



# Bayesian Hierarchical Model Assessment of Public Health Surveillance System Adoption in Rwanda,

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## Abstract

Public health surveillance systems are crucial for monitoring infectious diseases in Rwanda, but their adoption rates vary across different regions and sectors. A Bayesian hierarchical model was applied to analyse data from multiple sources, including official reports and surveys. The model accounts for both fixed effects (e.g., sector type) and random effects (e.g., geographical variation). The analysis revealed significant regional differences in adoption rates, with urban areas showing higher adoption compared to rural regions. This study demonstrates the utility of Bayesian hierarchical models in quantifying public health surveillance system adoption across Rwanda's diverse landscape. Health policymakers should prioritise interventions in underserved rural areas to improve overall adoption and effectiveness of surveillance systems. 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, public health surveillance, adoption rates, geographic variation, methodological evaluation, spatial analysis*

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