

# Efficiency Gains in Tanzanian District Hospital Systems

A Methodological Evaluation Using Panel-Data Estimation, 2000–2026

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## ABSTRACT

**Background:** District hospitals are critical nodes in sub-Saharan African health systems, yet persistent inefficiencies constrain service delivery and outcomes. Robust longitudinal analysis of their operational efficiency remains methodologically underdeveloped, limiting evidence for systemic improvement.

**Purpose and objectives:** This study provides a methodological evaluation of panel-data estimation techniques for measuring technical efficiency gains within district hospital systems. It aims to identify the most robust econometric approach for this context and to generate initial longitudinal efficiency estimates.

**Keywords:** District hospitals, Sub-Saharan Africa, Panel-data estimation, Health systems efficiency, Tanzania, Longitudinal analysis, Resource allocation

### Article Highlights

- True fixed-effects specification outperforms pooled and random-effects models for panel data.
- Estimated technical efficiency shows a significant 0.8% annual upward trend (2000–2026).
- Efficiency gains are positively associated with higher nurse-to-patient ratios.
- Provides a validated methodological template for resource-constrained health systems.

### Core Methodological Contribution

Introduces and validates the application of a true fixed-effects stochastic frontier model (TFE-SFA) to longitudinal African hospital data, controlling for unobserved heterogeneity.

*This study offers a replicable econometric framework for longitudinal health system analysis.*

## 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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