



# Bayesian Hierarchical Model Evaluation of Public Health Surveillance Systems in Ghana,

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## Abstract

Public health surveillance systems are crucial for monitoring disease prevalence and guiding public health interventions in Ghana. A Bayesian hierarchical model was applied to analyse data from multiple years to assess system performance and resource allocation. Uncertainty quantification was performed through credible intervals. The analysis revealed that the current surveillance systems underestimated disease prevalence by approximately 20%, indicating a need for improved reporting accuracy. Bayesian hierarchical models provide a robust framework for evaluating public health surveillance systems and can be used to improve resource allocation in Ghana's health sector. Enhanced training programmes for surveillance staff, regular system audits, and integration of new data sources are recommended to improve the accuracy and reliability of Ghana's surveillance systems. Treatment effect was estimated with  $\text{text}\{logit\}(\pi) = \beta_0 + \beta^T p X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *African geography, Bayesian statistics, Hierarchical modelling, Public health surveillance, Cost-effectiveness analysis, Epidemiology, Data analysis*

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