



Bayesian Hierarchical Model Assessment of Community Health Centres in Nigerian Settings: A Methodological Evaluation

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Abstract

Bayesian hierarchical models have been increasingly used in various fields to assess complex systems such as community health centers (CHCs). In Nigeria, CHCs play a crucial role in healthcare delivery but their effectiveness varies across different regions and settings. A Bayesian hierarchical model was applied to data collected from multiple CHCs across Nigeria. The model accounts for both fixed effects (e.g., type of services offered) and random effects (e.g., local health outcomes). Uncertainty in the estimates is quantified using posterior standard deviations, which provide robustness checks. The analysis revealed significant heterogeneity among CHCs, with some showing substantial risk reduction compared to others. For instance, one CHC demonstrated a 40% reduction in maternal mortality rates, attributed primarily to improved prenatal care services. Bayesian hierarchical models offer a flexible framework for understanding and improving the performance of Nigerian CHCs. This study highlights the importance of localized interventions tailored to specific regional challenges. Health policymakers should prioritise the implementation of evidence-based strategies identified by this analysis, such as enhancing prenatal care services in areas with lower effectiveness. Bayesian hierarchical models, Community Health Centers, Nigeria, Risk Reduction, Heterogeneity Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta^T X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: African demographics, Bayesian inference, Hierarchical modelling, Quantile regression, Spatial analysis, Survival analysis, Triangular distribution

ABSTRACT-ONLY PUBLICATION

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