



Bayesian Hierarchical Model for Measuring Clinical Outcomes in Public Health Surveillance Systems of Nigeria: A Methodological Evaluation

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Abstract

Public health surveillance systems in Nigeria are essential for monitoring and managing clinical outcomes across various diseases. However, their effectiveness is often hampered by data quality issues such as missing or inconsistent information. The study employs a Bayesian hierarchical model to analyse clinical outcome data from multiple sources, including hospital records, community surveys, and laboratory tests. This approach allows for the integration of heterogeneous information with varying measurement scales. The analysis reveals that the Bayesian hierarchical model significantly improves accuracy in estimating disease prevalence and treatment outcomes compared to traditional methods, particularly when dealing with imprecise or incomplete data. The findings underscore the utility of Bayesian hierarchical models for enhancing the reliability of public health surveillance systems in Nigeria. This methodological evaluation provides a robust framework for improving clinical outcome measurements. Public health officials should consider implementing this model to enhance data quality and decision-making processes within their surveillance systems. Future research could explore its application across different diseases and geographic regions. Bayesian hierarchical models, public health surveillance, Nigeria, clinical outcomes, mixed data types Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African epidemiology, Bayesian methods, clinical outcome assessment, hierarchical modelling, infectious diseases surveillance, public health metrics, spatial analysis*

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