



Bayesian Hierarchical Model for Efficiency Measurement in Ghanaian District Hospitals Systems

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Abstract

Efficient operation of district hospitals is crucial for healthcare delivery in Ghana, where resource constraints often limit service provision. A Bayesian hierarchical model was employed to analyse data on hospital inputs (staffing, equipment) and outputs (patient care quality). The analysis revealed significant variation in efficiency levels among districts, with some achieving gains of up to 40% over baseline conditions. This study validates the use of Bayesian hierarchical models for assessing hospital system performance and highlights areas needing improvement. District health planners should focus on improving resource allocation strategies based on this model's findings. Treatment effect was estimated with $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Bayesian statistics, hierarchical modelling, efficiency measurement, district health systems, econometrics, resource allocation*

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