Bayesian Hierarchical Model Evaluation for Efficiency Gains in Tanzanian District Hospitals Systems

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Abstract

Efficiency gains in healthcare systems are critical for improving patient outcomes and resource utilization, particularly in underserved regions like Tanzania. A Bayesian hierarchical model was applied to assess hospital performance data from to across multiple districts. Uncertainty quantification was performed through robust standard errors. The analysis revealed significant variability in efficiency gains among hospitals, with some achieving up to 35% improvement over baseline levels. Bayesian hierarchical models offer a nuanced approach to understanding hospital performance and can guide targeted interventions for enhancing service quality. District health authorities should prioritise areas identified as needing improvement based on the model's findings, with specific focus on patient care protocols and resource allocation strategies. Treatment effect was estimated with $text\{logit\}(\pi)=beta\,0+\beta^{\rightarrow}\,p\,X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Bayesian statistics, hierarchical modelling, econometrics, efficiency measurement, district healthcare systems, resource allocation, Africa*

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