Modeling novel strategies to block malaria transmission: Stopping *Plasmodium* parasites within the mosquito

Douglas G. Paton[1] **Lauren M. Childs**[2] **Maurice A. Itoe**[1] **Inga E. Holmdahl**[1] **Caroline O. Buckee**[1] **Flaminia Catteruccia**[1]

[1] *Harvard T.H. Chan School of Public Health, 677 Huntington, Ave, Boston, MA 02115*

[2] *Virginia Tech, 225 Stanger Street Blacksburg, VA, US, 24061*

lchilds@vt.edu

Transmission of the deadly parasite *Plasmodium falciparum* between humans requires a bite by an infectious *Anopheles* mosquito. As a result, these bites result in hundreds of thousands of deaths each year. Mass distribution of insecticide-treated bed nets have vastly reduced the burden of malaria in recent years, but widespread insecticide resistance in *Anopheles* populations has begun to be observed. Novel tools that differ from fast-acting insecticides are needed to combat malaria transmission and avoid a resurgence in malaria related deaths. Here, we use recent evidence on compounds that target biological processes key to malaria transmission [1] or directly target the parasite in the mosquito [2] in a discrete-time model of *Anopheles* mosquito population dynamics and malaria transmission. Incorporating these types of effects into our model predicts that the inclusion of these compounds on mosquito nets would significantly reduce the burden of malaria across all ranges of prevalence and levels of insecticide resistance. These compounds show great promise in preventing transmission of the malaria parasite without completely abrogating the *Anopheles* mosquito population. Such novel effective tools with lower ecological impact are urgently needed.

References

[1] L. M. Childs, F. Y. Cai, E. G. Kakani, S. N. Mitchell, D. Paton, P. Gabrieli, C. O. Buckee, and F. Catteruccia, *Disrupting Mosquito Reproduction and Parasite Development for Malaria Control*. PLOS Pathogens, 12(12):e1006060, 2016.

⋆Mini-Symposium: Advances in modeling vector-borne neglected tropical diseases

[2] D. G. Paton, L. M. Childs, M. A. Itoe, I. E. Holmdahl, C. O. Buckee, and F. Catteruccia, *Exposing Anopheles mosquitoes to antimalarials blocks Plasmodium parasites transmission*. Nature, accepted 2019.