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Analysing relationships between pesticide use and insecticide resistance in mosquito vectors of malaria

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Prevalence of Plasmodium falciparum, the parasite that causes the deadliest form of malaria, decreased significantly between 2000 and 2015. This indicates that the increased use of malaria control treatments such as house spraying and impregnated bednets are effective. However, there is evidence for insecticide resistance in mosquito vectors of malaria, which threatens directly the human population in malaria regions. This study introduces a method to analyse relationships between pesticide use and insecticide resistance in mosquito vectors of malaria in Sub-Saharan Africa. For the analysis it is essential to know how much pesticides are used. These data are lacking for Sub-Saharan Africa and therefore co-variates that have a strong relationship with pesticide use (e.g., crop type, crop growth, income) are used to create a map on the potential pesticide use. Besides pesticide use, it is essential to know where pesticides end up in the environment. Pesticide models are dominantly calibrated and validated in areas with a temperate climate. In Sub-Saharan Africa, which is dominated by tropical climates, the application and residues of pesticides can act differently. From a literature review on pesticide models, most dominant factors that influence the application and fate rate of pesticides were selected. These factors are used to analyse where pesticides end up in the environment. The areas where malaria control treatments result in malaria resistance are related to the potential pesticide use and the areas where pesticides end up in the environment. In this way, recommendations on malaria control treatments can be provided and measures in terms of pesticide use can be taken.