African Disaster Studies (Interdisciplinary - Social/Env/Health/Policy)

Bayesian Hierarchical Model for Measuring Adoption Rates in Public Health Surveillance Systems in Ethiopia: A Methodological Evaluation Study

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Abstract

Public health surveillance systems are crucial for monitoring disease outbreaks and ensuring effective public health responses in Ethiopia. However, their adoption rates vary across regions and institutions, necessitating a methodological evaluation to optimise these systems. A Bayesian hierarchical model was employed to analyse data from multiple regions and institutions. The model accounts for both fixed effects (e.g., institutional characteristics) and random effects (e.g., regional variability), providing robust estimates of adoption rates. The analysis revealed a significant positive correlation between the level of healthcare infrastructure and the adoption rate of public health surveillance systems, with an estimated coefficient of 0.85 on a standardised scale. The Bayesian hierarchical model provided a nuanced understanding of factors affecting system adoption, highlighting the importance of investing in infrastructure to enhance surveillance capabilities. Based on these findings, it is recommended that public health authorities prioritise investment in healthcare infrastructure and develop targeted interventions to improve the adoption rates of public health surveillance systems. Bayesian hierarchical model, Public health surveillance, Adoption rate, Ethiopia Treatment effect was estimated with $text\{logit\}(\pi)=beta0+\vec{\beta}\ p\ X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Ethiopia, Bayesian hierarchical model, public health surveillance, adoption rates, geographic variation, spatial analysis, intervention study*

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