

Publication

A crossover study to evaluate the diversion of malaria vectors in a community with incomplete coverage of spatial repellents in the Kilombero Valley, Tanzania

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Malaria elimination is unlikely to occur if vector control efforts focus entirely on transmission occurring indoors without addressing vectors that bite outdoors and outside sleeping hours. Additional control tools such as spatial repellents may provide the personal protection required to fill this gap. However, since repellents do not kill mosquitoes it is unclear if vectors will be diverted from households that use spatial repellents to those that do not.; A crossover study was performed over 24 weeks in Kilombero, Tanzania. The density of resting and blood-engorged mosquitoes and human blood index (HBI) of malaria vector species per household was measured among 90 households using or not using 0.03% transfluthrin coils burned outdoors under three coverage scenarios: (i) no coverage (blank coils); (ii) complete coverage of repellent coils; and (iii) incomplete coverage of repellent and blank coils. Mosquitoes were collected three days a week for 24 weeks from the inside and outside of all participating households using mosquito aspirators. Paired indoor and outdoor human landing collections were performed in three random households for six consecutive nights to confirm repellent efficacy of the coils and local vector biting times.; The main vectors were *Anopheles arabiensis* and *Anopheles funestus* (sensu stricto), which fed outdoors, outside sleeping hours, on humans as well as animals. *Anopheles arabiensis* landings were reduced by 80% by the spatial repellent although household densities were not reduced. The HBI for *An. arabiensis* was significantly higher among households without repellents in the incomplete coverage scenario compared to houses in the no coverage scenario (Odds ratio 1.71; 95% CI: 1.04-2.83; $P = 0.03$). This indicated that *An. arabiensis* mosquitoes seeking a human blood meal were diverted from repellent users to non-users. The repellent coils did not affect *An. funestus* densities or HBI.; Substantial malaria vector activity is occurring outside sleeping hours in the Kilombero valley. Repellent coils provided some protection against local *An. arabiensis* but did not protect against local (and potentially pyrethroid-resistant) *An. funestus*. Pyrethroid-based spatial repellents may offer a degree of personal protection, however the overall public health benefit is doubtful and potentially iniquitous as their use may divert malaria vectors to those who do not use them.

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