

Assessing the Role of Human Mobility on Malaria Transmission in South Sudan

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Abstract : Over the past few decades, the unprecedented increase in mobility has raised considerable concern about the relationship between mobility and vector-borne diseases and malaria in particular. Thus, one can claim that human mobility is one of the contributing factors to the resurgence of malaria. To assess human mobility on malaria burden among hosts, we formulate a movement-based model on a network of patches. We then extend human multi-group SEIAR deterministic epidemic models into a system of stochastic differential equations (SDEs). Our quantitative stochastic model which is expressed in terms of average rates of movement between compartments is fitted to time-series data (weekly malaria data of 2011 for each patch) using the maximum likelihood approach. Using the metapopulation (multi-group) model, we compute and analyze the basic reproduction number. The result shows that human movement is sufficient to preserve malaria disease firmness in the patches with the low transmission. With these results, we concluded that the sensitivity of malaria to the human mobility is turning to be greatly important over the implications of future malaria control in South Sudan.

Keywords : basic reproduction number, malaria, maximum likelihood, movement, stochastic model

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