



Bayesian Hierarchical Model for Evaluating Clinical Outcomes in Ethiopian Public Health Surveillance Systems: A Meta-Analysis

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Abstract

Public health surveillance systems in Ethiopia are crucial for monitoring clinical outcomes related to infectious diseases such as tuberculosis (TB). However, there is a need to evaluate and improve these systems through meta-analysis. A Bayesian hierarchical model will be employed, incorporating data from multiple studies on TB surveillance. This approach allows for the estimation of treatment efficacy across different settings while accounting for heterogeneity among studies. The analysis revealed a significant improvement ($p < 0.05$) in diagnostic accuracy of TB cases measured by sensitivity and specificity when using advanced diagnostic tools compared to conventional methods. This study demonstrates the effectiveness of Bayesian hierarchical models in evaluating public health surveillance systems, particularly for improving diagnostics in TB management. The findings suggest that integrating advanced diagnostic technologies into routine surveillance practices could lead to more accurate and timely reporting of clinical outcomes. Bayesian Hierarchical Model, Public Health Surveillance, Clinical Outcomes, Ethiopia, Tuberculosis Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Ethiopia, Bayesian hierarchical models, meta-analysis, clinical outcomes, surveillance systems, infectious diseases, methodological evaluation*

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