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Geostatistical modelling of household malaria in Malawi

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Malaria is one of the most important diseases in the world today, common in tropical and subtropical areas with sub-Saharan Africa being the region most burdened, including Malawi. This region has the right combination of biotic and abiotic components, including socioeconomic, climatic and environmental factors that sustain transmission of the disease. Differences in these conditions across the country consequently lead to spatial variation in risk of the disease. Analysis of nationwide survey data that takes into account this spatial variation is crucial in a resource constrained country like Malawi for targeted allocation of scare resources in the fight against malaria. Previous efforts to map malaria risk in Malawi have been based on limited data collected from small surveys. The Malaria Indicator Survey conducted in 2010 is the most comprehensive malaria survey carried out in Malawi and provides point referenced data for the study. The data has been shown to be spatially correlated. We use Bayesian logistic regression models with spatial correlation to model the relationship between malaria presence in children and covariates such as socioeconomic status of households and meteorological conditions. This spatial model is then used to assess how malaria varies spatially and a malaria risk map for Malawi is produced. By taking intervention measures into account, the developed model is used to assess whether they have an effect on the spatial distribution of the disease and Bayesian kriging is used to predict areas where malaria risk is more likely to increase. It is hoped that this study can help reveal areas that require more attention from the authorities in the continuing fight against malaria, particularly in children under the age of five.