

A Bayesian Hierarchical Modelling Approach to the Cost-Effectiveness of Community-Based Health Systems in Ghana

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ABSTRACT

Background: Community-based health systems are a cornerstone of primary care in many African nations, yet robust, context-specific evaluations of their cost-effectiveness remain scarce. Existing analyses often fail to adequately account for hierarchical data structures and the substantial uncertainty inherent in resource-limited settings.

Purpose and objectives: This study aimed to develop and apply a Bayesian hierarchical model to evaluate the cost-effectiveness of community health centres in Ghana, providing a methodological framework that explicitly quantifies uncertainty for decision-makers.

Keywords: *Bayesian hierarchical modelling, cost-effectiveness analysis, community-based health systems, sub-Saharan Africa, primary healthcare, health economics, Ghana*

Article Highlights

- Bayesian model estimates ICER with 95% credible interval for Ghanaian community health centres
- Substantial centre-level heterogeneity revealed ($\tau = 0.31$, 95% CrI: 0.22, 0.45)
- Methodology explicitly quantifies uncertainty for health policy decision-making
- Framework applicable to other resource-limited, decentralised health systems

Methodological Innovation

Uses Bayesian hierarchical linear regression with Hamiltonian Monte Carlo estimation to handle clustered data and quantify uncertainty in cost-effectiveness analysis.

Presents a novel modelling framework for economic evaluation in decentralised African health systems.

ABSTRACT-ONLY PUBLICATION

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

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