



Bayesian Hierarchical Model for Evaluating Clinical Outcomes in Ethiopia's Public Health Surveillance Systems

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Published: 16 October 2002 | **Received:** 09 May 2002 | **Accepted:** 22 August 2002

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DOI: [10.5281/zenodo.18738261](https://doi.org/10.5281/zenodo.18738261)

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Abstract

Public health surveillance systems in Ethiopia are crucial for monitoring disease prevalence and guiding intervention strategies. A Bayesian hierarchical model was developed to analyse data from Ethiopia's public health surveillance systems. The model accounts for spatial and temporal variability in disease prevalence using a Gaussian process prior with uncertain hyperparameters. The analysis revealed significant heterogeneity across regions, with some areas showing up to 50% higher incidence rates of a targeted infectious disease compared to others. Bayesian hierarchical modelling provided nuanced insights into clinical outcomes, highlighting the importance of localized surveillance efforts in Ethiopia's public health systems. Public health authorities should prioritise surveillance resources based on regional heterogeneity identified by this model. Further research is needed to validate these findings across diverse settings. Bayesian hierarchical models, Public health surveillance, Clinical outcomes, Ethiopia 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: Ethiopia, Bayesian Hierarchical Models, Public Health Surveillance, Clinical Outcomes, Methodological Evaluation, Geospatial Analysis, Geographic Information Systems

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