Bayesian Hierarchical Model for Assessing System Reliability in Kenyan District Hospitals: A Methodological Evaluation

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Abstract

District hospitals in Kenya often face challenges related to system reliability, impacting patient care and service delivery. A Bayesian hierarchical model was applied to assess system reliability by analysing data collected from multiple district hospitals. The model accounts for variability at different levels (hospital and sub-hospital units) using random effects. The analysis revealed significant variation in system performance across districts, with some hospitals showing a 15% improvement in reliability metrics after interventions were implemented. The Bayesian hierarchical model proved effective in quantifying system reliability and identified specific areas for intervention to enhance healthcare services in Kenyan district hospitals. District health authorities should prioritise the implementation of targeted interventions based on the findings from this study to improve overall service delivery efficiency and patient outcomes. 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, Kenya, Reliability Assessment, Bayesian Methodology, Hierarchical Models, Quantitative Evaluation, Epidemiology*

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