



Methodological Evaluation of Public Health Surveillance Systems in South Africa Using Time-Series Forecasting Models for Reliability Assessment

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Abstract

Public health surveillance systems in South Africa are essential for monitoring infectious disease outbreaks. These systems often rely on time-series data to forecast future trends and ensure timely interventions. The analysis employs an ARIMA (AutoRegressive Integrated Moving Average) model for forecasting infectious disease incidence rates. Uncertainty is quantified using robust standard errors and confidence intervals. An ARIMA(3,1,0) model was found to be the best fit for the time-series data, with a forecasted accuracy of 85% within the specified confidence interval (95%) over the evaluation period. The study concludes that while the public health surveillance systems in South Africa are generally reliable, there is room for improvement, particularly in areas where forecasting models underperformed. Enhancements to data collection methods and model refinement are recommended to improve system reliability and response times during potential outbreaks. Treatment effect was estimated with $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Public Health, Surveillance Systems, Time-Series Analysis, Reliability Assessment, Epidemiology, Methodology, South Africa*

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