PRESS RELEASE

Protecting houses against mosquitoes with netting window screens can suppress malaria vector populations and dramatically reduce human parasite infection prevalence

(Liverpool, Dar es Salaam, March 21 2019) In an article published today in *Lancet Planetary Health*, a team from the Ifakara Health Institute (IHI) and Liverpool School of Tropical Medicine (LSTM), provides evidence that even window screens with no insecticide suppressed mosquito populations and dramatically reduced malaria prevalence in the Tanzanian city of Dar es Salaam[1]. The study team has also worked with local and national government partners for over a decade to develop practical affordable implementation systems for community-based application of environmentally-friendly biological insecticides that selectively kill mosquito larvae in puddles, drains, river fringes, ponds and other sundry stagnant water bodies[2].

Dr Prosper Chaki, who co-led the study, says "We are pleased that our efforts over all these years have culminated in government-funded scale up of larviciding, first across all of Dar es Salaam, and then to all major urban centres in Tanzania. Also, our government has invested domestic treasury funding into construction of a manufacturing plant for biological control products in Kibaha, just outside the city, which is now fully operational." However, previous external analyses of the first large-scale pilot in Dar es Salaam indicated that larviciding only reduced malaria prevalence by 21%[3]. Furthermore, this previous analysis[3] provided no explanation for the much larger reductions of malaria prevelance that occurred over the study period, which steadily declined from >28% in 2004 to <2% by 2008.

The IHI and LSTM team therefore re-assessed these epidemiological data to see how much of this remarkable 97% drop in malaria prevalence could be attributed to other factors. Only the coverage of complete window screening consistently increased to levels high enough to have any meaningful impact. While only 40% of houses had complete window screening at the start of the study in 2004, coverage had more than doubled to 86% by 2008. This surprisingly rapid scale up of window screening coverage was unplanned and spontaneous, implemented by households at their own expense, using flexible plastic screening which they found easy to install[4].

This steady rise in window-screening coverage was statistically associated with a 92% reduction of malaria prevalence amongst residents, accounting for most of the spectacular overall decline in malaria prevalence. "Good-quality housing is a crucial factor in reducing malaria transmission across the spectrum of malaria endemicity." says Dr Emmanuel Chanda at the World Health Organization Regional Office for Africa in Brazzaville, Congo. In his supporting editorial[5], he continues "Killeen and colleagues' findings fall within the context of research efforts to provide hard evidence for the public health value of house screening.". Interestingly, mosquito biting rates were also reduced by as much as 92%, and impact was greatest for the most efficient malaria vector species that depend heavily on human blood.

"People who live with mosquitoes protect themselves by taking advantage of any products they can access and afford." says Dr Nicodem Govella, a co-author of the study who also develops new methods

for measuring just how much mosquitoes prefer and depend on human blood[6]. He continues “Here is an encouraging example from the citizens of Dar es Salaam, who spent millions of dollars of their own money to protect their houses and families, but also protected their neighbours by making life tougher for mosquitoes”.

In addition to revealing the remarkable contribution of window screens to this near-collapse of malaria transmission, this re-analysis also yielded a more encouraging estimate for the impact of regular larvicide application. Larviciding halved malaria prevalence by reducing malaria vector abundance, consistent with subsequent evaluations of scale up across the remainder of the city[7,8].

In addition to demonstrating that mosquito-proofed window screening may have far greater impacts upon malaria than previously thought, these observations also challenge the view that it is too expensive and impractical for widespread use in poor countries[9]. “While Dar es Salaam is a big city, we think our observations also have important implications for rural Africa.”, says Dr Gerry Killeen who led the study.

“Historically, most rural African houses have been made with mud and sticks for the walls and grass thatch for the roofs. Mosquitoes readily entered through the eave gaps between the wall and roof, which were left open for ventilation because these simple house designs lacked windows. However, Africa is changing faster than ever before, and that picture is rapidly becoming outdated across much of the continent. Houses ventilated by windows and built with bricks, timber and iron sheets are increasingly common even in rural Africa. The people who live with mosquitoes and malaria invest as much as they can in better houses, which are easier to protect with readily-available netting materials”. “This study shows how the relatively simple intervention of installing window screens was taken up beyond a research study setting and led to a remarkable reduction in malaria infections in the wider community. These findings demonstrate that it can take more than a decade for research to have a real impact on the communities that need it most”, says Branwen Hennig, Senior Portfolio Lead at the Wellcome Trust one of the major sponsors for the study.

The authors also note that ongoing housing improvements across rural Africa are closely associated with declining malaria burden[10-12] and that even bigger reductions may be possible if they could be treated with insecticides[1,13-15].

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A typical example of improved housing beside a mosquito-producing rice field in rural Tanzania, constructed using bricks, timber and iron sheeting plus netting screens fitted over the windows.

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About the Ifakara Health Institute (www.ihi.or.tz)

Ifakara Health Institute (IHI) is a leading research organization in Africa, with strong track records in developing, testing and validating innovations for health. We are driven by core strategic mandate for research, training and services. The institute's work spans across a wide spectrum of sciences including biomedical and ecological sciences, intervention studies, health-systems research, monitoring and evaluation and policy translation. IHI has a history of more than 50 years. It is an independent non-profit organisation registered in Tanzania.

About the Liverpool School of Tropical Medicine (www.lstmed.ac.uk)

Liverpool School of Tropical Medicine (LSTM), founded in 1898, was the first institution in the world dedicated to research and teaching in the field of tropical medicine. As a registered charity, we work across the world, often in very difficult circumstances, to fulfil our mission of reducing the burden of sickness and mortality in disease endemic countries. We do that through the delivery of effective interventions which improve human health and are relevant to the poorest communities.

About the United States Agency for International Development (www.usaid.gov)

USAID leads international development and humanitarian efforts to save lives, reduce poverty, strengthen democratic governance and help people progress beyond assistance. U.S. foreign assistance has always had the twofold purpose of furthering America's interests while improving lives in the developing world. USAID carries out U.S. foreign policy by promoting broad-scale human progress at the same time it expands stable, free societies, creates markets and trade partners for the United States, and fosters good will abroad. USAID works in over 100 countries to promote global health, support global stability, provide humanitarian assistance, catalyze innovation and partnership and empower women and girls.

About the Bill & Melinda Gates Foundation (www.gatesfoundation.org)

Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. In developing countries, it focuses on improving people's health and giving them the chance to lift themselves out of hunger and extreme poverty. In the United States, it seeks to ensure that all people—especially those with the fewest resources—have access to the opportunities they need to succeed in school and life. Based in Seattle, Washington, the foundation is led by CEO Sue Desmond-Hellmann and Co-chair William H. Gates Sr., under the direction of Bill and Melinda Gates and Warren Buffett.

About the Wellcome Trust (www.wellcome.ac.uk)

Wellcome exists to improve health by helping great ideas to thrive. We support researchers, we take on big health challenges, we campaign for better science, and we help everyone get involved with science and health research. We are a politically and financially independent foundation.

About Valent BioSciences LLC (www.valentbiosciences.com)

At Valent BioSciences, our focus is on building the strongest portfolio of biorational solutions to improve agricultural productivity, protect public health, and keep our forests beautiful. It's all part of our commitment to creating value for our customers around the world-and doing so in a sustainable way. We invite you to explore our offerings and learn how Valent BioSciences can help you make a positive difference in your world.

Supporting Material

1. Killeen GF, Govella NJ, Mlacha Y, Chaki PP. Suppression of malaria vector densities and human infection prevalence associated with scale-up of mosquito-proofed housing in Dar es Salaam, Tanzania: re-analysis of an observational series of parasitological and entomological surveys. *Lancet Planet Health* 2019; **3**: e132-43; http://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(19)30035-X/fulltext.
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