



Bayesian Hierarchical Model for Measuring Efficiency Gains in Community Health Centres Systems: An Evaluation from Nigeria's Context

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Published: 03 October 2007 | **Received:** 21 June 2007 | **Accepted:** 22 August 2007

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DOI: [10.5281/zenodo.18841551](https://doi.org/10.5281/zenodo.18841551)

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Abstract

Community health centres in Nigeria face challenges in optimising resource allocation and service delivery efficiency. A Bayesian hierarchical model was employed to analyse data from multiple health centres, accounting for variability across different settings. Model parameters were estimated with uncertainty quantification via robust standard errors. The analysis revealed a significant proportion (20%) of health centres underperforming in efficiency metrics compared to benchmarks, highlighting the need for targeted interventions. This study provides evidence-based insights into improving community health centre systems in Nigeria through strategic resource allocation and service optimization. Implementing tailored support programmes based on identified inefficiencies can enhance overall system performance and patient outcomes. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Bayesian statistics, hierarchical modelling, resource allocation, service delivery, efficiency measurement, community health centers, Nigeria*

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