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A Multilevel Regression Protocol for Evaluating the Technical Efficiency of Community Health Centres in Rwanda

A Methodological Framework for Health Systems Analysis

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ABSTRACT

Background: Community health centres are the cornerstone of primary healthcare delivery in Rwanda, yet systematic, quantitative evaluations of their technical efficiency are lacking. Existing health systems analyses often fail to account for the hierarchical structure of health service data, where centres are nested within districts with varying resource endowments and epidemiological profiles.

Purpose and objectives: This protocol details a methodological framework for a multilevel regression analysis to measure and explain variations in the technical efficiency of community health centres. The primary objective is to estimate centre-level efficiency scores while quantifying the proportion of variance attributable to district-level contextual factors.

Keywords: *Health systems analysis, Technical efficiency, Multilevel regression, Community health centres, Sub-Saharan Africa*

Article Highlights

- Two-stage design: Data Envelopment Analysis followed by multilevel regression.
- Quantifies variance in efficiency attributable to district-level contextual factors.
- Framework designed for actionable insights in decentralized health management.
- Anticipates >30% of efficiency variance explained by higher-level system factors.

Analytical Core

Multilevel model: $y_{ij} = \beta_{0} + \beta X_{ij} + u_{j} + e_{ij}$, where i denotes centres nested within districts j. Inference uses 95% CIs with robust standard errors clustered at district level.

This paper presents a research protocol; empirical results are anticipated from future application.