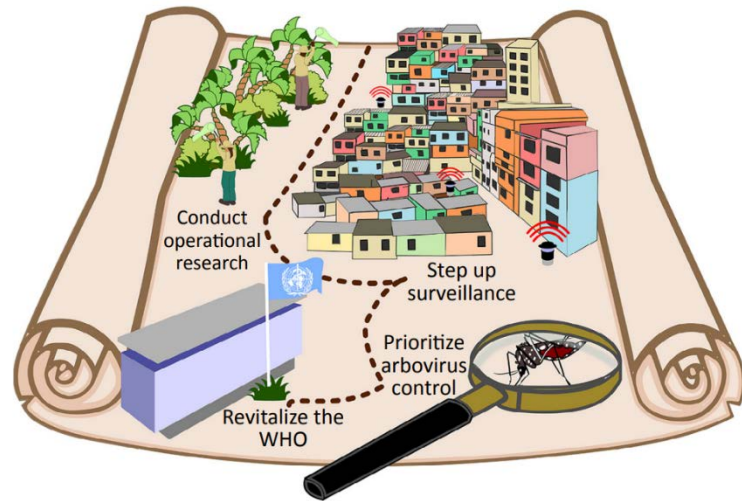


Selected Recent Publications

[Revamping Mosquito-borne Disease Control to Tackle Future Threats](#)

Trends Parasitol. May 2018

In this opinion piece the authors discuss the need for a critical re-evaluation of the global approach to mosquito-borne diseases with a focus on arbovirus control. They summarize the views of 25 international mosquito experts about the current state of mosquito-borne disease control and highlight the issues they suggest must be addressed in order to tackle emerging threats on the horizon.



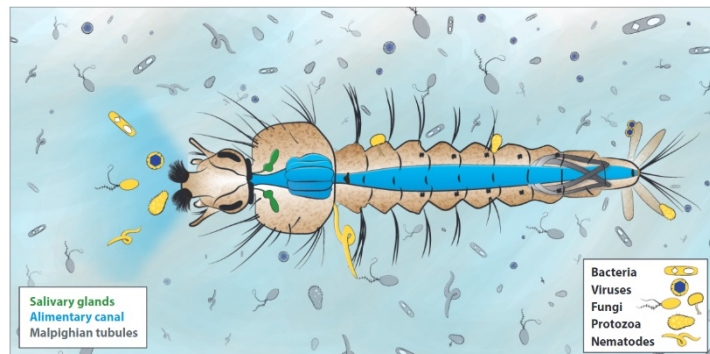
Trends in Parasitology

Figure 1. Roadmap of Critical Policy Issues That Must Be Addressed to Turn the Tide Against Mosquito-borne Diseases (MBDs). Depicted are four critical policy issues within MBD control that must be addressed within the next two decades, according to the opinions of 25 international mosquito experts.

[Mosquito Immunobiology: The Intersection of Vector Health and Vector Competence](#)

Annual Review of Entomology 2018

A thorough review of mosquito immunobiology which details how mosquitoes play host to endosymbiotic, entomopathogenic, and mosquito-borne organisms which trigger and shape innate infection-response capacity. Mosquitoborne pathogens and entomopathogens overcome these immune responses, employing avoidance or suppression strategies. Burgeoning methodologies are capitalizing on this concerted deployment of immune responses to control mosquito-borne disease.



[Expanding the Vector Control Toolbox for Malaria Elimination: A Systematic Review of the Evidence.](#)

Adv Parasitol. 2018; Epub 27 Feb 2018.

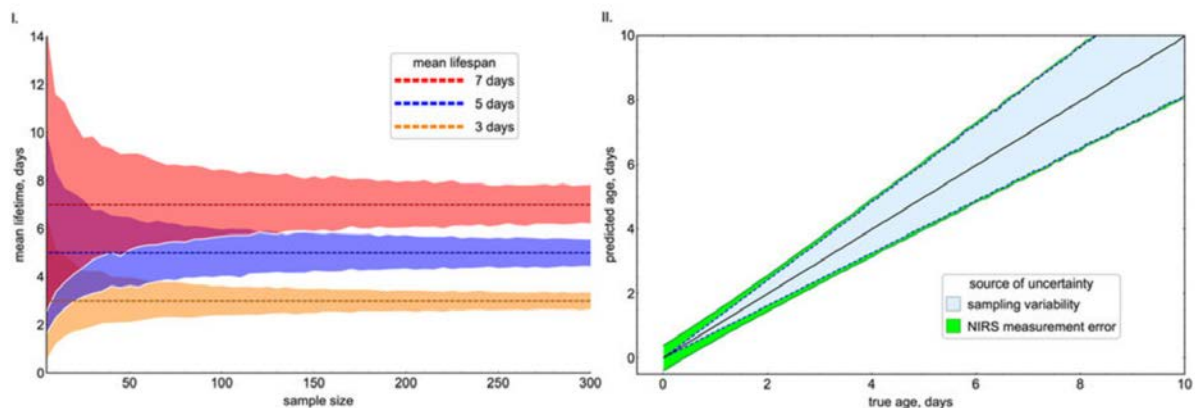
The authors collated published and unpublished evidence of effectiveness across a wide spectrum of malaria vector control examining 21 product classes, excluding ITNs and IRS. They conclude—despite substantial gaps in the supporting evidence, several tools may be promising supplements to ITNs and IRS in appropriate settings. A key point—efficacy is tied to local transmission ecology and making recommendations across diverse transmission settings and local vector ecologies is difficult; what works in one or two settings may not work in all settings. The genetic diversity among *Anopheles* further contributes to this complexity. Strengthening operational capacity and research to

implement underutilized tools, such as LSM and mosquito-proofed housing, using an adaptive, learning-by-doing approach, while expanding the evidence base for promising supplementary tools that are locally tailored, should be considered central to global malaria elimination efforts.

[Monitoring the Age of Mosquito Populations Using Near-Infrared Spectroscopy.](#)

Sci Rep. 27 March 2018

Abstract: Mosquito age is the most informative metric for evaluating interventions that kill adult mosquitoes but there is no simple or reliable way of measuring it in the field. Near-Infrared Spectroscopy (NIRS) has been shown to be a promising, high-throughput method that can estimate the age of mosquitoes. Currently the ability of NIRS to measure mosquito age is biased, and has relatively high individual mosquito measurement error, though its capacity to rigorously monitor mosquito populations in the field has never been assessed. In this study, we use machine learning methods from the chemometric literature to generate more accurate, unbiased estimates of individual mosquito age. These unbiased estimates produce precise population-level measurements, which are relatively insensitive to further increases in NIRS accuracy when feasible numbers of mosquitoes are sampled. The utility of NIRS to directly measure the impact of pyrethroid resistance on mosquito control is illustrated, showing how the technology has potential as a highly valuable tool for directly assessing the efficacy of mosquito control interventions.



[Effectiveness of a long-lasting PBO treated insecticidal net and indoor residual spray interventions, separately and together, against malaria transmitted by pyrethroid resistant mosquitoes: A community randomised factorial design trial.](#)

The Lancet: Published online 11 April 2018

“Our study is the first RCT to report that PBO-treated long-lasting insecticidal nets were more effective than standard pyrethroid long-lasting insecticidal nets against malaria infection and transmission. It also provides the strongest evidence to date of the

negative effect of high-level pyrethroid resistance on the use and efficacy of standard nets. This study is also the first RCT to provide evidence for the effect of long-term malaria control of the first long-lasting organophosphate formulation to be developed specifically for indoor residual spraying (Actellic 30CS). This finding justifies the scale up and use of indoor residual spraying in sub-Saharan Africa and the 12-year investment into long-lasting alternatives to pyrethroid and DDT for indoor spraying between private and public sector organisations.

Effectiveness of a long-lasting piperonyl butoxide-treated insecticidal net and indoor residual spray interventions, separately and together, against malaria transmitted by pyrethroid-resistant mosquitoes: a cluster, randomised controlled, two-by-two factorial design trial

Natacha Protopopoff, Jacklin F Masha, Eliud Lukole, Jacques D Charlwood, Alexandra Wright, Charles D Mwalimu, Alphaxard Manjurano, Franklin W Masha, William Kisinzu, Immo Kleinschmidt, Mark Rowland



[Insecticide-resistant malaria vectors must be tackled](#)

The Lancet Gerry F Killeen and Hilary Ranson Published: 11 April 2018

In this commentary the authors use the findings presented by Protopopoff and colleagues above to call for more rapid and decisive evidence review and policy recommendation and for authorities to take a bolder stance to emphasise pre-emptive action. They write, “If we continue waiting until we have all the evidence we need to be absolutely confident in our most important insecticide resistance management decisions, they will always come too late.”

Implications of insecticide resistance for malaria vector control with long-lasting insecticidal nets: a WHO-coordinated, prospective, international, observational cohort study.

Lancet Infect Dis. 9 April 2018

The results of this much discussed WHO-coordinated, prospective, observational five country cohort study is now published. This was a massive undertaking in which 40 000 children were enrolled and assessed for clinical incidence during 1.4 million follow-up visits. 80 000 mosquitoes were assessed for insecticide resistance.

Biological control of human disease vectors: a perspective on challenges and opportunities

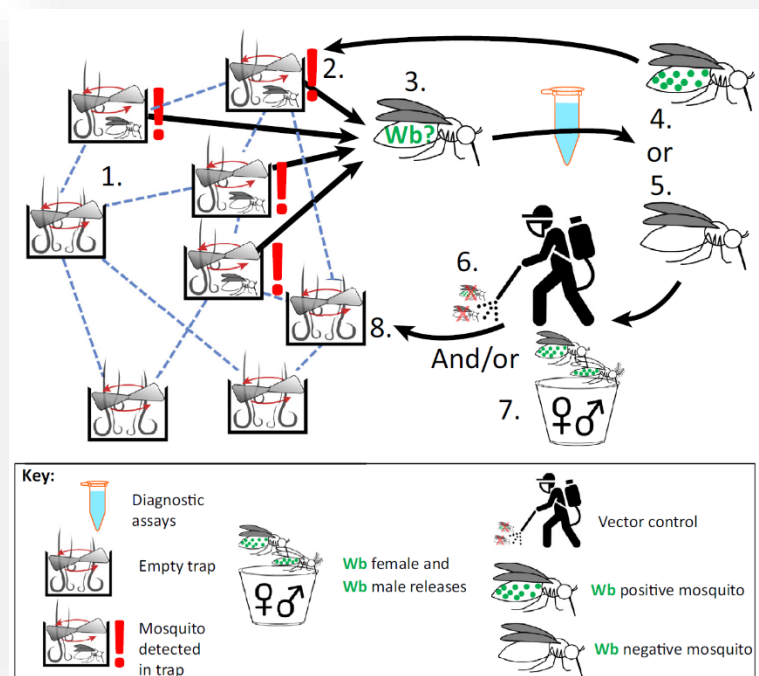
Biocontrol; Published online 10 May 2018

“This perspective paper explores whether biological control might be able to make a greater contribution to vector control in the future, and highlights some of the challenges in taking a technology from initial concept through to operational use. Biological control has established itself in agriculture and environmental management in spite of very similar challenges of limited funding, demanding timelines, regulatory hurdles, operational constraints, complex cost-benefit relationships, etc. Can some of this knowledge and experience be transferred to public health?”

Mission accomplished? We need a guide to the “post release” world of Wolbachia for Aedes-borne disease control.

Trends in Parasitology; March 2018

Abstract: Historically, sustained control of *Aedes aegypti*, the vector of dengue, chikungunya, yellow fever, and Zika viruses, has been largely ineffective. Subsequently, two novel ‘rear and release’ control strategies utilizing mosquitoes infected with *Wolbachia* are currently being developed and deployed widely. In the incompatible insect technique, male *Aedes* mosquitoes, infected with *Wolbachia*, suppress populations through unproductive mating. In the transinfection strategy, both male and female *Wolbachia*-infected *Ae. aegypti* mosquitoes rapidly infect the wild population with *Wolbachia*, blocking virus transmission. It is critical to monitor the long-term stability of *Wolbachia* in host populations, and also the ability of this bacterium to continually inhibit virus transmission. Ongoing release and monitoring programs must be future-proofed should political support weaken when these vectors are successfully controlled.



The polyphyly of Plasmodium: comprehensive phylogenetic analyses of the malaria parasites (order Haemosporida) reveal widespread taxonomic conflict

The Royal Society; Published 23 May 2018

“Our comprehensive phylogenetic analyses recovered strong support for a novel view of malaria parasite evolution that provides a framework for understanding haemosporidian life-history traits, host-switching, diversification and the origin of the malaria parasites that infect humans. These analyses resolve several historically controversial relationships among the major genus-level lineages within the Haemosporida, though they also challenge many of the current taxonomic classifications.”

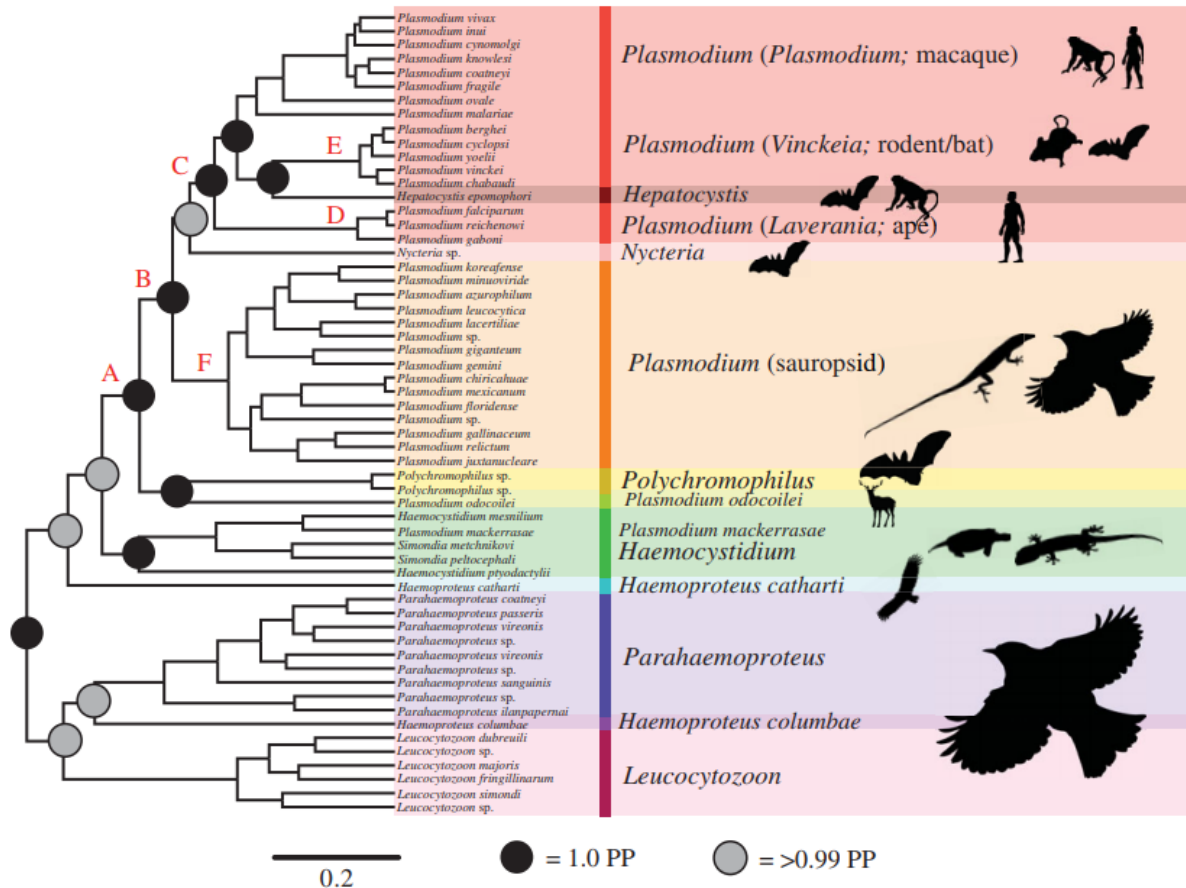


Figure 2. The favoured haemosporidian phylogeny. The haemosporidian parasite phylogeny recovered from BEAST using the fully partitioned amino acid dataset and lognormal relaxed molecular clock. The outgroup *Theileria* is not shown for ease of viewing the ingroup topology. Shown as silhouettes are representatives of the vertebrate host group for each haemosporidian lineage. Clades denoted with the letters A–F are referred to in the Discussion.

The impact of temperature on insecticide toxicity against the malaria vectors *Anopheles arabiensis* and *Anopheles funestus*

Malaria Journal; 2 April 2018

CONCLUSIONS: Environmental temperature has a marked effect on the efficacy of insecticides used in public health against important African malaria vectors. Caution must be exercised when drawing conclusions about a chemical's efficacy from laboratory assays performed at only one temperature, as phenotypic resistance can vary significantly even over a temperature range that could be experienced by mosquitoes in the field during a single day. Similarly, it might be inappropriate to assume equal efficacy of a control tool over a geographic area where local conditions vary drastically.

Associated patterns of insecticide resistance in field populations of malaria vectors across Africa

PNAS: 21 May 2018

Abstract: Estimation of resistance is complicated by the sparsity of observations in field populations, variation in resistance over time and space at local and regional scales, and cross-resistance between different insecticide types. Using observations of the prevalence of resistance in mosquito species from the *Anopheles gambiae* complex sampled from 1,183 locations throughout Africa, we applied Bayesian geostatistical models to quantify patterns of covariation in resistance phenotypes across different insecticides. For resistance to the three pyrethroids tested, deltamethrin, permethrin, and λ -cyhalothrin, we found consistent forms of covariation across sub-Saharan Africa and covariation between resistance to these pyrethroids and resistance to DDT. We found no evidence of resistance interactions between carbamate and organophosphate insecticides or between these insecticides and those from other classes. For pyrethroids and DDT we found significant associations between predicted mean resistance and the observed frequency of *kdr* mutations in the *Vgsc* gene in field mosquito samples, with DDT showing the strongest association. These results improve our capacity to understand and predict resistance patterns throughout Africa and can guide the development of monitoring strategies.

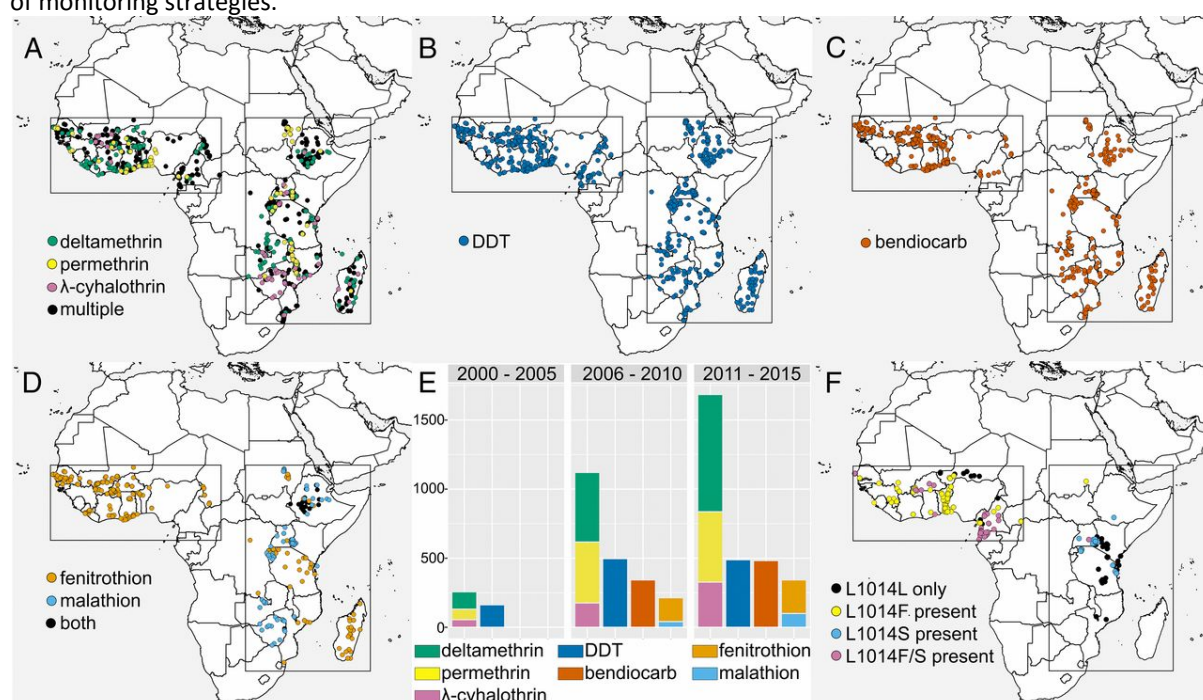


Fig. 1. The spatiotemporal distribution of the sample collection locations for insecticide resistance bioassays included in our dataset. Rectangles enclose the West and East regions considered in our analysis. (A) Pyrethroid (Py) bioassays. (B) Organochlorine (Och) bioassays. (C) Carbamate (Ca) bioassays. (D) Organophosphate (Oph) bioassays. (E) The number of bioassay records for each time period. The keys in A–D correspond to the insecticides shown in E. (F) The locations of sample collection used to calculate *Vgsc* allele frequency data. The mutations L1014F and L1014S present at each location are shown.

WHO News and Publications

Global report on insecticide resistance in malaria vectors: 2010-2016

This report presents an overview of data on malaria vector resistance from the WHO database as reported by Member States and partners. It aims to provide the baseline for subsequent status updates and to identify any temporal trends. An online mapping tool called [Malaria Threats Map](#) allows further interactive exploration of available data.

Product prequalification conversions completed

In line with the revised evaluation process for vector control products, the conversion of WHOPES recommendations to WHO Prequalification listings has now been completed. The list of prequalified vector control products can be found online.

[Malaria surveillance, monitoring & evaluation: a reference manual](#)

WHO 2018

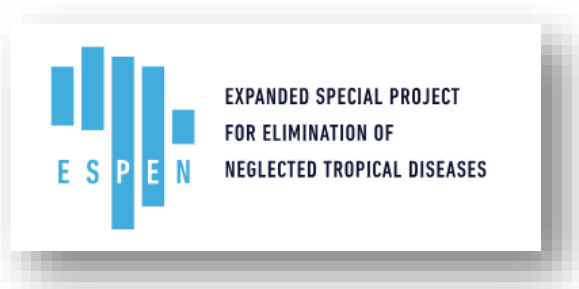


The WHO has published a [new manual focused on malaria surveillance, monitoring and evaluation](#). The aim of this manual is to serve as a reference document for guidance on strengthening malaria surveillance systems for staff in ministries of health, national malaria programmes and health information systems, partners involved in malaria surveillance as well as WHO staff who advise countries on malaria surveillance. A section on entomological surveillance and vector control monitoring and evaluation is included.

[The Equipment for vector control specification guidelines, 2nd edition](#)

This document provides the specifications for major pesticide application equipment used for control of vectors of diseases. The specification guidelines contained herein are intended to assist national authorities and other public health users in selecting equipment of assured quality for application of pesticides for vector control.

[The ESPEN Portal](#) is an electronic platform designed to enable health ministries and stakeholders to share, and exchange subnational programme data, in support of the NTD control and elimination goals.



Quick jump

Type or select



Browse maps by disease

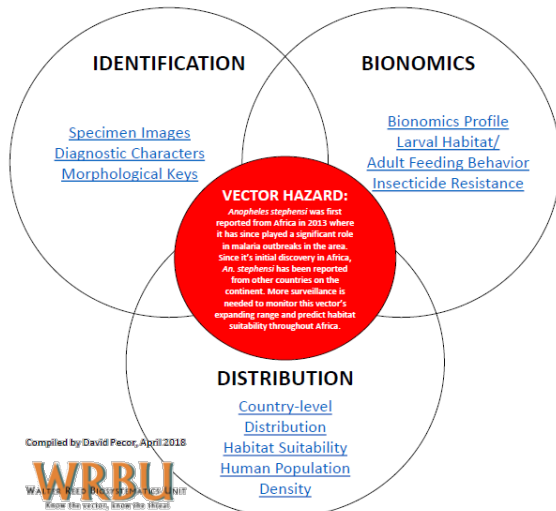
- [Lymphatic filariasis \(801 maps\)](#)
- [Onchocerciasis \(694 maps\)](#)
- [Loiasis \(64 maps\)](#)
- [Schistosomiasis \(596 maps\)](#)
- [Soil-transmitted helminthiasis \(596 maps\)](#)
- [Trachoma \(0 maps\)](#)

Useful websites and resources

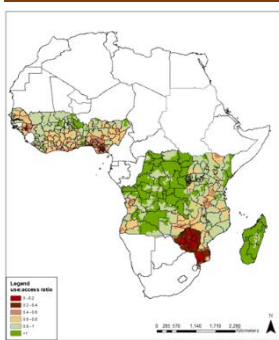
[PMI 12th Annual Report to Congress](#)

The U.S. President's Malaria Initiative's (PMI's) Twelfth Annual Report to Congress describes the U.S. Government's leadership and technical and financial contributions to the fight against malaria. With PMI support, hundreds of millions of people have benefited from protective measures and have been diagnosed and treated for malaria. The concerted efforts of host-country governments, donor governments, multilateral agencies, non-governmental organizations, and implementing partners have helped reduce malaria deaths by more than 60 percent, saving almost 7 million lives and preventing more than 1 billion malaria cases between 2000 and 2015.

Anopheles (Cellia) stephensi Liston, 1901
Expanding Range to Northern Africa and Beyond



Anopheles stephensi was first reported from Africa in 2013 where it has since played a significant role in malaria outbreaks in the region. Since its initial discovery in Djibouti it has been reported from other countries on the continent. It is important for malaria control programs in the region to raise awareness and train their surveillance teams to be on the look out for this invasive species. The [Walter Reed Biosystematics Unit \(WRBU\)](#) as prepared this [document](#) to summarize the identification, bionomics, and distribution of the species.



[VectorWorks ITN Access and Use Report](#)

2 May 2018

This report presents four indicators related to use of insecticide treated nets (ITNs); individual access to ITN within the household, individual use of ITN the previous night, household ownership of at least one ITN, and the use:access ratio.

[The Eave Tube presentation from In2Care given at the VCWG meeting in Feb 2018](#)

Delivery tool for insecticide Rotations

Eave Tubes - A new paradigm in malaria vector control

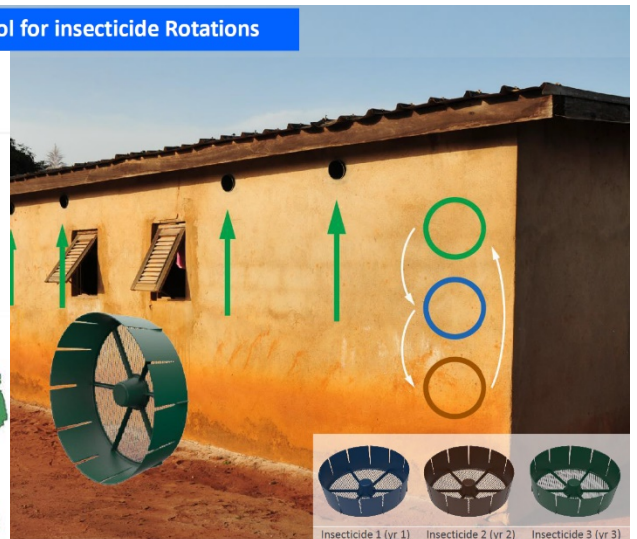
Mosquitoes are attracted by human odours exuding from the house

Enhanced with eave tubes

Open eaves
Dwelling
Roof
Eave tubes
Wall
Filler brick and mortar

Eave tube
Outside
Inside
Insecticide-coated net
Wall

- New product that provides house-level protection
- Under evaluation at WHO VCAG: "Lethal House Lure"
- Phase 3 RCT in Côte d'Ivoire - supported by BMGF



Recent and upcoming events of note

[Bill Gates Malaria Summit London 2018](#)

London, United Kingdom
April 18, 2018

Here is the speech Bill Gates gave at the Malaria Summit. It includes a nice overview of innovation and promising tools on the horizon.

Click here for a deeper look into the [Malaria Summit London](#), where you can view videos of speeches from Bill Gates and others or review summit highlights.



[8th meeting of the Vector Control Advisory Group \(VCAG\)](#)

The 8th meeting of the Vector Control Advisory Group (VCAG) was held from 14-16 May in Geneva. VCAG serve as an advisory body to WHO on new tools, technologies and approaches for the control of vector-borne diseases. At the recent meeting, nice dossiers were reviewed of which two were for new submissions to VCAG. It is anticipated that the meeting report will be available online within a month. Presentations from the open sessions of the VCAG meeting are available online.

[PAMCA 2018 24-26 September 2018—Victoria Falls, Zimbabwe](#)



In the news

[VECTOR CONTROL MALARIA DECLARATION \(VCMD\), LONDON 2018 UNITING TO ERADICATE MALARIA BY 2040 – \(ZERO BY 40\)](#)





London: 18 April 2018 - Today, at the London Commonwealth Heads of Government Meeting, the world's leading Crop Protection companies announce their commitment to support the research, development and supply of innovative products to save lives and help eradicate malaria by 2040. BASF, Bayer, Mitsui Chemicals, Sumitomo Chemical Company and

Syngenta have been the major driving force behind the development of innovative vector control solutions, such as bednets and indoor spraying. Since 2000, nearly 4 in every 5 malaria cases successfully averted through intervention have been due to long-lasting insecticide treated bednets (LLINs) and indoor residual spraying (IRS), saving millions of lives.

In coming together under the 'ZERO by 40' banner, these companies are, with the support of the Bill & Melinda Gates Foundation and Liverpool based IVCC (the Innovative Vector Control Consortium), reaffirming their commitment to use their expert knowledge and chemical resources to supply and develop innovative vector control solutions to help reduce the malaria burden which, today is increasingly being threatened by insecticide resistance.

Details including specifics of the pledge can be accessed at the [Zero by 40 website](#).

[PMI Pilots New WHO-Recommended Insecticide](#)

21 March 2018

First New WHO-Recommended Insecticide in 40 Years Piloted in Tanzania



Recently, WHO recommended the use of SumiShield® 50WG from a new class of insecticides for IRS. The insecticide, developed by Sumitomo Chemical in Japan, is the first new insecticide recommended for use in public health in 40 years. In February and March 2018, the PMI VectorLink Project piloted the insecticide in Tanzania to assess both community acceptance and any operational issues. The project will monitor the entomological and epidemiological impact of the new insecticide. The pilot was conducted in Tanzania's Mara Region in Musoma Rural district. The project sprayed 43,880 structures with the insecticide, protecting 175,116 people from malaria. The pilot was part of a larger IRS campaign in the country, which protected more than 2.6 million people.

[Good news on U.S. Government global health and research funding.](#)

President Donald Trump has signed a bipartisan spending package for fiscal year (FY) 2018 to keep the federal government open until September 30. In this final spending bill, Congress rejected many of the cuts and program eliminations proposed by the Administration in its FY18 budget request and instead provided increases to federal investments in scientific research, education, student aid, and healthcare programs. This spending bill means a great deal to the University of Rochester and other research universities around the country. The bill provided \$755 million for Malaria activities, which matched the FY 2017 enacted levels and was \$81 million (12%) above the President's FY 2018 request (the FY 2018 request included \$424.0 million for malaria through the GHP account and \$250 million through a one-time transfer of unspent emergency Ebola funding).

[Trump Signs \\$1.3T FY18 Omnibus Spending Bill Following Veto Threat; Experts Examine Bill For Signals About Development Policy](#)

Agency/Program	FY17 Enacted	FY18 President's Budget Request	FY18 House	FY18 Senate	FY18 Final
NIH	\$34.1B	\$26.9B	\$35.2B	\$36.1B	\$37.1B
NSF	\$7.47B	\$6.65B	\$7.3B	\$7.31B	\$7.8B
CDC	\$7.255B	\$5.054B	\$7.056B	\$7.15B	\$8.3B
HRSA	\$6.46B	\$5.8B	\$6.09B	\$6.46B	\$7B
SAMHSA	\$3.765B	\$3.4B	\$3.458B	\$3.77B	\$5.16B
Student Aid					
Pell Grant Maximum	\$5,920	\$5,920	\$5,920	\$6,020	\$6,095
Federal Work Study	\$990M	\$500M	\$990M	\$990M	\$1.13B
SEOG	\$733M	\$0	\$733M	\$733M	\$840M
TRIO	\$950M	\$808M	\$1.01B	\$953M	\$1.01B
NASA					
Science	\$5.76B	\$5.71B	\$5.86B	\$5.6B	\$6.2B
Aeronautics	\$660M	\$624M	\$660M	\$650M	\$685M
Space Tech	\$687M	\$679M	\$687M	\$700M	\$760M
Dept. of Energy					
UR's LLE	\$68M	\$60M	\$68M	\$75M	\$75M
Office of Science	\$5.39B	\$4.47B	\$5.39B	\$5.55B	\$6.26B
ARPA-E	\$306M	\$26M (for agency closeout)	\$0	\$330M	\$353M
NNSA ICF Program	\$523M	\$533M	\$523M	\$545M	\$545M
DoD 6.1 Basic Research	\$2.27B	\$2.2B	\$2.28B	\$2.259B	\$2.34B
NEH	\$150M	\$42M (for agency closeout)	\$145M	\$150M	\$152.8M
NEA	\$150M	\$42M (for agency closeout)	\$145M	\$150M	\$152.8M
IMLS	\$231M	\$23M	\$231M	\$235M	\$240M
CNCS	\$0.31B	\$135M	\$1.03B	\$1.2B	\$1.1B

[PMI, USAID Welcome Kenneth Staley As New U.S. Global Malaria Coordinator](#)

In this statement, Acting Global Malaria Coordinator Irene Koek announces the appointment of Kenneth Staley as the new global malaria coordinator for the U.S. President's Malaria Initiative (PMI). Koek notes, "Dr. Staley's appointment by the White House was announced April 9. A welcome statement by USAID Administrator Mark Green is posted here. ... We look forward to working under the leadership of Dr. Staley to redouble PMI efforts to expand the coverage of proven interventions to people in need, where they live, in rural communities whereby further contributing to shrinking the malaria map..." (4/10).