



Bayesian Hierarchical Model for Evaluating Community Health Centre Systems in Tanzania: A Methodological Assessment

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Abstract

Bayesian hierarchical models are increasingly used in health research to analyse complex data structures, particularly in resource-limited settings like Tanzania where interventions often need careful evaluation. A Bayesian hierarchical linear regression model was employed, accounting for variability across CHCs and within each centre. Uncertainty quantification was achieved through posterior predictive checks and credible intervals. The analysis revealed a significant proportion ($p < 0.05$) of yield improvement in CHCs when implemented with improved referral protocols, indicating potential for systemic enhancement. This study provides evidence supporting the efficacy of specific interventions within CHC systems in Tanzania and offers insights into how these models can be applied to other settings. Future research should validate findings using larger datasets and explore scalability across different geographical regions. Policy recommendations include promoting best practices through training and standardisation. Treatment effect was estimated with $\text{text}\{ \text{logit} \}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: African, Bayesian, Hierarchical, Intervention, Quantitative, Resource-limited, Study

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