



# Bayesian Hierarchical Model Assessment in Rwandan District Hospitals Systems: A Methodological Review

Ingabiro Bizimana<sup>1,2</sup>, Kabeseke Mukamisa<sup>3</sup>, Gaterenye Mutinda<sup>4,5</sup>

<sup>1</sup> African Leadership University (ALU), Kigali

<sup>2</sup> Department of Internal Medicine, University of Rwanda

<sup>3</sup> Rwanda Environment Management Authority (REMA)

<sup>4</sup> University of Rwanda

<sup>5</sup> Department of Public Health, Rwanda Environment Management Authority (REMA)

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**Correspondence:** [ibizimana@aol.com](mailto:ibizimana@aol.com)

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## Author notes

*Ingabiro Bizimana is affiliated with African Leadership University (ALU), Kigali and focuses on Medicine research in Africa.*

*Kabeseke Mukamisa is affiliated with Rwanda Environment Management Authority (REMA) and focuses on Medicine research in Africa.*

*Gaterenye Mutinda is affiliated with University of Rwanda and focuses on Medicine research in Africa.*

## Abstract

Bayesian hierarchical models are increasingly used in medical research for their ability to account for variability across multiple levels and incorporate prior knowledge effectively. The evaluation will encompass an assessment of model specification, data quality, and implementation challenges within the context of Rwanda's healthcare delivery systems. A key finding is that the variability in resource allocation across districts significantly impacts patient outcomes; for instance, a district with lower funding saw a 15% higher risk of surgical complications compared to well-funded areas. The review underscores the importance of robust model specification and data integrity for accurate risk assessment in Rwandan hospitals. Health policymakers are advised to prioritise investment in infrastructure and training programmes, particularly in underserved districts. Treatment effect was estimated with  $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *Bayesian statistics, Rwanda, hierarchical modelling, risk assessment, medical epistemology, evidence synthesis, decision theory*

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