Advancing Malaria Prediction in Uganda through AI and Machine Learning

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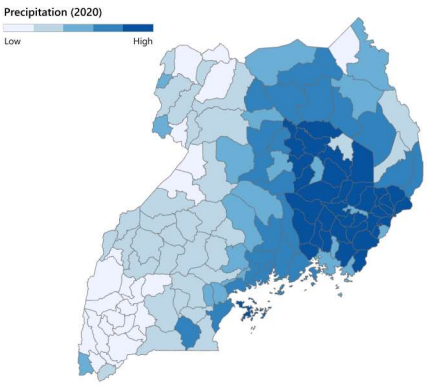
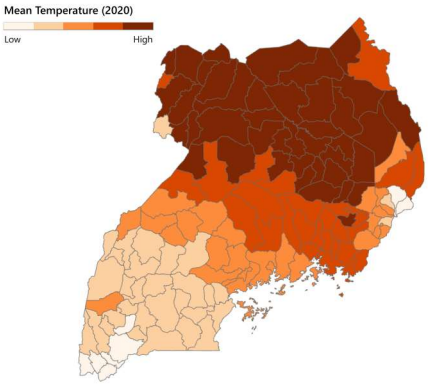
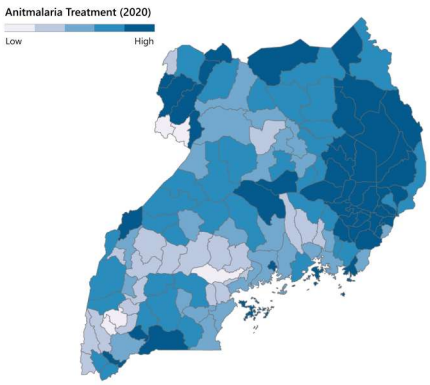
In 2022, Uganda recorded over 12.7 million malaria infections and 17,556 deaths. Despite significant eradication efforts, malaria remains a serious threat, particularly in regions like Africa. This study integrated Gregor's Type IV theory with Geographic Information Systems (GIS) to enhance insights into malaria transmission dynamics, with a focus on Uganda. This research combined data-driven algorithms, artificial intelligence, and geospatial analysis to identify the most reliable predictors of malaria incidence rates and assess the factors impacting transmission. Key predictors included antimalarial treatment, mosquito net access, indoor residual spraying (IRS), mean temperature, and precipitation. Among the predictive models tested Linear Regression, K-Nearest Neighbor, Neural Network, and Random Forest the Random Forest model demonstrated the highest accuracy, achieving an R2 of 0.88 and an MSE of 0.0534. Findings showed that antimalarial treatment was the most influential predictor, with mosquito net access reducing incidence rates, while higher temperatures correlated with increased rates. The study recommended prioritizing IRS in malaria hotspots and providing immediate support to districts with high incidence rates identified in 2020. By advocating for predictive modeling in malaria control, the research emphasized evidence-based strategies to reduce transmission and improve public health outcomes.

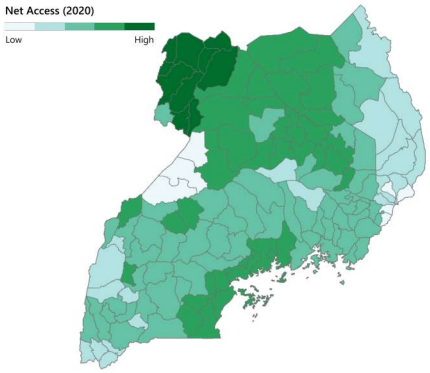
Climate Variables

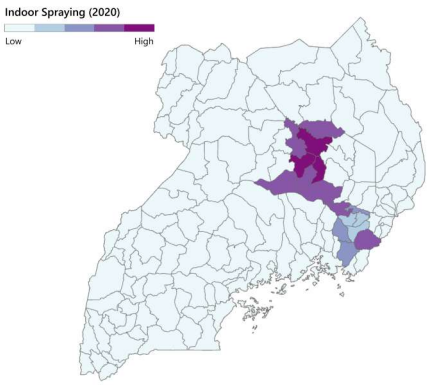


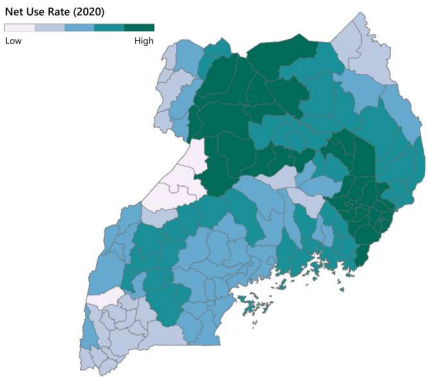


Malaria Preventative Variables









Story Map

Publication