Bayesian Hierarchical Model for Evaluating Cost-Effectiveness of Community Health Centres in Rwanda

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Abstract

Community health centres play a crucial role in improving healthcare access and outcomes in Rwanda. However, understanding their cost-effectiveness is essential for resource allocation and policy development. A Bayesian hierarchical model was employed to estimate costs and outcomes across different regions in Rwanda, incorporating data from multiple sources including patient records and administrative datasets. The model accounts for variability within and between regions by accounting for both fixed effects (e.g., healthcare services provided) and random effects (e.g., regional differences). The Bayesian hierarchical model revealed significant heterogeneity in cost-effectiveness across different health centres, with some showing substantial cost savings compared to alternative models. This study provides a robust framework for assessing the cost-effectiveness of community health centres using advanced statistical methods, contributing to evidence-based policy development in Rwanda's healthcare system. Based on this analysis, recommendations are made for optimising resource allocation and improving service delivery across all regions. Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \beta^{\rightarrow}\,p\,X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Geographic, African, Hierarchical, Bayesian, Model, Evaluation, Cost-Effectiveness*

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