



# Bayesian Hierarchical Model for Assessing Adoption Rates in Uganda's Public Health Surveillance Systems

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## Abstract

Public health surveillance systems in Uganda are crucial for monitoring disease outbreaks and managing public health interventions. However, their effectiveness varies across different regions and sectors. A Bayesian hierarchical regression model was applied to analyse data collected from multiple public health units across Uganda. The model accounts for both systematic differences between regions and within-unit variation. The analysis revealed significant heterogeneity in adoption rates, with some regions showing adoption levels as high as 85% compared to others at just 30%. This variance highlights the need for targeted interventions to improve system utilization. The Bayesian hierarchical model provided a nuanced understanding of adoption patterns and identified key factors influencing system uptake. These insights can guide policy makers in optimising resource allocation. Public health officials should prioritise awareness campaigns and technical support in regions with lower adoption rates, while leveraging existing systems in high-performing areas for comparative learning. Treatment effect was estimated with  $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *Uganda, Bayesian, Hierarchical, Model, Adoption, Surveillance, Methodology*

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