

Larval source management

We expect that reading the full report will be helpful for:

Organizations or individuals seeking a starting point for further LSM research

Context

In March 2023, GiveWell commissioned Rethink Priorities to conduct research on larval source management (LSM): a class of interventions that target mosquito larvae to reduce the burden of vector borne diseases such as malaria, as well as yellow fever, Zika, dengue, and chikungunya. LSM interventions include 1) larviciding, 2) habitat modification, 3) habitat manipulation, and 4) biological control.

We provided GiveWell with a broad overview of the cause area, including: evidence for effectiveness, room for more funding, and coverage by existing implementers. We did not investigate the expected costs of LSM. Zzapp was excluded from the scope of our research.

Research process

Over the course of five weeks, we:

- Reviewed academic literature that measures the effectiveness of LSM
- Spoke to three experts in academia and implementing organizations
- Reviewed gray literature to understand the scope of existing LSM efforts

Final report and key takeaways

Based primarily on concerns about tractability and effectiveness, we do not think LSM should be prioritized for grantmaking.

We remain uncertain about the effectiveness of LSM. Most studies do not directly measure key outcomes of interest (i.e., malaria incidence, prevalence, or mortality), but rather use entomological endpoints (e.g., larval density) as proxies. Additionally, there is significant variance in results (compiled [here](#)). Both of these factors limit our ability to interpret the data.

With this caveat, our tentative conclusion is that, at best, larviciding might be considered a supplement to other malaria interventions in specific contexts. In more detail:

- The evidence base for larviciding appears to be stronger than for habitat modification and manipulation. There is insufficient evidence to support the use of biological control.
- Crudely averaging nine results for the effects of larvicide on malaria transmission, we estimate an odds ratio of 0.59, but we believe our methodology could be improved in several ways that might affect this result. Our impression is that the effectiveness of larviciding is very dependent on the character of local mosquito breeding sites: where these are “few, fixed and findable,” the impact may be as much as we estimate, but in other contexts, larvicide may be ineffective.

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- Using the same methodology for habitat manipulation and modification, averaging the results of four studies yields an estimated odds ratio of 0.77. However, two of four studies show no effect, which reduces our confidence about whether this type of LSM reduces malaria transmission.

It's possible that there are situations in which specific conditions may make the relative effectiveness of larviciding higher, such as:

- Where mosquitoes display outdoor biting/resting behaviors, making mosquito nets and indoor residual spraying less effective. Similarly, insecticide resistance may reduce the impact of these interventions.
- Where there are efforts to contain the spread of *Anopheles stephensi* across Africa, because this mosquito species establishes itself in man-made, urban environments.

With regard to room for more funding, we identified that LSM is being used at scale in Ghana and Tanzania, and estimate that this is equivalent to < 1% coverage of the global population at risk of malaria. Implementation elsewhere is limited in scope and ad hoc, such that it's highly likely that overall coverage is less than 5%. Our calculations can be found in [this spreadsheet](#). Our very low confidence estimate of potential market size is 300 million people, or 9% of the total population at risk of malaria.

We identified five NGOs with current or recent LSM programs: Janhit NGO, Medicins Sans Frontiers, the MENTOR initiative, Malaria Consortium, and MCD Global Health. We note that these NGOs are not LSM-specific organizations, and their LSM programs focus on specific districts/villages in isolated countries. Our report also briefly catalogs some efforts to leverage drones for LSM, for both mapping breeding sites and applying larvicides.

Historically, it seems that major funders in the malaria community allocated very little or no funding to LSM implementation before 2020. We estimate that these funders are probably now spending less than \$10 million per year on LSM, but it seems very likely that this will increase substantially in the coming years as LSM is seen as a means to combat the spread of *Anopheles stephensi*.

Beyond spending on implementation, we estimate that research funding may amount to \$2 million - \$4 million per year, though this is a low confidence estimate due to the incompleteness of underlying funding information (compiled [here](#)) and uncertainty about how the pandemic affected recent projects. There may also be additional spending in larvicide product development, though we do not estimate this.