Bayesian Hierarchical Model for Measuring Adoption Rates in Public Health Surveillance Systems in Senegal,

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Abstract

Public health surveillance systems in Senegal have been established to monitor infectious diseases such as cholera and meningococcal disease. However, there is limited data on how effectively these systems are being utilised. A Bayesian hierarchical model was applied to analyse survey data collected from healthcare facilities. The model accounted for regional variations and provided estimates of adoption rates with corresponding uncertainty intervals. The analysis revealed that adoption rates varied significantly between districts, with some areas showing high adoption (above 80%) while others had lower adoption (below 50%). The Bayesian hierarchical model effectively captured regional differences and provided nuanced insights into the adoption patterns of public health surveillance systems. Public health officials should prioritise implementation in districts with low adoption rates to enhance system effectiveness. Bayesian Hierarchical Model, Public Health Surveillance, Senegal, Adoption Rates Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\, p\, X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Bayesian statistics, Hierarchical modelling, Public health surveillance, Quantitative methods, Geographic information systems, Spatial analysis*

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