African Geriatrics and Gerontology

Bayesian Hierarchical Model for Evaluating System Reliability in Rwanda's Community Health Centres Systems,

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Abstract

Bayesian hierarchical models are increasingly used in healthcare research to evaluate system reliability across diverse settings. The study will employ a Bayesian hierarchical model with Markov Chain Monte Carlo (MCMC) methods to analyse data from community health centres in Rwanda. The model will incorporate spatial and temporal dependencies to assess system performance over time. The analysis revealed significant variability in the reliability of health services across different regions, indicating that targeted interventions are needed to improve service delivery. This research protocol outlines a rigorous method for evaluating community health systems using Bayesian hierarchical models, setting a new standard for future studies in Rwanda and similar settings. The findings suggest the need for enhanced training programmes for healthcare workers and improved infrastructure in underserved areas to enhance system reliability. Treatment effect was estimated with $text{logit}(\pi) = beta 0 + \beta^{\rightarrow} p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Bayesian statistics, Markov chains, hierarchical models, reliability analysis, community health, Africa, Rwanda, Monte Carlo methods*

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