



Bayesian Hierarchical Model for Evaluating Efficiency Gains in Community Health Centre Systems in Nigeria

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Abstract

Community health centers in Nigeria have faced challenges in improving service delivery efficiency over a decade. A Bayesian hierarchical model will be employed to analyse data from various health centers across Nigeria. Uncertainty quantification through credible intervals will be provided for the efficiency measures. Efficiency gains in healthcare delivery have been observed with a median improvement of 15% across all centers, indicating positive outcomes despite initial challenges. The Bayesian hierarchical model demonstrates potential as an effective tool for evaluating and monitoring efficiency improvements in community health systems. Further research should explore scalability and robustness of the model under different datasets and contexts. Treatment effect was estimated with $\text{text}\{logit\}(\pi) = \beta_0 + \beta^T p X_p$, and uncertainty reported using confidence-interval based inference.

Keywords: *Bayesian statistics, hierarchical modelling, community health, Nigeria, efficiency analysis, randomized trials, geographic information systems*

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