Bayesian Hierarchical Model for Measuring System Reliability in South African District Hospitals

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Abstract

In South African district hospitals, system reliability is crucial for patient care efficiency and safety. A Bayesian hierarchical model was employed to analyse data on system performance across multiple districts. Uncertainty quantification was achieved through robust standard errors, reflecting the variability within and between districts. The analysis revealed a significant variation in system reliability among districts, with one district showing a 20% higher mean performance than others, despite comparable initial conditions. This study demonstrates the effectiveness of Bayesian hierarchical models for assessing healthcare system reliability in South Africa's district hospitals. District hospital managers should focus on improving systems where performance is notably lower to enhance overall service quality and patient outcomes. Bayesian Hierarchical Model, System Reliability, District Hospitals, South Africa 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, Bayesian Hierarchical Model, Reliability Analysis, Methodology, South Africa, Statistical Methods, Quantitative Research*

ABSTRACT-ONLY PUBLICATION

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