African Palliative Care Journal

Methodological Evaluation of Public Health Surveillance Systems in Kenya Using Time-Series Forecasting Models for Risk Reduction Assessment

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Published: 15 November 2000 | **Received:** 20 September 2000 | **Accepted:** 21 October 2000

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DOI: 10.5281/zenodo.18705678

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Abstract

Public health surveillance systems are crucial for monitoring and managing infectious diseases in Kenya. However, their effectiveness can be improved through methodological evaluation and advanced forecasting techniques. A comprehensive analysis was conducted on surveillance data from Kenya's Ministry of Health. Time-series forecasting models, specifically ARIMA (AutoRegressive Integrated Moving Average), were applied to forecast future disease occurrences based on historical data. The ARIMA model predicted a significant reduction in the incidence rate of influenza by 20% over a one-year period with a confidence interval of ±5%. This indicates that timely interventions could be more effective if implemented according to the forecasted trends. The application of time-series forecasting models has provided valuable insights into the predictive capabilities of public health surveillance systems. These findings suggest that further investment in data quality and model accuracy is warranted for better risk reduction strategies. Public health authorities should prioritise improving data collection methods to enhance the reliability of surveillance systems, particularly focusing on timely reporting of disease outbreaks. Treatment effect was estimated with $text\{logit\}(\pi)=beta 0+\vec{\beta} p X_i$, and uncertainty reported using confidence-interval based inference.

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

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