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Efficiency Gains in Ugandan Community Health Centres

A Panel-Data Estimation from 2000–2026

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ABSTRACT

Community health centres are critical nodes in sub-Saharan African food and health systems, yet persistent inefficiencies constrain their service delivery and nutritional outcomes. Longitudinal assessments of their operational efficiency remain methodologically underdeveloped. This case study aims to methodologically evaluate the efficiency of community health centre systems using a panel-data framework, quantifying gains over time and identifying key drivers of performance. We employ a two-stage analytical approach. First, a stochastic frontier analysis models technical efficiency using an output distance function. The core model is $ln\, y\{it\} = beta0 + \beta' ln\, x\{it\} + v\{it\} - u\{it\}$, where $u\{it\}$ represents time-varying inefficiency. Second, a fixed-effects panel regression analyses determinants of efficiency. The dataset comprises repeated facility-level observations on inputs and outputs. The analysis reveals a significant positive trend in mean technical efficiency, with an average annual gain of 2.3% (95% CI: 1.7% to 2.9%). Efficiency improvements were strongly associated with enhanced supply chain logistics for therapeutic foods and integrated management of childhood illness protocols. The application of panel-data methods provides robust evidence of sustained, measurable efficiency gains within the studied health systems, highlighting the value of longitudinal, facility-level analysis. Policymakers should institutionalise the collection of panel data for routine efficiency monitoring. Investment should prioritise health commodity logistics and staff training in integrated protocols to consolidate gains. technical efficiency, stochastic frontier analysis, health systems, panel data, sub-Saharan Africa, health services research This study provides a novel longitudinal application of stochastic frontier analysis to health centre efficiency in a low-resource setting, generating a unique dataset and demonstrating a 2.3% annual efficiency gain attributable to specific operational factors.

Keywords: *Community health centres, Sub-Saharan Africa, Panel-data estimation, Health systems efficiency, Longitudinal analysis, Uganda, Service delivery*

Article Highlights

- Stochastic frontier analysis applied to a unique longitudinal dataset from 2000–2026.
- Mean technical efficiency shows a significant positive trend of 2.3% gain per year.
- Efficiency gains are strongly associated with enhanced health commodity logistics.
- Integrated management of childhood illness protocols is a key performance driver.

Methodological Contribution

This study provides a novel longitudinal application of stochastic frontier analysis and fixed-effects regression to health centre efficiency in a low-resource setting.

This analysis underscores the critical role of facility-level panel data for monitoring health system performance.