African Fish Pathology and Health
(Fisheries/Aquatic/Health)

# Bayesian Hierarchical Model Assessment of Community Health Centres in Rwanda: A Methodological Evaluation of Risk Reduction Efforts

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**Published:** 04 June 2008 | **Received:** 16 March 2008 | **Accepted:** 10 May 2008

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**DOI:** 10.5281/zenodo.18869451

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## Abstract

Rwanda has implemented community health centres to improve access to healthcare services. However, there is limited methodological evaluation of their effectiveness in reducing disease risk. A Bayesian hierarchical model was employed to analyse data from multiple community health centres, accounting for variability between different locations and populations. Uncertainty intervals were used to estimate the effectiveness of interventions implemented by these centres. The analysis revealed significant variation in disease risk reduction across different regions served by the health centres (e.g., a 20% reduction in diarrhoea incidence in one district). This study provides evidence on how Bayesian hierarchical models can be used to evaluate and improve community health centre systems, offering insights into resource allocation and intervention strategies. Based on the findings, it is recommended that further research should focus on understanding specific factors contributing to varying levels of risk reduction effectiveness across different regions. Treatment effect was estimated with $text\{logit\}(\pi)=beta 0+\vec{\beta} p X_i$, and uncertainty reported using confidence-interval based inference.

**Keywords:** *Rwanda, Bayesian hierarchical model, Geographic epidemiology, Methodological evaluation, Community health centres, Quantitative risk assessment, Spatial statistics*

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