



# Methodological Evaluation of Public Health Surveillance Systems in South Africa Using Time-Series Forecasting Models for Cost-Effectiveness Analysis,

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## Abstract

This study addresses a current research gap in Medicine concerning Methodological evaluation of public health surveillance systems systems in South Africa: time-series forecasting model for measuring cost-effectiveness in South Africa. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A mixed-methods design was used, combining survey and interview data collected over the study period. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of public health surveillance systems systems in South Africa: time-series forecasting model for measuring cost-effectiveness, South Africa, Africa, Medicine, intervention study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. Treatment effect was estimated with  $\text{text}\{logit\}(\pi) = \beta_0 + \beta^T p X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** African geography, public health surveillance, time-series analysis, forecasting models, cost-effectiveness, intervention studies, analytical frameworks

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