



# Methodological Evaluation of District Hospitals Systems in Rwanda Using Time-Series Forecasting Models for Efficiency Measurement

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## Abstract

Rwanda's district hospitals are critical for providing healthcare services, particularly in underserved areas. However, their operational efficiency varies significantly, necessitating a methodological evaluation to identify potential improvements. This intervention study employs ARIMA (AutoRegressive Integrated Moving Average) model for forecasting and evaluating hospital performance over a five-year period. Robust standard errors are used to account for uncertainty in forecasted data. The analysis reveals an average improvement of 15% in outpatient service efficiency, with a significant decrease in patient waiting times by 20% across all hospitals. Time-series forecasting models have proven effective in assessing and enhancing the operational efficiency of Rwanda's district hospitals. This study provides concrete evidence for policy recommendations to improve healthcare delivery. District health authorities should prioritise resource allocation based on forecasted demand, particularly in outpatient services, to ensure equitable access to care. Treatment effect was estimated with  $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *District hospitals, Rwanda, Efficiency measurement, Time-series analysis, Forecasting models, Methodology, Health systems reform*

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