Mosquito-based method to reduce dengue could be highly cost-effective in Singapore

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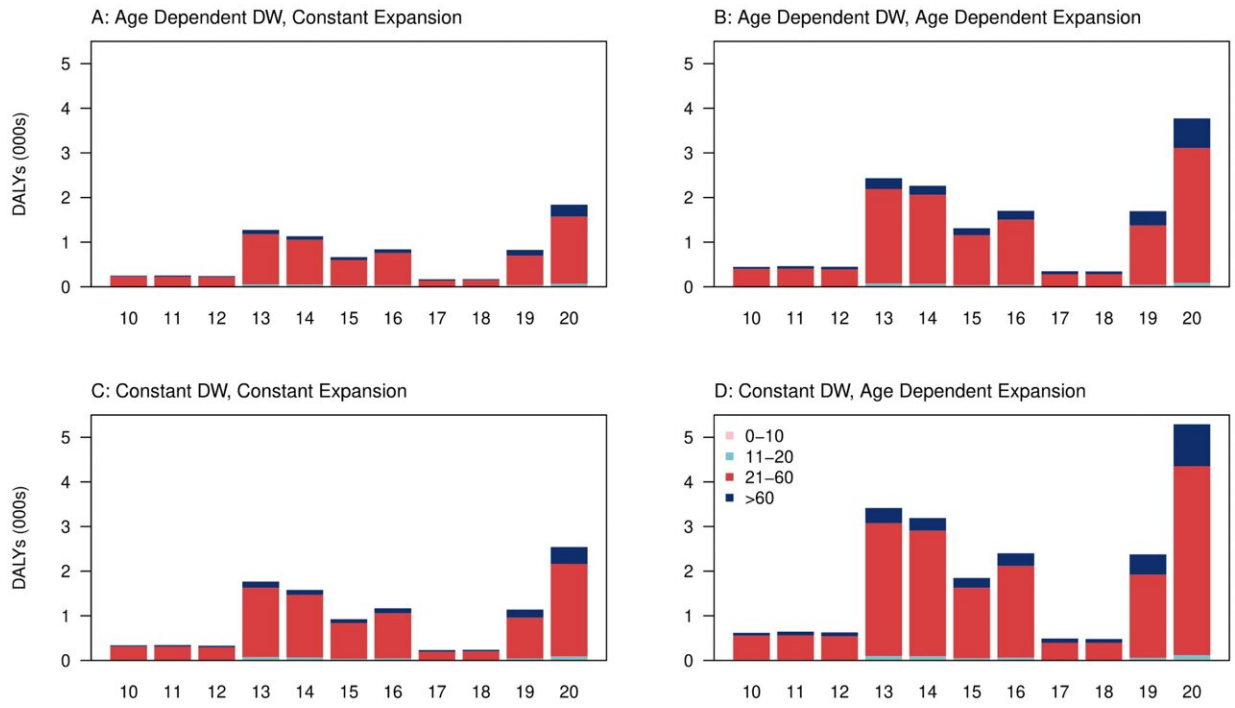

Estimated disability-adjusted life years (DALYs, in thousands) caused by dengue each year from 2010 to 2020 in Singapore under different scenarios: A) age dependent disability weights (DW), constant expansion factors B) age dependent disability weights, age dependent expansion factors C) constant disability weights, constant expansion factors D) constant disability weights, age dependent expansion factors. Credit: Soh et al., 2021, CC-BY 4.0 (creativecommons.org/licenses/by/4.0/)

New research suggests that dengue—a viral infection spread by mosquitos—could be suppressed in Singapore in a highly cost-effective manner through the release of mosquitos infected with the bacterium Wolbachia. Stacy Soh of the National Environment Agency in Singapore and colleagues present these findings in the new open-access journal *PLOS Global Public Health* on October 13, 2021.

Singapore experiences periodic dengue outbreaks, including a 2020 outbreak that peaked at 1,792 weekly cases. Mosquitos infected with the natural bacterium Wolbachia are less likely to spread dengue, and evidence suggests that dengue can be suppressed by releasing Wolbachia-infected mosquitos into local mosquito populations. However, the overall cost-effectiveness of this strategy had not been studied.

To evaluate the potential cost-effectiveness of Wolbachia suppression in Singapore, Soh and colleagues first used economic and epidemiological data to calculate the impact of dengue in the country from 2010 through 2020. They estimated that, over that 10-year period, dengue cost Singapore between $1.014 to $2.265 billion in 2010 U.S. dollars, as well as 7,645 to 21,262 disability adjusted life years (DALYs)—total years of human life lost to illness, disability, or death.

Next, the researchers calculated the hypothetical cost of a Wolbachia program over the same 10-year period. They considered a strategy in which Wolbachia-infected males would have been released, as opposed to infected females, in hopes of suppressing existing mosquito populations. In this scenario, the researchers modeled a minimum of 40 percent efficacy, in line with results from real-world studies.

The researchers calculated that, under such a program, averting a single DALY would cost $100,907, for a total of $329.40 million saved overall. The authors note that future work could help refine these cost estimates. For instance, future research could address how a Wolbachia

suppression program might unfold in the context of distribution of a newly developed dengue vaccine, or alongside other existing vector control efforts, such as eliminating mosquito breeding sites.

Regardless, the authors consider their estimates indicate that a Wolbachia program would be highly cost-effective and suggest that its rollout be prioritized in Singapore to suppress the spread of dengue.

Author Dr. Lim summarizes: "The release of Wolbachia-infected mosquitoes is a promising disease intervention strategy that aims to control dengue and other arboviral infections, however, the overall cost-effectiveness of the technology is not well studied under the suppression approach that aims to suppress the wild-type mosquito population through the release of Wolbachia-infected males. Using Singapore as the primary case example, this study found that the Wolbachia releases in Singapore are expected to be highly cost-effective and its rollout must be prioritized to reduce the onward spread of dengue."

More information: Soh S, Ho SH, Seah A, Ong J, Dickens BS, Tan KW, et al. (2021) Economic impact of dengue in Singapore from 2010 to 2020 and the cost-effectiveness of Wolbachia interventions. *PLOS Glob Public Health* 1(10): e0000024. doi.org/10.1371/journal.pgph.0000024