

Methodological Evaluation of District Hospital Systems in Nigeria

A Systematic Review of Multilevel Regression Analyses for Efficiency Gains (2000–2026)

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ABSTRACT

Background: District hospitals are critical nodes in Nigeria's healthcare system, yet their operational efficiency remains a persistent challenge. Systematic evaluations of the methodologies used to analyse these systems are lacking, particularly concerning advanced statistical approaches that account for hierarchical data structures.

Purpose and objectives: This systematic review aims to critically appraise the application of multilevel regression models in studies evaluating the efficiency of district hospital systems, assessing methodological rigour, model specification, and the inferential value of findings for health systems policy.

Methodology: A systematic search of multiple electronic databases was conducted following PRISMA guidelines. Peer-reviewed studies employing multilevel modelling to analyse hospital efficiency data were included. Data were extracted on model specifications, variables, and statistical reporting. Quality assessment used a bespoke tool for quantitative health systems research.

Keywords: *District hospitals, Nigeria, Multilevel modelling, Health systems efficiency, Sub-Saharan Africa, Systematic review, Regression analysis*

Article Highlights

- Systematic review finds inconsistent application of multilevel regression models.
- Poor reporting of model diagnostics and uncertainty measures limits evidence reliability.
- Two-level random intercept models dominate but are often insufficiently validated.
- Heterogeneous variable selection contributes to conflicting findings on efficiency drivers.

Core Statistical Model

The predominant structure identified was a two-level random intercept model: $y_{ij} = \beta_0 + \beta X_{ij} + u_j + e_{ij}$, where u_j represents hospital-level random effects.

This review establishes a novel checklist for the critical appraisal of multilevel models in health systems research.

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