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A Methodological Evaluation and Time-Series Forecasting Model for the Cost-Effectiveness of Public Health Surveillance Systems in Uganda: A Systematic Review (2000–2026)

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ABSTRACT

Background: Public health surveillance is a cornerstone of effective disease control, yet the cost-effectiveness of such systems in low-resource settings remains inadequately assessed. In Uganda, diverse surveillance methodologies have been implemented, but a comprehensive methodological evaluation and predictive economic analysis are lacking.

Purpose and objectives: This systematic review aimed to critically evaluate methodological approaches for assessing public health surveillance and to develop a time-series forecasting model to project the cost-effectiveness of these systems in the Ugandan context.

Keywords: *public health surveillance, cost-effectiveness analysis, time-series forecasting, Sub-Saharan Africa, systematic review, health economics, Uganda*

Article Highlights

- Systematic review reveals only 28% of studies used standardised economic evaluation frameworks.
- Novel ARIMA-based model forecasts cost-effectiveness of public health surveillance systems.
- Projections indicate potential for significant efficiency gains in resource allocation.
- Methodological heterogeneity in current evaluations limits comparative analysis.

Forecasting Model Core

ARIMA(p,d,q) formulation integrates historical cost and outcome data to project future cost-effectiveness ratios, with uncertainty quantified via 95% prediction intervals.

This review synthesizes methodological approaches and introduces a predictive tool for health economic planning.