Bayesian Hierarchical Model for Evaluating System Reliability in Public Health Surveillance Systems in Kenya: An Analytical Study

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Abstract

Public health surveillance systems are crucial for monitoring and responding to infectious diseases in Kenya. However, their reliability often needs evaluation. A Bayesian hierarchical model was applied to assess system performance across different regions and levels within the Kenyan public health surveillance network. The analysis revealed that the proportion of accurate disease reports varied significantly between regions, with some areas reporting up to 20% more reliable data than others. This study provides insights into regional variations in system reliability and highlights the need for targeted interventions to improve surveillance accuracy. Public health authorities should focus on enhancing surveillance systems in underperforming regions, particularly those with lower reporting accuracies. Bayesian hierarchical model, public health surveillance, Kenya, system reliability Treatment effect was estimated with $\text{logit}(\pi) = \beta 0 + \beta^{\rightarrow} p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Kenya, Public Health Surveillance, Bayesian Hierarchical Models, Reliability Analysis, Geographic Information Systems, Spatial Statistics, Epidemiology Models*

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