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Methodological Evaluation of District Hospitals Systems in South Africa Using Time-Series Forecasting Models for Risk Reduction Analysis

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Abstract

This study evaluates the operational systems of district hospitals in South Africa, focusing on risk reduction through time-series forecasting models. A hybrid ARIMA-GARCH model was employed to forecast future trends in patient admissions, with robust standard errors accounting for uncertainty. Patient admission patterns showed a consistent upward trend over the past five years, necessitating proactive interventions to mitigate potential overcrowding. The use of time-series forecasting models has identified key areas where district hospitals can enhance their operational efficiency and risk management strategies. District health authorities are advised to implement preventive measures based on forecasted data, such as expanding outpatient services or optimising bed allocation policies. time-series forecasting, ARIMA-GARCH model, patient admission trends, South African district hospitals, risk reduction Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \beta^{\rightarrow} p\, X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, ARIMA, GARCH, forecasting, econometrics, healthcare systems, South Africa*