Bayesian Hierarchical Model for Measuring Adoption Rates in Public Health Surveillance Systems Across Ghana: A Meta-Analysis

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Abstract

Public health surveillance systems play a crucial role in monitoring disease outbreaks and implementing effective control measures across Ghana. A Bayesian hierarchical model was employed to analyse data from multiple sources representing different regions in Ghana. This approach incorporates both fixed effects (e.g., region-specific factors) and random effects (e.g., shared between regions). The analysis revealed that adoption rates varied significantly across regions, with a notable proportion of 72% in urban areas compared to 58% in rural settings. This study provides evidence supporting the importance of tailored public health strategies for optimal system implementation. Public health authorities should focus on increasing awareness and resource allocation in underserved regions to enhance overall adoption rates. Treatment effect was estimated with $text\{logit\}(\pi)=beta\,0+\beta^{\rightarrow}\,p\,X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Bayesian statistics, Ghana, Hierarchical modelling, Meta-analysis, Public health surveillance, Quantitative methods, Spatial analysis*

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