



Bayesian Hierarchical Model for Measuring Adoption Rates in Community Health Centres Systems in South Africa: A Longitudinal Study

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Abstract

Community health centres (CHCs) in South Africa play a critical role in delivering healthcare services to underserved populations. However, their effectiveness varies significantly across different regions and over time. A longitudinal study was conducted in South Africa, employing a Bayesian hierarchical model to measure adoption rates. The model accounts for spatial heterogeneity and temporal dynamics within CHCs. The estimated mean adoption rate across all CHCs over the study period was found to be 65%, with significant variability observed between regions. This study demonstrates the utility of Bayesian hierarchical models in evaluating health system performance longitudinally, providing insights into regional disparities and informing policy decisions. Policy makers should consider using this model for regular assessments of CHC effectiveness to ensure equitable service delivery across South Africa. Bayesian Hierarchical Model, Community Health Centres, Adoption Rates, Longitudinal Study, South Africa 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 hierarchical modelling, longitudinal analysis, methodological evaluation, community health centres, adoption rates, statistical methods*

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