



Bayesian Hierarchical Model for Evaluating Efficiency Gains in Public Health Surveillance Systems in Senegal

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Abstract

Public health surveillance systems in Senegal are crucial for monitoring infectious diseases such as malaria and tuberculosis. A Bayesian hierarchical model was developed to assess system performance across different regions. Key variables included detection rates and response times. The model demonstrated that certain regions saw an increase in early detection by 20% compared to baseline data. The findings suggest potential areas for intervention, including enhancing laboratory capacity or improving communication protocols. Investment should be directed towards strengthening surveillance networks and training public health workers in high-risk zones. Bayesian hierarchical model, public health surveillance, efficiency gains, Senegal Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, African, Bayesian, Modelling, Systems, Analysis, Evaluation*

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