



Bayesian Hierarchical Model for Measuring System Reliability in District Hospitals: A Methodological Evaluation of Rwanda's Health Systems in Transition,

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Abstract

This study aims to evaluate the reliability of district hospitals in Rwanda, a country undergoing significant health system transition. A Bayesian hierarchical model will be employed to analyse data from district hospitals across Rwanda. The model will incorporate uncertainty through robust standard errors, ensuring reliable estimates of system performance. The analysis revealed a consistent need for investment in diagnostic equipment and staff training within the lower-level healthcare facilities. The application of Bayesian hierarchical models provides a nuanced understanding of district hospital reliability, guiding targeted interventions to improve service delivery. Investment strategies should prioritise upgrading diagnostic capabilities and enhancing professional development programmes among health care workers. Bayesian Hierarchical Model, System Reliability, Rwanda Healthcare Transition 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: *District hospitals, Geographic Information Systems, Hierarchical modelling, Monte Carlo methods, Reliability analysis, Spatial statistics, Bayesian inference*

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