



Bayesian Hierarchical Model Evaluation of Urban Primary Care Networks in South Africa: A Methodological Study

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Abstract

Urban primary care networks in South Africa face challenges in achieving consistent clinical outcomes due to varying service delivery models and patient demographics. A Bayesian hierarchical regression model was employed to analyse data from multiple clinics, accounting for both clinic-specific and patient-level variability. The analysis revealed significant clinic variation in treatment adherence rates (e.g., 15% difference in antibiotic prescription rates). Bayesian hierarchical models provided a nuanced understanding of clinical outcomes across different primary care settings, identifying clinics with superior adherence to treatment protocols. Clinics identified as having high adherence should be supported for further research and model improvement, while those needing intervention can benefit from targeted training programmes. Primary Care Networks, Bayesian Hierarchical Model, Clinical Outcomes, South Africa Treatment effect was estimated with $\text{text}\{\logit\}(\pi) = \beta_0 + \beta^T X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, stratification, econometrics, precision medicine, Bayesian inference, hierarchical modelling, spatial analysis*

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