



Bayesian Hierarchical Model for Assessing System Reliability in Public Health Surveillance Systems in Senegal

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Abstract

Public health surveillance systems are essential for monitoring diseases and managing outbreaks in Senegal. However, their reliability needs to be assessed to ensure effective disease control. A Bayesian hierarchical model was employed to analyse data from multiple surveillance sites across Senegal. The model accounts for both site-specific and shared variability, providing robust estimates of system reliability. The analysis revealed that the proportion of correctly identified disease cases ranged between 85% and 92%, indicating moderate but consistent performance across different surveillance sites in Senegal. This study provides evidence-based insights into the reliability of public health surveillance systems, enabling policymakers to make informed decisions for system improvements. Based on this research, it is recommended that additional resources be allocated to less reliable sites and that training programmes be developed to enhance surveillance personnel's skills. Treatment effect was estimated with $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, Bayesian, Hierarchical, Model, Reliability, Surveillance, Senegal*

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