# Bayesian Hierarchical Model for Evaluating Risk Reduction in Public Health Surveillance Systems Across Senegal,

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## Abstract

Public health surveillance systems in Senegal have been established to monitor disease outbreaks efficiently. However, their effectiveness varies across regions and time periods. A Bayesian hierarchical model was utilised to analyse data from multiple regions, accounting for spatial and temporal variations. Model uncertainty was quantified through credible intervals. The analysis revealed significant reductions in disease detection times by approximately 35% across the surveillance systems, with substantial heterogeneity observed between regions. Bayesian hierarchical modelling provided a robust framework to assess risk reduction strategies and highlighted the need for localized interventions. Implementing targeted improvements based on regional findings will enhance overall surveillance system performance in Senegal. Public Health Surveillance, Bayesian Hierarchical Model, Risk Reduction, Senegal Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \beta^{\neg} p\, X_i$, and uncertainty reported using confidence-interval based inference.

# ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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