



Bayesian Hierarchical Model for Evaluating Maternal Care Systems in Rwanda: A Methodological Assessment

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Abstract

Maternal care systems in Rwanda have been improving over recent years, but there is a need for methodological rigor to evaluate their effectiveness. A BHM was applied to data from multiple maternal care facilities in Rwanda, incorporating random effects for facility-specific variability. The model estimated average treatment effects on patient outcomes while accounting for within-facility correlations. The BHM revealed significant heterogeneity among facilities in terms of clinical performance, with some showing substantial improvement over time and others needing further intervention. This study demonstrates the utility of BHM in evaluating complex healthcare systems and highlights the importance of addressing facility-specific challenges for optimal maternal care outcomes. Facility managers should use this model to identify areas requiring targeted improvements, while policymakers can leverage these insights to inform future system enhancements. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta^T X_p$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Bayesian hierarchical model, Maternal care systems, Methodological evaluation, Rwanda, Statistical inference, Clinical outcomes assessment*

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