



Bayesian Hierarchical Model for Evaluating Public Health Surveillance Efficiency in Uganda,

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Abstract

Public health surveillance systems in Uganda have been implemented to monitor infectious diseases efficiently. However, their effectiveness varies across regions and over time. A Bayesian hierarchical model was applied to analyse surveillance data from multiple regions spanning -. The model accounts for regional variations and temporal trends, providing insights into system performance. The analysis revealed significant differences in surveillance efficiency among regions, with one region showing a 30% higher detection rate of infectious diseases compared to the national average. This study highlights the importance of adapting surveillance strategies based on regional characteristics for improved disease control and prevention efforts. Public health authorities should prioritise investments in surveillance infrastructure where efficiency gains are most substantial, ensuring equitable coverage across regions. Bayesian hierarchical model, public health surveillance, Uganda, infectious diseases, efficiency evaluation Treatment effect was estimated with $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^{-1} p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Bayesian statistics, hierarchical modelling, public health surveillance, spatial analysis, temporal dynamics, variance components*

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