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The complex connection between flood risk and malaria dynamics in Sub-Saharan Africa

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The Sustainable Development Goal 3 commits to ending the malaria epidemic by 2030. Malaria poses a significant health threat in Sub-Saharan Africa and is a leading cause of child mortality. Additionally, climate change is disrupting the water cycle, likely increasing the frequency of floods and exposing more people to health risks. The stagnant flood water could serve as a breeding ground for mosquitoes. However, the relationship between flood risk and malaria dynamics in Sub-Saharan Africa remains poorly understood. In this study, we assess the impact of flood risk on children under five years old, revealing a 60-100% rate of the parasite *Plasmodium falciparum* within the demarcated flood zones in 49 Sub-Saharan African countries from 2000 to 2018. We utilised data on heavy rainfall, flood hazard maps derived from satellite imagery, and geospatial-temporal datasets concerning population and malaria rates to assess the number of children affected by floods and the burden of malaria in flood zones. Additionally, we incorporated socioeconomic vulnerability datasets. Vulnerability is categorised into four domains concerning children under five years: health, economy, health economy, and social factors.

The global method analyses trends over time for each country regarding the increased or decreased hazard, exposure, and vulnerability related to heavy rains and the burden of malaria in flood-prone areas. We aim to conduct a regression analysis to assess the relationship between these drivers and the malaria burden in flood zones. We also conducted a local analysis to identify potential deviations from the baseline by comparing the prevalence of *Plasmodium falciparum* in the flood zones to the prevalence at the national level. A linear regression was conducted to evaluate the possible relationship between malaria at the country level and within the flood zones in conjunction with the vulnerability.

We started the analyses for nine countries and observed that the proportion of male and female children exposed to floods in hazard zones is increasing globally and proportionally, alongside the

number of children impacted by malaria in those zones. Although malaria cases among children aged 2 to 10 generally decreased, we observed some spikes in incidence in flood zones during the study period. Using Spearman's rank correlation coefficient, we observed a strong relationship between exposure to floods and the influence of malaria. However, there was no statistical significance regarding the impact of vulnerability and flood hazard on malaria dynamics. The regression analysis will give us more insight into the relationship between all the drivers. These findings underscore the complexity of the interactions involved, suggesting that the relationship is influenced by multiple factors rather than a single driving force.