Bayesian Hierarchical Model for Measuring System Reliability in Rwanda's District Hospitals

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Abstract

Rwanda's district hospitals play a critical role in providing healthcare services across the country. However, their operational efficiency and reliability are not well understood. A Bayesian hierarchical model was employed to analyse data from multiple districts. This approach accounts for variability between districts while estimating overall hospital performance. The analysis revealed significant variation in system reliability across different hospitals within the same district, with some showing high efficiency ($\geq 90\%$) and others low ($\leq 50\%$). Bayesian hierarchical modelling provided nuanced insights into hospital systems' reliability, highlighting disparities and potential improvements. District health authorities should prioritise infrastructure upgrades and training programmes to improve the most unreliable hospitals' performance. Hospital Reliability, Bayesian Hierarchical Model, District Hospitals, Rwanda Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\,p\,X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *District Hospitals, Rwanda, Bayesian Hierarchical Models, Reliability Analysis, Methodology, Quantitative Methods, Healthcare Systems*

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This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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