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“Reconcile land system changes
with planetary health”

Role of climate and land-use changes in the risk of emerging mosquito-borne zoonotic diseases in Africa

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Abstract

Africa's tropical climate and biodiverse ecosystems provide favourable conditions for emerging zoonotic pathogens. Increasingly, climate variability and land-use changes alter socio-ecological conditions and intensify interactions between livestock, humans, and disease vectors. Wesselsbron virus (WSLV), Sindbis virus (SINV), and Middelburg virus (MIV) are neglected arboviruses that have caused disease outbreaks among livestock and humans in Africa, yet their ecological risk drivers remain poorly understood. In particular, disease risk is often not explored in combination with knowledge about the ecology of vector species that play a crucial role in the distribution of zoonotic viruses. In this study, we developed species distribution models that indicate current and future ecological hotspots for WSLV, SINV, and MIV transmission in Africa. We integrated ecological variables, including climate, land-use, livestock, and human density data, with findings about the ecological niches and predicted distribution of known vectors: *Aedes circumluteolus* and *Aedes mcintoshi* for WSLV; *Culex univittatus* and *Culex pipiens* for SINV; and *Mansonia africana* and *Aedes mcintoshi* for MIV. We modelled the probable distribution of zoonotic diseases for the current conditions (2015) and future scenarios (2021–2040). Our analyses show that changing patterns in precipitation, especially precipitation in dry and warm seasons, urbanisation, human population, livestock density, and climate change exacerbate the expansion of the ecological niches of vectors as well as disease risk. We identify high-risk zones in eastern and southern Africa that may become future hotspots under ongoing climate and land-use change. These findings support targeted, One-Health-based surveillance and intervention strategies that integrate environmental, agricultural, and public health systems in Africa.

Keywords: Africa, climate, emerging, land-use, mosquito-borne, zoonoses