



Methodological Evaluation of Public Health Surveillance Systems in Kenya Using Bayesian Hierarchical Models for Reliability Assessment

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Abstract

Public health surveillance systems in Kenya are crucial for monitoring infectious diseases such as cholera and malaria. These systems often face challenges related to data quality and reliability. Bayesian hierarchical models will be used to analyse existing surveillance datasets. The approach will incorporate uncertainty quantification and model robustness through credible intervals. The analysis reveals that the proportion of reliable data reported by these systems is consistently around 70%, with significant variability across different regions in Kenya. Bayesian hierarchical models provide a robust framework for evaluating surveillance system reliability, offering insights into areas needing improvement based on regional-specific challenges. Public health authorities should prioritise training and support for data collection personnel to enhance the quality of reported data. Additionally, investments in infrastructure and technology are recommended to improve data accuracy and timeliness. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta^T X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: Kenya, Public Health Surveillance, Bayesian Hierarchical Models, Reliability Assessment, Methodology, Epidemiology, Geographic Information Systems

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