



# Bayesian Hierarchical Model for Evaluating Efficiency Gains in Nigerian Community Health Centers Systems

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## Abstract

Community health centers (CHCs) play a critical role in Nigeria's healthcare system, yet their operational efficiency remains underexplored. A Bayesian hierarchical model was employed to analyse data from multiple CHCs across different regions. The model accounts for heterogeneity in efficiency levels among centers while controlling for various contextual factors. The analysis revealed that average efficiency gains varied significantly between CHCs, with some achieving up to a 25% increase in operational effectiveness after implementing targeted interventions. This study provides evidence-based insights into enhancing the performance of Nigerian CHCs through tailored strategies and resource allocation. Based on findings, policymakers should prioritise support for CHCs identified as having lower initial efficiency levels to maximise overall system benefits. Treatment effect was estimated with  $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** Nigerian, Bayesian, Hierarchical, Model, Efficiency, Evaluation, Community

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