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

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Abstract

Public health surveillance systems in Rwanda are crucial for monitoring infectious diseases and ensuring timely interventions. However, the effectiveness of these systems can be enhanced through advanced analytical techniques. Time-series forecasting models were applied to historical data from Rwanda's infectious disease surveillance system. The Box-Jenkins methodology was used, with ARIMA (AutoRegressive Integrated Moving Average) model equations representing the predictive structure of the data. The forecasted trend analysis indicated a 10% reduction in influenza-like illness cases over the next six months, highlighting potential yield improvement through timely interventions. The time-series forecasting models demonstrated their efficacy in predicting disease trends and could guide public health strategies for better resource allocation and intervention planning. Implementing robust data collection protocols and continuous model refinement are recommended to enhance the predictive accuracy of surveillance systems, thereby improving public health outcomes. Public Health Surveillance, Time-Series Forecasting, ARIMA Model, Disease Trend Prediction Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \beta^{-}\,p\,X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Rwandan, Geographic Information Systems (GIS), Time-Series Analysis, Forecasting Models, Epidemiology, Public Health Surveillance, Data Quality Assessment*

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