



Bayesian Hierarchical Model Evaluation of Public Health Surveillance Systems in Nigeria,

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Abstract

Public health surveillance systems are crucial for monitoring diseases in Nigeria. These systems aim to detect outbreaks early, facilitating timely intervention and reducing morbidity. A Bayesian hierarchical model was employed to assess system performance. The model accounts for spatial and temporal variations in surveillance data, incorporating prior knowledge about system parameters. The model identified significant spatial variation in the reliability of surveillance systems across different regions of Nigeria, with some areas showing a detection rate of over 90%. Bayesian hierarchical models provide valuable insights into the performance of public health surveillance systems. This approach highlights regional disparities and underscores the need for targeted interventions to improve system reliability. Public health authorities should prioritise enhancing surveillance in regions with lower detection rates, implementing localized strategies to address specific challenges. Bayesian hierarchical model, Public health surveillance, Nigeria, Reliability assessment Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Bayesian hierarchical models, Epidemiology, Public health surveillance, Reliability analysis, Spatial-temporal modelling, System evaluation*

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