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

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Abstract

Public health surveillance systems in South Africa are crucial for monitoring infectious diseases such as tuberculosis (TB). These systems often rely on time-series data to forecast trends and predict potential outbreaks, enabling timely interventions. A comprehensive search strategy was employed across multiple databases including PubMed, Scopus, and Web of Science. Studies published between and were included if they utilised time-series forecasting models to monitor TB prevalence or other infectious diseases in South Africa. Methodological quality assessment was conducted using the Cochrane Risk of Bias tool. The analysis revealed that while some studies applied robust statistical techniques, there is variability in model performance and methodological transparency across different surveillance systems. For instance, one study reported a mean forecasting accuracy within ±10% (95% CI: ±8-±12%). This review underscores the importance of consistent application of high-quality time-series models for effective public health monitoring in South Africa. We recommend improving methodological consistency, enhancing data quality, and promoting transparency to ensure reliable forecasting outcomes. This will aid in more informed decision-making by policymakers and healthcare providers. 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, methodology, forecasting, tuberculosis, epidemiology, spatial analysis*

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