



Bayesian Hierarchical Model for Evaluating Clinical Outcomes in Rural Clinics Systems of South Africa: A Methodological Assessment

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Abstract

Clinical outcomes in rural clinics of South Africa are often underreported due to resource constraints and data management issues. A Bayesian hierarchical model was developed incorporating multiple layers of uncertainty. Data from two rural clinics were analysed to estimate clinical performance metrics with robust standard errors. Diagnosis accuracy in one clinic improved by 15% after implementing targeted interventions, while patient adherence to treatment protocols increased by 20%. The Bayesian hierarchical model effectively captured the variability within and between rural clinics, providing a nuanced understanding of clinical outcomes. Rural clinics should consider using this method for ongoing performance monitoring and quality improvement initiatives. 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 Statistics, Hierarchical Modelling, Quantitative Methods, Clinical Outcomes, Resource Constraints, Data Management*

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