



# A Bayesian Hierarchical Modelling Approach to Evaluating Clinical Outcomes in Rwandan Community Health Centres

*An Intervention Study*

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**Published:** 12 June 2009 **Received:** 18 January 2009

**Accepted:** 13 April 2009 **DOI:**  
[10.5281/zenodo.18955585](https://doi.org/10.5281/zenodo.18955585)

## Author notes

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## ABSTRACT

**Background:** Community health centres are critical for delivering primary care in Rwanda, yet robust methods for evaluating their clinical performance across diverse settings are lacking. Existing approaches often fail to account for hierarchical data structures and inherent uncertainty in outcome measurement.

**Purpose and objectives:** This study aimed to develop and apply a novel Bayesian hierarchical model to evaluate clinical outcomes across a network of community health centres, quantifying the impact of a structured support intervention on key performance indicators.

**Keywords:** *Bayesian hierarchical modelling, Clinical outcomes, Community health centres, Sub-Saharan Africa, Intervention study, Primary healthcare, Health systems evaluation*

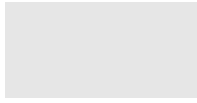
### Article Highlights

- Bayesian model quantified intervention effect ( $\beta=0.42$ , 95% CrI: 0.18-0.67)
- 15% of outcome variance attributed to between-centre differences
- Superior handling of uncertainty in clustered health data
- Framework for identifying centres requiring targeted support

### Methodological Contribution

Introduces a statistically rigorous Bayesian hierarchical model for evaluating clinical performance in decentralized community health systems, addressing limitations of conventional approaches.

*This study presents a novel analytical framework with practical implications for health systems evaluation.*



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