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Bayesian Hierarchical Model for Evaluating Clinical Outcomes in Rural Clinics of Ghana: An Assessment System Analysis

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Abstract

Clinical outcomes in rural clinics of Ghana are often underreported or misinterpreted due to variability in patient populations and resource availability. A Bayesian hierarchical model was employed to analyse clinical data from multiple rural clinics. The model accounts for variability within and between clinics by incorporating random effects that capture clinic-specific differences and shared parameters representing common factors affecting outcomes. The analysis revealed significant heterogeneity in clinical outcomes across different clinics, with some showing up to a 20% improvement rate over others when using the proposed Bayesian hierarchical model. The model successfully identified key areas for improvement and resource allocation within rural healthcare systems of Ghana. It serves as an effective tool for system assessment and performance enhancement. Rural clinics should implement the recommended improvements based on this model to optimise their clinical outcomes and patient care. Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\ p\ X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, African, Bayesian, Modelling, Hierarchical, Epidemiology, Data, Synthesis*

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