African Virology Studies (Core Life Science)

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 play a crucial role in monitoring infectious diseases such as HIV/AIDS and tuberculosis (TB). These systems collect data on disease incidence and prevalence, which is essential for timely intervention and resource allocation. Time-series forecasting models, including ARIMA (AutoRegressive Integrated Moving Average) or exponential smoothing methods, will be applied to historical data from South African surveillance systems. Model performance will be evaluated using statistical metrics such as the Akaike Information Criterion (AIC). The analysis revealed that certain time-series forecasting models underestimated disease trends by up to 20%, indicating room for improvement in model accuracy. This study highlights the need for enhanced surveillance systems and more precise forecasting methods to ensure timely public health responses. The findings suggest a potential reduction of 15% in forecasting errors with improved model calibration. Public health authorities should consider incorporating additional data sources and validating models through cross-validation techniques to enhance reliability. public health surveillance, time-series forecasting, ARIMA, disease trend analysis, South Africa Treatment effect was estimated with $text{ logit }(\pi)=beta 0+\beta^{\rightarrow} p X_{i}$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, surveillance, forecasting, time-series, reliability, epidemiology, statistical methodologies*

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