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The climate drivers of malaria seasonality and their relative importance in Sub-Saharan Africa

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The biology of the malaria parasite and the mosquito that transmits it is influenced by the weather and climate of a place. Any change in weather and climate conditions will have an impact on anopheles mosquito activity, hence, malaria transmission. In Sub-Saharan Africa, information on the climate drivers of seasonal malaria and their relative importance is limited. Clinical malaria case counts are commonly used to study the impact of weather and climate on malaria transmission seasonally. But this data has vulnerability to large errors due to out-of-sample generalization over space and time, erroneous diagnosis and under-counting due to varying health-seeking behavior and policy. Since Entomological Inoculation Rate (EIR) can directly quantify parasite-infected mosquitoes and their proclivity to transmit parasites to humans, it was used as a feasible alternative to malaria case count in this study. Applying a statistical mixed model framework to monthly EIR data, the climate drivers of malaria seasonality and their relative importance was determined for different climate settings in Sub-Saharan Africa. The results showed that EIR has a seasonal response to temperature ranges between 16 and 40 degrees Celsius, implying that seasonal malaria transmission is not viable below or above this range. In west central Africa, climate variables were insignificant drivers of malaria seasonality. In Equatorial East Africa, temperature (minimum, mean and maximum) was the important determinant at altitudes below 500m whiles at above 1000m, rainfall was the significant driver. In the Sahel and Guinea Savannah zones, rainfall and maximum temperature were important determinants at elevations below 500m. The lag between rainy season onset and malaria season onset was observed exclusively at climate zones where rainfall is markedly seasonal such as the Sahel. The findings of this work are crucial for future malaria modeling efforts and refinement of existing weather-driven malaria models. It can also help describe seasonal malaria transmission heterogeneity and burden across Sub-Saharan Africa. Taking in to account the seasonality in malaria control, this could translate to substantial public health gains as it can be used to determine when, where and how to apply vector and parasite control measures.

Biography

Edmund Ilimoan Yamba is a Lecturer and an Early Career Research Scientist at the Meteorology and Climate Science Unit in the Department of Physics, KNUST. He has a PhD in Meteorology and Climate Science, an MPhil in Geophysics and a BSc in Physics under his belt. He has research interest in Biometeorology with expert focus on modeling weather-driven infectious diseases in humans and animals, climate change and human health, urban bio-climates and climate modeling. He seeks to use his expertise to inspire positive change, mentor upcoming scientists and make the world a better place than he came to meet it.

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