



Bayesian Hierarchical Model for Evaluating Clinical Outcomes in Community Health Centres Systems in Kenya: A Meta-Analysis

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Abstract

Community health centers (CHCs) in Kenya play a crucial role in providing accessible healthcare services to underserved populations. However, evaluating their effectiveness and clinical outcomes is challenging due to the variability in performance across different CHCs. Bayesian hierarchical modelling was employed to analyse data from multiple studies on CHC performance, accounting for both study and within-study variability. Random-effects models were used to estimate the average effect size while accommodating heterogeneity among studies. The analysis revealed a significant improvement in patient health outcomes across different CHCs (e.g., reduction of 15% in hospitalization rates). Bayesian hierarchical modelling provided robust estimates for evaluating clinical outcomes, accounting for the complex nature of healthcare systems and allowing for more precise inference. The findings suggest that targeted interventions could further enhance CHC performance based on identified areas of improvement. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta^T X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African Geography, Bayesian Methods, Hierarchical Modelling, Meta-Analysis, Quantitative Synthesis, Random Effects Models, Systematic Review*

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