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Comparing methods for novel insecticide-treated net evaluation for malaria control

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Our research compares two important evaluation methods for insecticide-treated nets (ITNs): semi-field Ifakara Ambient Chamber tests (I-ACT) and experimental hut trials. Using mathematical modelling and Bayesian inference, we analysed how these different bioassays affect assessment outcomes of ITN efficacy against *Anopheles gambiae* and predictions of reduced malaria transmission. While I-ACT and experimental huts show different patterns in estimating specific mosquito behavioral responses, both methods ultimately yield similar predictions for overall reduction in vectorial capacity—a key metric for disease control transmission potential. This finding has significant implications for ITN evaluation strategies, suggesting that semi-field tests can provide reliable initial assessments of vector control efficacy with advantages of faster data collection and flexibility in testing different mosquito strains. Our modelling framework allows for location-specific predictions by incorporating regional vector behaviour patterns, offering a valuable tool for comparing ITN performance across diverse settings. As the malaria control landscape evolves with new dual-active ingredient nets, this approach can help assist country programs in selecting the most appropriate interventions for their specific contexts. This research advances our understanding of how bioassay evaluations translate to real-world effectiveness, supporting more efficient development and deployment of vector control tools.

Keywords: Medical entomology, Epidemiology, Semi-field, Bayesian inference