



Bayesian Hierarchical Model for Evaluating Community Health Centre Systems in Ghana: A Methodological Assessment

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Abstract

Community health centres (CHCs) play a critical role in healthcare delivery in Ghana. However, their effectiveness is often underpinned by various socio-economic and environmental factors. A Bayesian hierarchical model was employed to analyse data from multiple CHCs across Ghana. The model accounts for spatial and temporal variations in health outcomes. The analysis revealed significant variability in the effectiveness of CHCs, with some centres showing yields up to 30% higher than others under similar conditions. This study provides insights into the factors influencing CHC performance and highlights areas needing targeted interventions. Policy makers should prioritise resource allocation and training programmes for CHCs in underserved regions to enhance overall health outcomes. 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 methods, hierarchical modelling, health systems evaluation, quantile regression, spatial analysis, stochastic processes*

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