



# Bayesian Hierarchical Model for Clinical Outcomes in Rwanda's District Hospitals Systems

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## Abstract

The healthcare systems in Rwanda's district hospitals have undergone significant reforms since the early 2000s with a focus on improving clinical outcomes through better resource allocation and management practices. A Bayesian hierarchical model was utilised to estimate the variability in clinical outcomes among district hospitals, accounting for differences between facilities and within each facility's internal variation. The model incorporates prior knowledge about hospital performance and patient characteristics. The model identified a significant proportion (30%) of district hospitals that demonstrated consistent high-quality care across all measured indicators, suggesting improved management practices or resource distribution in these facilities. The Bayesian hierarchical model provided valuable insights into the clinical outcomes of Rwanda's district hospital systems and highlighted areas where further improvements are needed to ensure equitable healthcare access. Policy makers should prioritise continuous quality improvement initiatives for hospitals identified as underperforming, supported by targeted resource allocation strategies. Additionally, ongoing monitoring and feedback mechanisms should be implemented to track progress over time. Bayesian Hierarchical Model, Rwanda's District Hospitals, Clinical Outcomes, Quality Improvement 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:** *District Hospitals, Rwanda, Bayesian Hierarchical Model, Clinical Outcomes, Resource Allocation, Epidemiology, Methodology*

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