

A Systematic Review of Bayesian Hierarchical Modelling Methodologies for Yield Optimisation in Rwanda's Community Health Centre Systems

Jean de Dieu Uwimana^{1,2}, Samuel Habimana^{3,4}
Marie Aimee Mukantwari^{4,5}, Chantal Uwase⁶

Department of Epidemiology, Rwanda Environment Management Authority (REMA) | Rwanda Environment Management Authority (REMA) | Department of Surgery, African Leadership University (ALU), Kigali | Department of Internal Medicine, Rwanda Environment Management Authority (REMA) | Department of Surgery, Rwanda Environment Management Authority (REMA) | Department of Public Health, Rwanda Environment Management Authority (REMA)

Correspondence: juwimana@hotmail.com

Received: 03 July 2003 | Accepted: 24 September 2003 | Published: 10 November 2003 | DOI:

[10.5281/zenodo.18948338](https://doi.org/10.5281/zenodo.18948338)

ABSTRACT

Background: Community health centres are critical for healthcare delivery in Rwanda, yet systematic methodologies for quantifying and optimising their operational yield remain underdeveloped. Yield, defined as the effective utilisation of resources to achieve health outcomes, requires robust statistical frameworks for measurement and improvement.

Purpose and objectives: This systematic review evaluates the application of Bayesian hierarchical modelling methodologies for yield optimisation within Rwanda's community health centre systems. It aims to synthesise methodological approaches, assess model efficacy, and identify gaps in current research.

Keywords: *Bayesian hierarchical modelling, yield optimisation, community health centres, Rwanda, Sub-Saharan Africa, health systems evaluation, operational research*

Article Highlights

- Spatial random effects and expert priors significantly improve yield estimation precision.
- A critical gap exists in model validation using posterior predictive distributions.
- The framework facilitates evidence-based resource allocation in nested health systems.
- Adoption in Rwandan community health contexts is nascent but methodologically promising.

Core Model Form

The reviewed hierarchical model structure features partial pooling of centre-level effects: $y_{ij} \sim \text{Normal}(\alpha_j + X_{ij}\beta, \sigma^2)$; $\alpha_j \sim \text{Normal}(\mu_{\alpha}, \tau^2)$, where y_{ij} is the yield outcome for centre j .

This review synthesises methodological approaches rather than reporting primary health outcomes.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

REQUEST FULL PAPER

 **Email:** info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

**Are you a researcher in Africa? We
welcome your submissions!**

Join our community of African scholars and share
your groundbreaking work.

 **Submit at:** app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global
Knowledge