After Dramatic Decline in Malaria Deaths in Africa, Scientists Plan for Final Eradication: How to win the Endgame Against an Ancient Foe?

At world's largest meeting of malaria experts, evidence of elimination work underway at edge of disease distribution; focus now turns to malaria heartlands

DURBAN, SOUTH AFRICA (10 OCTOBER 2013)—With widespread use of insecticide-treated nets, indoor spraying and potent malaria medications credited with dramatically reducing malaria deaths in Africa, experts at a major malaria conference discussed the potential to use this progress as a springboard for achieving eradication of a disease that still kills some 660,000 people each year—most of them young African children.

"For the first time we have achieved very large-scale vector control coverage in Africa, and these interventions have prevented a large number of deaths and greatly reduced the burden of transmission," said Jo Lines, a malaria expert with the London School of Hygiene & Tropical Medicine who previously led the Vector Control Unit of the World Health Organization's Global Malaria Program. "So while there is a lot of attention still rightly focused on how we can win the battles of today or next week or next year, we can start turning our attention to the longer-term and think about what is needed to win the war."

Lines was one of several malaria experts discussing the road to malaria eradication in Africa at the Sixth Multilateral Initiative on Malaria (MIM) Pan-African Malaria Conference—the world's largest gathering of malaria experts—taking place in Durban, South Africa, 6-11 October 2013. Presentations at MIM, including the symposium Lines chaired on "planning for the endgame in Africa," highlighted how scientists are transitioning from eradication as a lofty aspiration to one that involves an operational plan on the ground.

For example, researchers from South Africa discussed efforts to develop a web site dense with data on local malaria infections, part of the country's effort to fight practically case by case to achieve its goal of eliminating malaria from the country by 2018. And researchers from Namibia presented the results from a joint effort to police malaria with neighboring Angola, an example, they said, of the cross-border initiatives that will be needed across Africa to eliminate malaria from the continent. Other researchers offered new approaches to malaria control they believe may be more "sustainable."

According to an abstract by Chistopher Plowe with the Howard Hughes Medical Institute, vaccines are likely to be essential to malaria elimination, given that vaccines have been part of "nearly all successful" infectious disease eradication efforts and "absent from all unsuccessful campaigns."

THE ELIMINATION CONUNDRUM: MAKING MALARIA GET OUT AND STAY OUT

Lines said that eliminating malaria in Africa requires confronting a range of confounding questions. For example, he noted that increasing access to things like insecticide treated nets and artemisinin combination therapies (ACTs), while crucial to saving lives and reducing disease transmission, comes at a cost: the more they are used, the faster mosquitoes and parasites are likely develop resistance. Also, he said that while malaria transmission patterns are "changing radically" across Africa, it's not always clear why.

For example, he said his research has documented that there was a significant decrease in malaria transmission in parts of Tanzania before these areas saw widespread use of insecticide treated nets. Meanwhile, in parts of Uganda and Malawi, he said transmission has remained intense despite aggressive use of bed nets and better access to effective medications.

"We don't know why these interventions are not working equally well in all places in Africa or why in some areas, like Tanzania, the fight against malaria appears to be aided by some other process," he said. "We do know that when we look back at areas that have eliminated malaria, like the Southern US and Europe, we see that things like land use change, housing and human behavior played a part—potentially a very large part—in conquering the disease."

Lines said eliminating malaria in Africa requires a better understanding of the different factors affecting transmission and also more attention to disease surveillance. Such work is crucial, he said, to ensuring that once malaria is eliminated from a particular region, it doesn't simply re-establish itself when an infected individual migrates from areas where malaria is still common.

“The lesson you want to learn from areas that have eliminated malaria is not just how did you drive it out but how did you keep it out,” he said.

He said elimination might ultimately need to involve some way of reducing the capacity of mosquitoes or humans to transmit the parasite.

For example, there is work underway today to develop a vaccine that would interrupt the life-cycle of the malaria parasite by preventing it from passing from humans back to mosquitoes. Other efforts have focused on the potential of genetically modified mosquitoes that are rendered incapable of passing along the parasite.

EYES ON THE PRIZE: ELIMINATION VIA DISEASE SURVEILLANCE

In South Africa, which hopes to eliminate malaria by 2018, tracking the total number of infections, recording where they are occurring and following-up to confirm details such as travel history and symptoms is a cornerstone of the country’s elimination strategy. South Africa’s intensive malaria surveillance program includes a website that is constantly updated and features an outbreak alert system and an automated mapping program that can depict malaria cases down to the local level.

A study by Bridget M. Shandukani with South Africa’s National Department of Health found that this type of meticulous surveillance, while costly and labor-intensive, is essential to finishing off malaria in countries like South Africa that have reduced malaria transmission to relatively low levels. She and her colleagues reported that during the 2012-2013 season, all nine of the districts in South Africa at risk for malaria entered into elimination mode, “reporting local case incidences of less than one case per one thousand population at risk.”

Meanwhile, researchers from Namibia presented a study that highlights the importance of cross-border initiatives for countries targeting elimination. They noted that most of the malaria cases in northern Namibia are “imported from southern Angola.” The study examined the effectiveness of a program—the Trans Kunene Malaria Initiative—that implemented a host of interventions in a 20-square kilometer region on both sides of the Namibia-Angola border.

The interventions included long-lasting insecticide treated bed nets, rapid diagnostic tests, community education and case management. Also, both governments agreed to remove customs duties from malaria “commodities,” including bed nets and chemicals used for indoor spraying programs.

The study, presented at MIM and led by Constance Njovu with the JC Flowers Foundation’s Isdell:Flowers Cross Border Malaria Initiative, noted that both areas targeted achieved a significant reduction in malaria.

“These results show that cross-border work is both critical to elimination of malaria and possible despite (involving) different national governments with language and cultural differences,” the scientists reported.

Meanwhile, researchers from the University of Pretoria focused on developing “sustainable” tools for malaria control, which they view as crucial to creating more durable reduction in illness and death and thus a more stable platform from which to pursue malaria eradication.

A study by Leo Braack with the University’s Center for Sustainable Malaria Control (CSMC) investigated night-time mosquito biting behavior outdoors, which, given the effectiveness of bed nets, are where an increasing proportion of malaria infections occur. The study found that most bites happen at or near ground level. Braack and his colleagues concluded that simply wearing mosquito-repellent anklets “holds the potential to lower malaria incidence.”

The CSMC’s Taneshka Kruger along with colleagues at the University’s Institute of Applied Materials sought to address limits to bed nets and indoor spraying as control measures: one has to be sleeping under a bed net to enjoy its protection, they noted, while indoor spraying is costly and raises fears of exposure to toxic chemicals. They found that lining interior doors with a mesh fabric treated with a slow-releasing insecticide was a safe, effective and potentially inexpensive form of long-lasting malaria control.

The Multilateral Initiative on Malaria (MIM) (http://www.mimalaria.org/eng/), launched in Dakar, Senegal in 1997, is an international alliance of organizations and individuals seeking to maximize the impact of scientific research against malaria in Africa to ensure that research findings yield practical health benefits. The MIM conference in Durban follows successful conferences held in Yaoundé, Cameroon, in November 2005, and in

Nairobi in October 2009. The MIM Secretariat is currently hosted by the Biotechnology Centre of the University of Yaoundé I/Amsterdam Medical Centre.

Media Contacts:

South Africa
Louis Da Gama: +44-7990810642, ldagama@gmail.com
Jessica Rockwood: +27-793517881, jessicarockwood@verizon.net
Geoffrey So: +27-728367853, gso@rbmny.org
Jennifer Jackson: +27.835987778, jennifer.jackson@mrc.ac.za
Keletso Ratsela: +27.828048883, keletso.ratsela@mrc.ac.za

Senegal
Fara Ndiaye: +221.773328863, fara.ndiaye@speakupafrica.org

France
Michel Aublanc: +33-608719795, michel.aublanc@orange.fr

Switzerland
Pru Smith: +41-227914586, smithp@who.int

United Kingdom
Alex Fullem: +44-7787404884, afullem@path.org

USA
Geoffrey So: +1-3479320820, gso@rbmny.org
Trey Watkins: +1-6466266054, kwatkins@rbmny.org

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