African Health Ethics and Law (Clinical/Bioethics focus)

Methodological Evaluation of Community Health Centre Systems in Rwanda Using Time-Series Forecasting Models for Clinical Outcome Measurement

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Abstract

Community health centres (CHCs) in Rwanda are pivotal for delivering healthcare services to underserved populations. However, there is a need to evaluate and improve their efficiency and effectiveness. Data from Rwanda's National Health Insurance Scheme were analysed using a SARIMA (Seasonal AutoRegressive Integrated Moving Average) model, with robust standard errors estimated at the 95% confidence level. A significant trend in patient recovery rates was observed over the study period, indicating that time-series forecasting can effectively predict clinical outcomes for future healthcare planning. The SARIMA model provided reliable forecasts of patient outcomes with a margin of error within ±2 standard errors, suggesting its potential as an evidence-based tool for CHCs in Rwanda. Based on the findings, recommendations include enhancing data collection practices and integrating predictive analytics into routine operations to improve service delivery and resource allocation. Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\ p\ X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, community health centres, forecasting models, intervention studies, clinical outcomes, methodological evaluation, predictive analytics*

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