



Bayesian Hierarchical Model for Evaluating Cost-Effectiveness of Public Health Surveillance Systems in Rwanda: An Analytical Study

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Abstract

Public health surveillance systems are crucial for monitoring infectious diseases in Rwanda. However, their cost-effectiveness remains under evaluation. A Bayesian hierarchical model was employed to analyse data from multiple regions, accounting for variability and dependencies among them. The model incorporates cost and effectiveness metrics as parameters. The analysis revealed significant differences in the cost-effectiveness ratios across regions, with one region showing a 20% lower cost per unit of effectiveness compared to others. This study provides insights into optimising public health surveillance systems by identifying underperforming areas and suggesting targeted improvements. Public health authorities should focus on enhancing the efficiency of surveillance systems in regions with higher costs relative to effectiveness. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Rwanda, Bayesian hierarchical model, cost-effectiveness analysis, infectious diseases surveillance, Markov chain Monte Carlo, spatial statistics, epidemiology methodology*

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