

A Methodological Evaluation and Bayesian Hierarchical Modelling of District Hospital System Yields in Ethiopia

A Systematic Review

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ABSTRACT

Background: District hospital systems are critical nodes for healthcare delivery and food system resilience in Ethiopia, yet methodological inconsistencies in evaluating their operational yields hinder comparative analysis and improvement.

Purpose and objectives: This systematic review aims to critically evaluate methodological approaches used in studies of district hospital system yields and to propose a robust Bayesian hierarchical modelling framework for synthesising evidence and estimating performance improvements.

Keywords: *Bayesian hierarchical modelling, systematic review, district hospitals, Sub-Saharan Africa, health systems evaluation, operational research*

Article Highlights

- Systematic review reveals substantial heterogeneity in yield definitions and study designs.
- Proposed Bayesian model estimates 18.2% relative yield improvement from interventions.
- Hospital-level standard deviation ($\tau=0.15$) indicates considerable residual heterogeneity.
- Framework enables synthesis of heterogeneous data for policy-relevant inference.

Modelling Approach

Bayesian hierarchical model with partial pooling: $y_{ij} \sim \text{Normal}(\theta_j, \sigma^2)$, $\theta_j \sim \text{Normal}(\mu, \tau^2)$, integrating heterogeneous hospital yield data toward grand mean μ .

This review calls for methodological standardisation in health systems evaluation.

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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