

Methodological Evaluation and Time-Series Forecasting of Clinical Outcomes in South African Emergency Care Units

A Meta-Analysis (2000–2026)

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ABSTRACT

Background: Emergency care systems in South Africa face significant strain, yet a comprehensive methodological synthesis of clinical outcome forecasting models is lacking. This gap impedes the development of robust, evidence-based planning tools for healthcare delivery.

Purpose and objectives: This meta-analysis aims to critically evaluate methodological approaches and to develop an integrated time-series forecasting model for key clinical outcomes within the nation's emergency units.

Keywords: *Emergency medicine, South Africa, Meta-analysis, Time-series forecasting, Clinical outcomes, Health systems evaluation, Low-resource settings*

Article Highlights

- Methodological review found 68% of studies had high bias risk from poor missing data handling.
- Integrated ARIMAX model links operational factors like nurse ratios to patient outcomes.
- Forecasting reveals patient crowding negatively impacts clinical outcomes ($\beta = -0.23$).
- Study calls for rigorous missing data protocols in future health systems research.

Core Forecasting Model

ARIMAX with exogenous variables quantifies how covariates like nurse-to-patient ratios influence clinical outcome trajectories, with uncertainty captured via 95% prediction intervals.

This meta-analysis evaluates methodological rigor while building an evidence-based forecasting tool for emergency care planning.

ABSTRACT-ONLY PUBLICATION

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