

Spatial determinants of Ebola virus disease risk for the West African epidemic

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Although many studies have investigated the probability of Ebola virus disease (EVD) outbreaks while other studies have simulated the size and speed of EVD outbreaks, few have investigated the environmental and population-level predictors of Ebola transmission once an outbreak is underway. Identifying strong predictors of transmission could help guide and target limited public health resources during an EVD outbreak. A Bayesian hierarchical Poisson model was used to estimate EVD risk and to evaluate the spatial variability explained by the selected predictors. We categorized our predictors into terciles, and found that districts had greater risk of EVD with increasing proportion of households not possessing a radio (RRRadio2 2.79, 0.90-8.78; RRRadio3 4.23, 1.16-15.93), increasing rainfall (RRRainfall2 2.18; 95% credible interval 0.66-7.20; RRRainfall3 5.34, 1.20-23.90), urban land cover (RRUrban2 4.87, 1.56-15.40; RRRUrban3 5.74, 1.68-19.67), and years of education (RREducation3 1.58, 0.40-6.25). We found that districts with higher proportion of radio ownership had reduced EVD transmission risk, suggesting that the use of radio messaging for control and prevention purposes may have been crucial in reducing the EVD transmission risk in certain districts, a potential modifiable risk factor for future outbreaks. Additionally, in areas with low proportion of radio ownership, public health authorities may need to develop and introduce different communication strategies. Future research should examine the etiologic relationships between the identified risk factors and human-to-human transmission of EVD with a focus on factors related to population mobility and healthcare accessibility, which are critical features of epidemic propagation and control.

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