Investigating the influence of density-dependent development of *Aedes aegypti* on *Wolbachia*-based control programs

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The mosquito species *Aedes aegypti* is responsible for transmitting dengue fever and Zika virus to humans throughout tropical and subtropical regions of the world. Populations of *Ae. aegypti* are known to be regulated by density-dependent processes that take place primarily in the juvenile aquatic stages of the mosquito's life as a result of competition for limited resources. Density dependence is most often assumed to impact survival of *Ae. aegypti* larvae, and an extensive amount of empirical and modeling work has investigated the role of density-dependent survival in mosquito population regulation and its potential impact on mosquito control programs. It is possible, however, that density dependence could drive other aspects of mosquito life history such as development time of juvenile mosquitoes, and this too could have important consequences for mosquito control strategies. To investigate the impact of density-dependent larval development on mosquito control, we have developed an ordinary differential equations model to study *Ae. aegypti* population control by introduction of the bacterium *Wolbachia*, which impacts the lifespan and egg production of wild mosquito populations and has the potential to interfere with virus transmission. We consider various relationships between density and larval development and compare the influences on mosquito population size and the success of *Wolbachia* introductions of density-dependent development with those of density-dependent survival. The results of this study help provide insights into appropriate control measures under different assumptions about the relationship between density and population regulation.

⋆Mini-Symposium: Density dependence in mosquito populations: implications for control