHO Eastern Mediterranean Region countries in Horn of Africa and Yemen: need for integrated vector surveillance and control](#)

Malaria Journal 19 June 2023

The available malaria data and the timeline for the detection of *An. stephensi* was reviewed to analyse the role of *An. stephensi* in malaria transmission in Horn of Africa of the Eastern Mediterranean Region (EMR) in Djibouti, Somalia, Sudan and Yemen.

This analysis leads to four major points of conclusion. First, in Djibouti *An. stephensi* is well established and has likely been the driving force for the explosive increase in urban malaria. Second, outside of Djibouti, the impact of invasive *An. stephensi* on malaria trends remains unclear. Third, *An. stephensi* is resistant to many insecticides commonly used in public health, and this poses challenges to effective vector control options. Fourth, breeding sites for *An. stephensi* are often typical habitats for *Ae. aegypti* and the two vector species are frequently found together.

[Resistance of *Anopheles stephensi* to selected insecticides used for indoor residual spraying and long-lasting insecticidal nets in Ethiopia](#)

Malaria Journal 27 July 2023

Anopheles stephensi is resistant to all tested insecticides used in IRS and the tested LLIN brands did not cause mosquito mortality as expected, except MAGNet. This suggests that control of this invasive vector using existing adult malaria vector control methods will likely be inadequate and that alternative strategies may be necessary.

Vector control in urban and emergency settings

[Housing modification for malaria control: impact of a "lethal house lure" intervention on malaria infection prevalence in a cluster randomised control trial in Côte d'Ivoire](#)

BMC Med 4 May 2023

This study evaluated the impact of window screening (S) and general house repairs to make the house more mosquito proof, together with EaveTubes (ET) on malaria infection prevalence in Côte d'Ivoire and compares the result in the primary outcome, malaria case incidence.

Infection prevalence, measured by rapid diagnostic test (RDT), was 50.4% and 36.7% in the control arm and intervention arm, respectively, corresponding to an odds ratio of 0.57 (0.45–0.71), $p < 0.0001$.

In addition to reducing malaria case incidence, house screening and EaveTubes substantially reduced malaria infection prevalence 18 months after installation. Infection prevalence may be a good metric to use for evaluating malaria interventions in areas of similar transmission levels to this setting.

Odds & Ends

[Urban malaria may be spreading via the wind—here's why that's important](#)

PNAS USA 27 April 2023

Until now, malaria in Africa has been primarily a rural problem. But the recent establishment and expansion of the invasive urban Asian vector *Anopheles stephensi* will likely drastically change Africa's risk landscape.

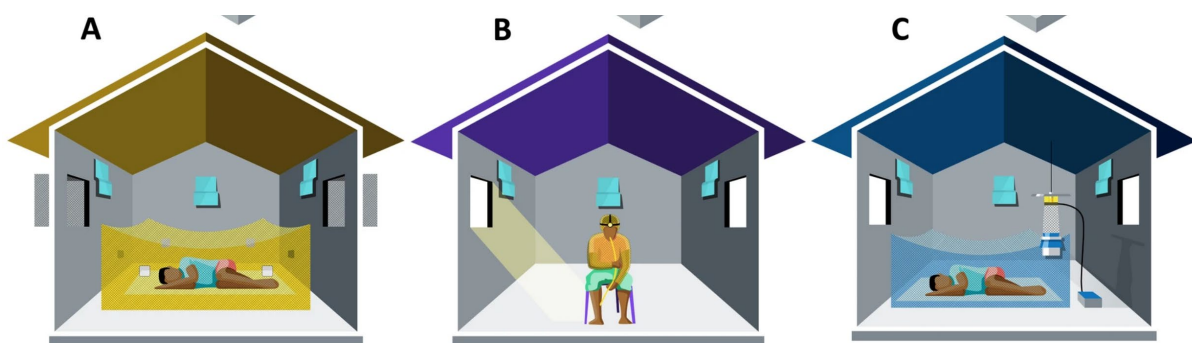
Herein, we examine the available data and propose a hypothesis: *An. stephensi* range expansion is mediated through long-distance, windborne migration.



[CDC light traps underestimate the protective efficacy of an indoor spatial repellent against bites from wild Anopheles arabiensis mosquitoes in Tanzania](#)

Malaria Journal 29 April 2023

Methods for evaluating efficacy of core malaria interventions in experimental and operational settings are well established but gaps exist for spatial repellents (SR). The objective of this study was to compare three different techniques: (1) collection of blood-fed mosquitoes (feeding), (2) human landing catch (HLC), and (3) CDC light trap (CDC-LT) collections for measuring the indoor protective efficacy (PE) of the volatile pyrethroid SR product Mosquito Shield™. The PE of Mosquito Shield™ against a wild population of pyrethroid-resistant *Anopheles arabiensis* mosquitoes was determined via feeding, HLC, or CDC-LT using four simultaneous 3 by 3 Latin squares (LS) run using 12 experimental huts in Tanzania. The PE of Mosquito Shield™ measured as feeding inhibition was 84%; landing inhibition 77%; and reduction in numbers collected by CDC-LT 30%.



Set up of huts used for “Feeding” (A), Human Landing Catch “Landing” (B) and CDC-LT (C) experiments including the placement of the Mosquito Shield™

[Spatial dynamics of malaria transmission](#)

PLoS Comput Biology 12 June 2023

The goal of this study was to develop and present a framework—including mathematical theory and software—to support malaria programs with planning, monitoring and evaluating malaria control.

A simple mathematical model of malaria has been the basis for the quantitative study of parasite transmission, but it lacked features to describe spatial dynamics and parasite dispersal. We present a new, modular framework for building highly realistic models of malaria drawing on a century of research and innovation. Using this framework, we develop metrics for parasite dispersal, local reproductive numbers, and malaria connectivity, we re-examine human biting rates and entomological inoculation rates. The framework was built around new, biologically realistic algorithms describing mosquito blood feeding and egg laying in response to resource availability. These algorithms serve as a rigorous yet structurally flexible interface for parasite transmission among human and mosquito host populations; and for the coupled dynamics of volant adult and aquatic immature mosquito populations. The framework supports structured aquatic habitats; patch models for adult mosquitoes; stratified human host populations; and flexible boundary conditions for malaria importation. Using this framework, we can design suites of models with varying levels of realism to study malaria in a place, and we can implement robust simulation-based analytics to support national disease control programmatic activities such as monitoring and evaluation or strategic planning.

[Characterising the intensity of insecticide resistance: A novel framework for analysis of intensity bioassay data](#)

Curr Res Parasitol Vector Borne Dis 16 June 2023

New methods for quantifying the extent of resistance in wild populations are urgently needed to guide deployment of interventions to improve disease control. Intensity bioassays measure mosquito mortality at a range of insecticide doses and characterise phenotypic resistance in regions where resistance is already detected. These data are increasingly being collected but tend to exhibit high measurement error and there is a lack of formal guidelines on how they should be analysed or compared. This paper introduces a novel Bayesian framework for analysing intensity bioassay data, which uses a flexible statistical model able to capture a wide variety of relationships between mortality and insecticide dose.

This work showcases the benefits of statistically rigorous analysis of insecticide bioassay data and highlights the additional information available from this and other dose-response data.

[TIMESS a power analysis tool to estimate the number of locations and repeated measurements for seasonally and clustered mosquito surveys](#)

Annals of Operational Research 10 July 2023

Every day, hundreds of mosquito surveys are carried out around the world to inform policy and management decisions on how best to reduce or prevent the burden of mosquito-borne disease or mosquito nuisance. These surveys are usually time consuming and expensive. Mosquito surveillance is the essential component of vector management and control. However, surveillance is often carried out with a limited if not without a quantitative assessment of the sampling effort which can result in underpowered or overpowered studies, or certainly in overpowered studies when power analyses are carried out assuming independence in the measurements obtained from longitudinal and geographically proximal mosquito surveys.

To facilitate power analysis for mosquito surveillance, we have developed TIMESS, a deployable browser-based Shiny app that estimates the number of repeated measurements and locations of mosquito surveys for a given effect size, power, significance level, seasonality and level of expected between-location clustering.

[Defining operational research priorities to improve malaria control and elimination in sub-Saharan Africa: results from a country-driven research prioritization setting process](#)

Malaria Journal 30 July 2023

The U.S. President's Malaria Initiative (PMI) Insights project together with the Université Cheikh Anta Diop of Dakar, Senegal, conducted a broad stakeholder consultation process to identify pressing evidence gaps in malaria control and elimination across sub-Saharan Africa (SSA), and developed a priority list of country-driven malaria operational research (OR) and programme evaluation (PE) topics to address these gaps. The resulting prioritized OR and PE topics predominantly focused on generating evidence needed to close gaps in intervention coverage, address persistent challenges faced by NMPs in the implementation of core strategic interventions, and inform the effective deployment of new tools.

Rank	Operational research/programme evaluation topic	Thematic area(s)	Research priority score	Average expert agreement score
1	Test and evaluate different delivery mechanisms to reach and sustain high coverage of ITNs among hard-to-reach and highest risk populations	Prevention	87.9	59.4
2	Evaluate the effectiveness and cost-effectiveness of different strategies for deploying the RTS, S AS01 malaria vaccine with chemoprevention (e.g., campaign vs. expanded programme on immunization (EPI)-linked vs combination campaign/EPI strategies)	Prevention and chemoprevention	86.6	53.0
3	Assess the effectiveness and cost-effectiveness of different intervention combinations (e.g., ITNs + IRS, ITNs or IRS + LSM, vector control + chemoprevention) to better understand how interventions should be combined to maximize impact	Crosscutting	85.3	53.5
3	Test and evaluate approaches or interventions to reduce the frequency of stockouts of key commodities for malaria case management, especially at the community level (specifically addressing challenges related to commodity quantification, stock management capacity, reporting and use of stock data)	Case management	85.3	47.9
5	Evaluate and compare different insecticide management and/or rotation strategies on insecticide resistance prevalence and intensity (crosscuts use of ITNs and IRS)	Prevention	85.1	54.1
6	Evaluate the impact and cost-effectiveness of expanding the age range, geographical coverage, and rounds of treatment of seasonal malaria chemoprevention (SMC)	Chemoprevention	84.5	55.3
7	Assess factors associated with volunteer community health worker (CHW) cadres' motivation and retention and evaluate different approaches or interventions to improve volunteer CHW motivation and retention	Case management	83.3	47.6
8	Assess predictors of adherence to and determinants of uptake of SMC and evaluate different strategies to achieving high SMC coverage and adherence	Chemoprevention	82.3	52.5
9	Test and evaluate the effectiveness of different deployment and targeting approaches for IRS to maximize impact (e.g., testing different insecticides, duration and frequency of spraying, geographic/structural targeting strategies)	Prevention	82.0	50.6
10	Assess different approaches or interventions to improve the analytic and data use capacity, and data use culture at different levels of the health system	SME	81.3	45.3
10	Assess the impact of IRS and focal/reactive IRS on malaria burden, transmission, and insecticide resistance	Prevention	81.3	52.4
10	Given the challenges with ITN durability, test and evaluate the effectiveness of different approaches to improve routine/continuous distribution channels for ITNs to sustain coverage between mass campaigns	Prevention	81.3	60.4

WHO News and Publications

[Sharing WHO malaria guidance in new ways](#)

19 July 2023

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* 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.

The current version of the Guidelines is dated 14 March 2023 and includes recommendations on 2 new types of insecticide-treated nets.

In addition to the [website](#), [MAGICapp platform](#), and Malaria Toolkit [mobile app](#), WHO has been sharing its malaria recommendations and other guidance through short, animated videos. Watch our latest videos on the response to malaria in urban areas, the spread of the *Anopheles stephensi* mosquito vector and recommendations on new types of insecticide-treated nets.

- [Responding to malaria in urban areas](#)
- [Spread of *Anopheles stephensi* in Africa](#)
- [New types of insecticide-treated nets](#)
- [Video landing page](#)

[Belize certified malaria-free by WHO](#)

21 June 2023

The World Health Organization (WHO) has certified Belize as malaria-free, following the country's over 70 years of continued efforts to stamp out the disease.

"WHO congratulates the people and government of Belize and their network of global and local partners for this achievement", said Dr Tedros Adhanom Ghebreyesus, WHO Director-General. "Belize is another example of how, with the right tools and the right approach, we can dream of a malaria-free future."

With today's announcement, a total of 42 countries and 1 territory have been certified as malaria-free by WHO, including 11 countries in the Region of the Americas.

Recent WHO publications of interest

- [Operational manual on leishmaniasis vector control, surveillance, monitoring and evaluation](#). The objective of this manual is to provide practical tools, techniques and procedures to strengthen sand fly control and surveillance to improve implementation of leishmaniasis control programmes.

- [International code of conduct on pesticide management: guidance on good labelling practice for pesticides, 2nd revision](#). Developed in collaboration with Food and Agriculture Organisation (FAO), this document provides guidance on defining or revising national pesticide labelling requirements and on reviewing the design and content of pesticide labels. It is designed for use primarily by government pesticide regulatory and registration authorities in low- and middle-income countries but may also be useful for the pesticide industry, nongovernmental organizations and other relevant entities in writing, evaluating or understanding pesticide labels.
- [Determining discriminating concentrations of insecticides for monitoring resistance in sand flies: report of a multi-centre laboratory study and WHO expert consultations](#). This report details the result of the study that tested a total of six insecticides and the synergist PBO in WHO tube tests and clothianidin in WHO bottle bioassay against susceptible strains of the five main sand fly vectors (*Phlebotomus dubosqui*, *Ph. longipes*, *Ph. papatasi*, *Ph. argentipes*, *Lutzomyia longipalpis*).
- [Standard operating procedure for testing the susceptibility of adult sand flies to insecticides in WHO tube tests](#). This standard operating procedure (SOP) describes the process to follow for evaluating the susceptibility of adult sandflies to insecticides using the WHO tube test.

[18th meeting of the Vector Control Advisory Group \(VCAG\)](#)

The meeting took place from 24-28 April 2023 and focused on submissions relating to the intervention classes of bait stations, spatial repellents, reduction of pathogen transmission induced by Wolbachia, and endectocides:

This report details the proceedings and outcomes of the meeting, including advice provided to applicants working on interventions in the following intervention types: sterile males, population suppression induced by gene drive, insecticide treated nets, endectocides and spatial repellents.



The [meeting report](#) was published 1 August 2023



Webinars, websites and other resources

[Reveal 3.0: Redefining Precision and Delivering Equitable Health](#)

5 June 2023

The team at Akros has been working with malaria elimination programs for the past 15 years to develop Reveal, an open source digital platform which powers up the microplanning and delivery of health campaigns to ensure equity is achieved. This [video](#) summarizes the platform and showcases its value and capabilities. You can learn more at www.revealprecision.com



[APMEN Webinar YouTube channel](#)

APMEN hosts 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 and upcoming topics include:

- ❑ 4 Apr 2023 – [Malaria: What happens Post-Elimination? Prevention of Re-establishment](#) | APMENxChange
- ❑ 15 May 2023 – [Addressing cross border malaria transmissions, challenges and best practices from the Asia Pacific](#)

- ❑ 17 August 2023 – Managing Vector-Borne Diseases during Climate Emergencies in Pakistan
Climate change increasingly impacts disease-carrying vectors such as mosquitoes, affecting their growth, habits and populations. Vector control becomes more complex in climate-induced humanitarian emergencies due to the scarcity of both human and logistical resources. Effective collaboration between national vector-borne disease programs, disaster departments, relief organizations, technical partners, and procurement agencies is crucial to facilitate information exchange and develop informed strategies for vector control. In this webinar, experts from Pakistan will shed light on their efforts in managing vector control during the recent floods, offering valuable insights for partner countries to learn from.

Date: 17 August 2023, Thursday (1:30pm Singapore Time)

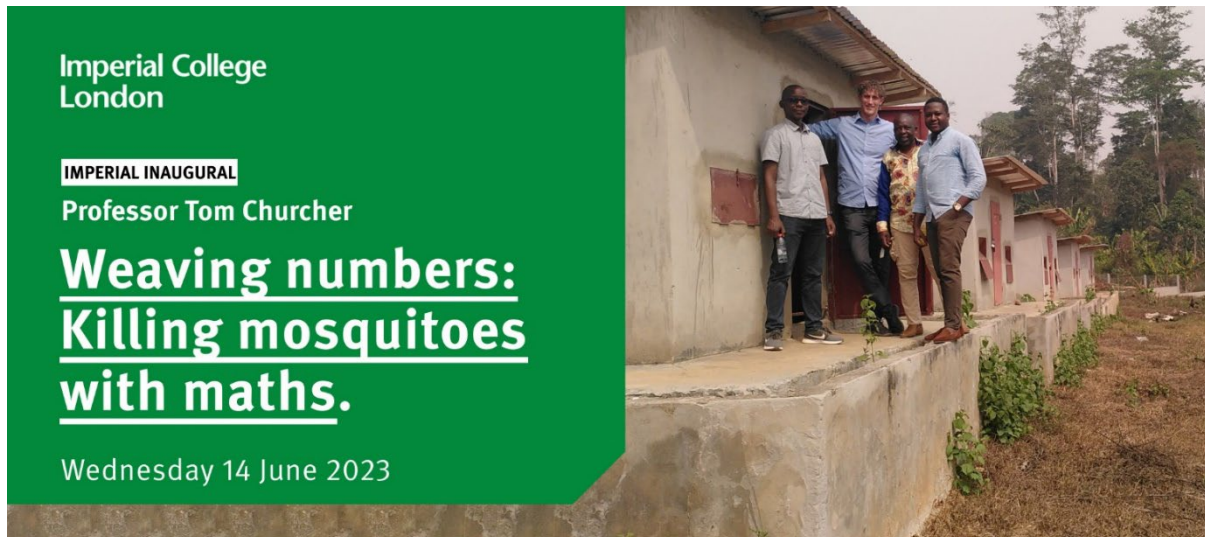
Registration link: https://aplma-org.zoom.us/webinar/register/WN_pq1rqagwRCGH3m1mEkSU6g

- ❑ 22 August 2023 — Genetic Approach to Vector Control: How can Gene Drive Help Control Malaria and Other Diseases?

Gene drive, a genetic engineering technique, aims to spread specific traits through targeted mosquito populations. By modifying the mosquitoes, gene drive approaches offer the potential to reduce disease vector populations or the transmission of disease-causing parasites and viruses. Our invited experts will share technical advancements and experiences with gene drive technology, shedding light on its potential role in combating vector-borne diseases such as malaria and dengue. Please join this APMENxChange webinar to explore the potential uses of gene drive technology for malaria control globally and for the Asia Pacific region.

Date: 22 August 2023, Tuesday (2:00pm Singapore Time)

Registration link: https://aplma-org.zoom.us/webinar/register/WN_hdCiwRsJS2i_uWuITSzbXg



Imperial College
London

IMPERIAL INAUGURAL
Professor Tom Churcher

Weaving numbers:
Killing mosquitoes
with maths.

Wednesday 14 June 2023

Professor Tom Churcher discuss his latest research. If you were unable to join us or would like to see it again, you can watch the lecture on our YouTube Channel here: [Weaving numbers: Killing mosquitoes with maths.](#)

In the news and social media

[*SC Johnson, Kenya Announce Partnership to Accelerate Efforts to Eradicate Malaria*](#)

21 April 2023

SC Johnson and the government of Kenya announced a new public-private partnership in the fight against malaria. SC Johnson Chairman and CEO Dr. Fisk Johnson and His Excellency Dr. William Samoei Ruto, President

of the Republic of Kenya, met and announced the company's commitment of more than USD 10 million to advance the distribution of the spatial repellents, fund malaria prevention education and build new health clinics in rural Kenyan communities. New manufacturing capacity will come from SC Johnson's Nairobi facility with a goal of producing enough supply of spatial repellents to reach 17 million people in East Africa annually.

[Study Finds More High-Altitude Dispersal of Disease Vectors in Africa](#)

Entomology Today

Previous studies in a malaria endemic area of the Sahel region in West Africa revealed high-altitude, long-distance migration of insects and various mosquito species. The objective of the current study was to assess whether similar behavior is exhibited by mosquitoes and other insects around the Lake Victoria basin region of Kenya in East Africa.

The study shows that that mosquitoes in mid-equatorial Kenya also ride the winds, not to escape drought but to expand their range. These mosquito migrants could challenge existing mosquito surveillance and control measures in the new regions where they land.

An Extraordinary Life: A Tribute to Phil Russell

ASTMH 13 June 2023

Philip K. Russell, MD, FASTMH, was an icon of vaccinology, virology, tropical medicine, infectious diseases, biodefense and a retired U.S. Army Major General. He was President of ASTMH in 1983 and the Founding President of the Sabin Vaccine Institute. Maj. Gen. Russell died in early 2021.

The Society has created a [tribute page to Maj. Gen. Russell](#) on the ASTMH website. The page includes recordings of:

- [A video tribute to Maj. Gen. Russell](#)
- [A symposium honoring the life and career of Maj. Gen. Russell](#)
- [A luncheon honoring the life and career of Maj. Gen. Russell](#)
- [An interview with Maj. Gen. Russell for the 'Workers in Tropical Medicine' series](#)

▶ [Visit the tribute page to Maj. Gen. Russell](#) for more information and links to all recordings



[The U.S. President's Malaria Initiative's 17th Annual Report to Congress](#)

Click on the video for a special message from the U.S. Global Malaria Coordinator Dr. David Walton given on World Malaria Day. PMI has also released their [17th Annual Report to Congress](#) highlighting their activities and achievements in FY 2022.



Disclaimer: Given the breadth of vector control related literature, we are unable to include all relevant work. This update is intended to focus primarily on *Anopheles* vectors and a subset of mosquito control topics relevant to IVCC and its partners. Any views expressed in this update do not necessarily reflect the views or opinions of IVCC. In many cases we directly quote abstracts and other sections of published work. Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by IVCC or its funders. Readers may view copyrighted publications shared here provided that the information is only for their personal, non-commercial use.