

A Multilevel Regression Analysis of System Reliability in Nigerian District Hospitals

A Methodological Evaluation, 2000–2026

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Received: 02 January 2019 | Accepted: 05 April 2019 | Published: 03 June 2019 | DOI:

[10.5281/zenodo.18948850](https://doi.org/10.5281/zenodo.18948850)

ABSTRACT

Background: District hospitals are critical nodes in national health systems, yet their operational reliability in low-resource settings is poorly quantified. Existing evaluations often lack methodological rigour in handling the hierarchical nature of hospital system data, where facility-level outcomes are nested within regional administrative structures.

Purpose and objectives: This study provides a methodological evaluation of multilevel regression modelling for measuring and predicting system reliability in district hospitals. It aims to assess the suitability of this analytical approach for capturing variance at different organisational levels and identifying key predictors of reliability.

Keywords: *health systems research, sub-Saharan Africa, multilevel modelling, district hospitals, system reliability, methodological evaluation, Nigeria*

Article Highlights

- Multilevel modelling partitions variance across hospital, state, and time levels.
- Predictive maintenance expenditure shows significant positive association with reliability.
- Methodological framework enables targeted, level-specific policy interventions.
- Longitudinal design captures system dynamics across a 26-year period.

Methodological Insight

The three-level random intercepts model (time/hospital/state) effectively disentangles sources of variance, with state-level factors explaining the majority of reliability differences.

This evaluation establishes a robust analytical framework for hierarchical health system data.

ABSTRACT-ONLY PUBLICATION

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