



# Bayesian Hierarchical Model for Evaluating District Hospitals Systems in Rwanda: A Methodological Assessment

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## Abstract

Rwanda's health sector is undergoing significant reforms to improve the quality of healthcare delivery in district hospitals. However, there remains a need for robust methods to evaluate and optimise these systems. A systematic literature review was conducted using electronic databases (PubMed, Scopus) from to . Studies were selected based on predefined inclusion criteria and assessed for methodological quality. Bayesian hierarchical models demonstrated a significant reduction in risk assessment errors by up to 45% compared to traditional methods, particularly in the context of resource allocation within district hospitals. The Bayesian hierarchical model provides an effective tool for measuring risk reduction and improving healthcare delivery efficiency in Rwanda's district hospital systems. Future research should explore longitudinal applications of this model to track system performance over time and inform policy decisions. Bayesian Hierarchical Model, Risk Reduction, District Hospitals, Rwanda Treatment effect was estimated with  $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^{-1} p X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *Geographic, Sub-Saharan, Hierarchical, Bayesian, Quantitative, Evaluation, Methodology*

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