African Clinical Nutrition

Bayesian Hierarchical Model for Evaluating System Reliability in Rwanda's District Hospitals: A Longitudinal Study

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Abstract

Rwanda's district hospitals play a critical role in healthcare delivery, yet their reliability varies significantly across different facilities. A longitudinal study utilising Bayesian hierarchical models was conducted. Data from multiple districts were analysed to identify patterns of system reliability over time. Initial data analysis revealed a consistent decline in the mean reliability score across all districts, indicating potential systemic issues that require intervention. The Bayesian hierarchical model provided robust insights into the reliability of district hospital systems but further research is needed to implement targeted interventions. District health authorities should prioritise system diagnostics and immediate remedial actions based on the findings from this study. Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\, p\, X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Longitudinal analysis, Bayesian statistics, Hierarchical modelling, Reliability assessment, District healthcare systems, Africa, Quantile regression*