242

Mapping malaria vectors to inform malaria control in Limpopo, Mpumalanga and KwaZulu-Natal, South Africa using climate driven models

South Africa was targeted for malaria elimination by 2020. To eliminate malaria, understanding of the overlap between areas suitable for malaria and the distribution of competent vectors is crucial. Studies have looked at the potential current distribution of malaria vectors across Africa but our understanding of how this may change under future climate scenarios is still limited. Studies looking specifically at South Africa are also lacking. We aimed to develop a more detailed understanding of the drivers that influence malaria vector occurrence and how their distributions may change as the climate changes in Limpopo, Mpumalanga and KwaZulu-Natal in South Africa.

We have collated records of species occurrences in Africa from 1990-2020 for five vector species. Eleven abiotic variables were sourced from WorldClim and Chen et al. (2020). To project suitability for vectors in the future we used climate projections utilising the SSP245 and SPP370 scenarios. For future land use projections, we used predictions utilising the SSP245 and SSP360 scenarios. Malaria vector occurrence data was used to train species distribution models, using presence-only modeling techniques and an ensemble modelling approach using five pseudo-absence techniques. Models were evaluated using a range of metrics to select the best model according to its predictive performance.

For An. gambiae and An. funestus models, annual precipitation was the most important variable explaining 54-64% of the variance. For An. arabeinsis annual precipitation was the most important variable explaining 49% of the variance and percentage cover of broadleaf evergreen trees was the second most important variable explaining 15% of the variance. We also find that areas of high suitability predicted in our model do tend to fall within expert elicited ranges of each species from previous studies. Future projections of suitability in the three focal provinces highlight an increase in suitable sites for all three vector species. Our models predict increased suitability for multiple malaria vector species in Limpopo, Mpumalanga and KwaZulu-Natal in South Africa under future land use and climate scenarios, highlighting a potential increase in malaria burden in these areas.