



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

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## Abstract

The healthcare sector in Ghana faces challenges related to resource allocation and operational efficiency, particularly at district hospitals where patient care delivery is critical. Data from 20 district hospitals were analysed. Time-series forecasting models such as the ARIMA model were applied to predict future operational efficiencies based on historical data. Robust standard errors and uncertainty intervals were used for inference. Districts with higher baseline patient volumes showed significant efficiency gains, with a mean improvement of 15% in resource utilization over the study period (95% confidence interval: 10-20%). The use of ARIMA models provided valuable insights into district hospital performance and highlighted areas requiring targeted interventions to improve service delivery. District health authorities should focus on improving patient flow management, enhancing training programmes for healthcare staff, and implementing sustainable resource allocation strategies. Treatment effect was estimated with  $\text{logit}(\pi) = \beta_0 + \beta^T X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *Sub-Saharan, district hospitals, forecasting, econometrics, resource allocation, performance measurement, time-series analysis*

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