Technical Update

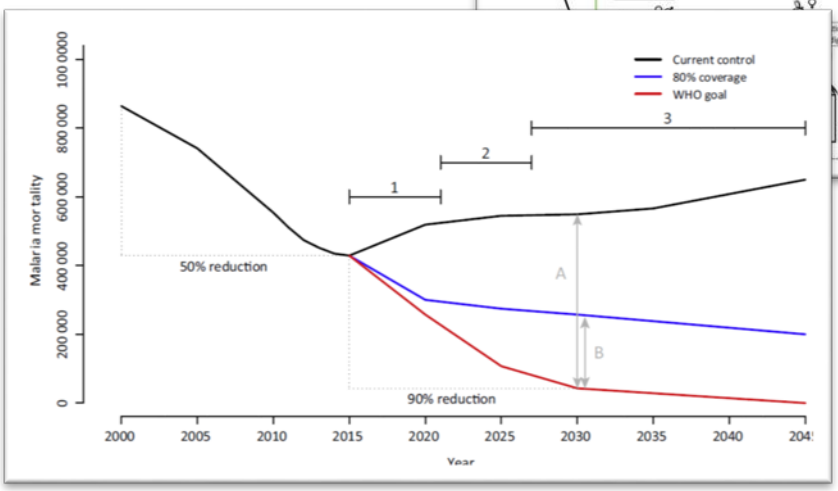
1 AUGUST 2017

Selected Recent Publications

Priorities for Broadening the Malaria Vector Control Tool Kit

Trends in Parasitology in press; Barreaux, Thomas and colleagues

In this opinion piece, the authors layout the tools in development to complement IRS and LLINs (e.g., ATSB, improved housing, livestock targets, next-generation LLINs and IRS). They present an interesting graphic to dispay their modelled estimates of malaria mortality under various scenarios.



Is outdoor vector control needed for malaria elimination? An individual-based modelling study Zhu, Müller, and Beier *Malar J July 2017*

This is an important paper to be aware of given the interest in ATSBs. The authors make some interesting assumptions which warrant some group discussion (particularly regarding their choice of 6 months for LLIN efficacy which is interesting).

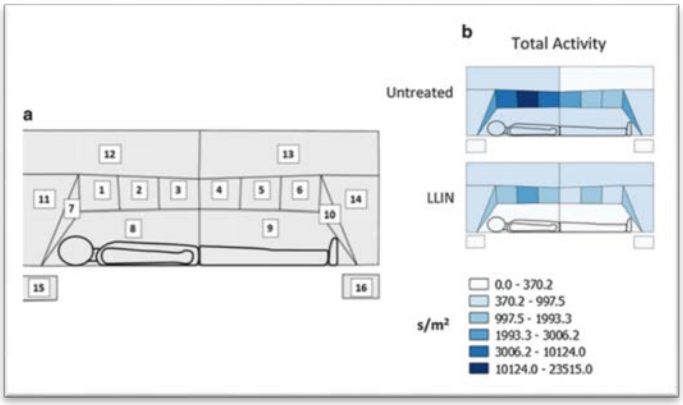
The Anopheles gambiae 2La chromosome inversion is associated with susceptibility to Plasmodium falciparum in Africa

In this paper, the authors demonstrate an association between a chromosomal inversion[1] (referred to as the 2La inversion) is associated with higher malaria infection levels in wild mosquitoes. Mosquitoes carrying the more-susceptible allele (2L+a) are also more likely to be found biting outside houses. Populations with high levels of the 2L+a allele may form reservoirs of persistent outdoor malaria transmission requiring novel measures for surveillance and control.

[1] An inversion is a chromosome rearrangement in which a segment of a chromosome is reversed end to end and occurs when a single chromosome undergoes breakage and rearrangement within itself.

Host-seeking activity of a Tanzanian population of Anopheles arabiensis at an insecticide treated bed net

Malaria Journal Published: 4 July 2017



This paper by Philip McCall and team describes the potential of their infrared video tracking system to record mosquito flight to investigate behaviour of wild mosquito populations under field conditions. They claim to have validated the findings of earlier laboratory studies on mosquito activity at LLINs and discuss the role of multiple brief contacts at the net roof as the critical LLIN mode of action. A range of activities, including flight path, position in relation to the bed net and duration of net contact, were quantified and compared between treatments.

First RNAi Insecticide Approved June 27, 2017

This month, the EPA registered four products that include RNA interference technology intended to control corn rootworms. Could this help pave the way for RNAi products for vectors? The Scientist |

The role of midgut symbiotic bacteria in resistance of Anopheles stephensi to organophosphate insecticides.

Pathog Glob Health. 2017 Jul 26

The results of this study indicated a direct relationship between the presence of bacteria in *An. stephensi* and resistance to temephos. The resistance of *An. stephensi* to temephos could be completely broken artificially by removing their bacterial symbionts in a resistant population.

Progress towards malaria elimination in Zimbabwe with special reference to the period 2003-2015. *Malar J. 24 Jul 2017*

Nice summary of the progress made in Zimbabwe with 20 of the 47 moderate to high burdened districts being upgraded from control to malaria pre-elimination between 2012 and 2015.

Aerial Release of Rhinoncomimus latipes (Coleoptera: Curculionidae) to Control Persicaria perfoliata (Polygonaceae) Using An Unmanned Aerial System. Pest Manag Sci. 21 Jul 2017

As many fields explore the possible role of unmanned systems for surveillance and delivery of interventions, this is an interesting paper reporting the release of weevil to control an invasive weed. This idea of managing pests at specific locations (i.e., precision targeting vector control) is appealing for various reasons. This 3-year study developed and evaluated two unmanned aerial systems for precise aerial release and survivorship of the weevils. The authors claim the system was low cost, logistically practical, and effective.

The invasive shrub Prosopis juliflora enhances the malaria parasite transmission capacity of Anopheles mosquitoes: a habitat manipulation

experiment. Muller, Beier and colleagues; Malaria Journal 5 July 2017

Highlights: "Villages where flowering branches of the invasive shrub *Prosopis juliflora* were removed experienced a threefold drop in the older more dangerous Anopheles females. Population density dropped by 69.4% and the species composition shifted from being a mix of three species of the *Anopheles gambiae* complex to one dominated by *Anopheles coluzzii*. The proportion of sugar fed females dropped from 73 to 15% and males from 77 to 10%."
The authors claim that this study demonstrates how an invasive plant shrub promotes the malaria parasite transmission capacity of African malaria vector mosquitoes and suggest that management of invasive plants could potentially reduce mosquito populations and malaria transmission.

A geo-coded inventory of anophelines in the Afrotropical Region south of the Sahara: 1898-2016 Unreviewed proof: 26 Jul 2017

Background: Understanding the distribution of anopheline vectors of malaria is an important prelude to the design of national malaria control and elimination programmes. A single, geo-coded continental inventory of anophelines using all available published and unpublished data has not been undertaken since the 1960s. The authors have assembled the largest ever geo-coded database of anophelines in Africa, representing a legacy dataset for future updating and identification of knowledge gaps at national levels. The geo-coded database is available on Harvard Dataverse as a reference source for African national malaria control programmes planning their future control and elimination strategies.

After Successful Bed Net Campaigns in Ghana, Creating A Thriving, Sustainable Commercial Market 17 Jul 2017

With free net distribution the commercial market for bed nets in Ghana has disappeared. Ghanaians just can't buy a replacement for a ripped one, or a new net for a new family member. Enter the Private Sector Malaria Prevention program, a project of the Johns Hopkins Center for Communication Programs (CCP). Funded by a three-year, 5 million GBP grant from the United Kingdom's Department for International Development, the aim is to make it so anyone in Ghana can buy an insecticide-treated bed net.

Contemporary status of insecticide resistance in the major Aedes vectors of arboviruses infecting humans.

PLoS Negl Trop Dis. 2017 Jul 20

WHO Publications

DESIGN OF EPIDEMIOLOGICAL TRIALS FOR VECTOR CONTROL PRODUCTS: REPORT OF A WHO EXPERT ADVISORY GROUP

CHÂTEAU DE PENTHES, GENEVA, 24–25 APRIL 2017

This meeting report precedes the manual currently being developed--a WHO manual on trial designs for evaluating new vector control tools that are currently not covered by a WHO policy recommendation, for publication in 2017.

Useful websites and resources

The PATH Innovation Pipeline for Malaria: Transformative tools and approaches for defeating malaria

Published in July 2017, this document is a nice summary of PATH's malaria portfolio. Note page 15 where they mention IVCC and the NgenIRS team.

This is an interesting 20-minute ***video*** describing the human decoy trap which Gay Gibson and Frances Hawkes are exploring with colleagues.

AMCA funded research: In 2015, the American Mosquito Control Association began the Mosquito Research Foundation. Re-named ***the AMCA Research Fund***, the new program seeks to fund research that will lead to new tools and strategies for mosquito surveillance and control, ultimately protecting the public from mosquito-borne disease and discomfort from mosquito bites. Priority research areas include:

- mosquito behavior and ecology;
- arbovirus transmission;
- impacts of pesticides on target and non-target organisms;
- methods of mosquito and arbovirus surveillance and control;
- evaluation of new pesticide products; and
- efficacy and resistance to current pesticides

The AMCA Research Fund is seeking proposals in any of the above areas. Proposals can be submitted from staff at local and state mosquito abatement programs, public and private universities and other qualified research institutions. Early career researchers, including those whose job titles are Assistant Professor, Post-Doctoral Researcher, Ph.D. Candidate, or researchers in county and state government institutions with fewer than 10 years on the job, are particularly encouraged to apply. While projects may build upon previous results, the AMCARF is committed to funding projects one year at a time. Small projects are particularly encouraged, but an upper limit of $55,000 on any one-year of one project has been set.

Recent and upcoming events of note

An LSHTM Event: A Tale of control, campaigns and cunning

Join us for an engaging and informative afternoon to celebrate 120 years since Sir Ronald Ross discovered that mosquitoes transmit the malaria parasite. In honour of his landmark discovery, the Malaria Centre at the London School of Hygiene & Tropical Medicine is hosting the *Mosquito Day World Café*, where you will be able to find out about the impact that mosquitoes have had throughout history.

DATE AND TIME: Fri 18 August 2017; 16:00 – 18:00 BST
London School of Hygiene & Tropical Medicine
Keppel St
London

NEW TECHNOLOGY CONQUERING OLD VECTORS

In the news

Interceptor® G2 launches a new chapter in the fight against malaria and insecticide resistance. It is a new insecticide-treated mosquito net that we started working on with the IVCC and the London School of Hygiene & Tropical Medicine more than a decade ago.
July 28, 2017 Egon Weinmueller

Dengue Fever Cases Top 100,000 In Sri Lanka's Outbreak July 26 in Infectious Disease

Highlighting the need for *Aedes* control tools—Although Sri Lanka eliminated malaria this year, *Aedes* mosquitoes don't care. "More than 107,000 suspected cases of dengue have been reported so far this year, according to Sri Lanka's ministry of health. That's almost twice the number of people diagnosed with dengue in Sri Lanka last year. The death toll from this outbreak is about 300 people, the IFRC says."

Making the case for malaria eradication in a tight budgetary environment
By Catherine Cheney in devex 24 July 2017
This article provides some valuable information and good news regarding 2018 U.S. Government spending on malaria— "the financial year 2018 U.S. foreign affairs budget bill would continue robust funding for the Global Fund at $1.35 billion, the same as enacted for financial year 2017, and for PMI at $755 million, the same as enacted for financial year 2017."

Young scientists bring their anti-malaria invention to Imperial 18 July 2017
Four students who invented a mosquito repellent device spent the day with Imperial malaria researchers finding out about the latest science. The students invented a floating, clear plastic sphere containing a motor and a solar panel to power it. The idea is that the sphere will sit in stagnant water pools, like water butts, and vibrate constantly, disturbing the surface of the water.

Google is changing the face of mosquito mass rearing July 14, 2017

Verily (formerly Google Life Sciences) is Alphabet Inc.'s research organization devoted to the study of life sciences. They have invested in mass rearing of mosquitoes and have developed an automated process to generate one million mosquitoes a week. The company has started releasing the first

batches of what will total 20 million sterilized mosquitoes in Fresno County, California to fight dengue and Zika.

Quotes

"*I have said elsewhere that the Panama Canal is being dug with a microscope, and I believe the same instrument will double the wealth of the Federated Malay States*."

Ronald Ross, 1911.