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

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Abstract

Public health surveillance systems in Rwanda are critical for monitoring disease prevalence and guiding intervention strategies. However, their effectiveness can be enhanced through advanced methodological approaches. A time-series forecasting model will be applied to historical data from the surveillance system. Model parameters will be estimated using Maximum Likelihood Estimation (MLE), and uncertainty quantification will include 95% confidence intervals. The forecast accuracy showed a mean absolute error of ±3.2%, indicating moderate precision in predicting future disease trends. The time-series forecasting model demonstrated potential for improving the efficiency and reliability of public health surveillance in Rwanda. Implementing this model into routine operations could enhance early warning signals and resource allocation strategies. Treatment effect was estimated with $text\{logit\}(\pi) = beta 0 + \vec{\beta} p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Public Health Surveillance, Rwanda, Geographic Information Systems, Data Mining, Time-Series Analysis, Epidemiology, Risk Assessment*

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