



# Methodological Assessment and Cost-Efficiency Evaluation of Public Health Surveillance Systems in Rwanda Using Bayesian Hierarchical Models

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## Abstract

Public health surveillance systems in Rwanda are crucial for monitoring infectious diseases to ensure timely intervention and control measures. The review will employ Bayesian hierarchical models to evaluate the efficiency and cost-effectiveness of these systems in Rwanda. This approach allows for the estimation of uncertainty around model parameters, providing insights into system performance and resource allocation. A key finding is that integrating predictive analytics within surveillance systems significantly enhances their accuracy in forecasting disease outbreaks with a precision level of 95% confidence interval. The review underscores the need for continuous improvement in public health surveillance systems to ensure they are both cost-effective and efficient in managing infectious diseases. Recommendation is made for Rwanda's Ministry of Health to adopt Bayesian hierarchical models as a standard methodological tool for evaluating public health surveillance systems, thereby improving their effectiveness and resource utilization. Treatment effect was estimated with  $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** African geography, Bayesian hierarchical models, Cost-effectiveness analysis, Epidemiology, Public health surveillance, Rwanda, Spatial statistics



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