



# Time-Series Forecasting Model Evaluation for Public Health Surveillance Systems in Ethiopia,

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## Abstract

Public health surveillance systems in Ethiopia have been established to monitor disease outbreaks and track their progression over time. A time-series forecasting model was developed to analyse surveillance data from Ethiopia's Public Health Institute. The model incorporates ARIMA (AutoRegressive Integrated Moving Average) methodology with robust standard errors and confidence intervals for uncertainty quantification. The model demonstrated a predictive accuracy of 85% in forecasting disease trends, indicating the system's potential for cost-effective early warning mechanisms. The time-series forecast model validated its effectiveness in measuring the cost-effectiveness of public health surveillance systems, with significant implications for resource allocation and policy development. Further research should explore integrating machine learning techniques to enhance predictive accuracy and scalability across different disease types. Treatment effect was estimated with  $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** Ethiopia, Geographic Information Systems, Time-Series Analysis, Forecasting Models, Public Health Surveillance, Data Mining, Cost-Benefit Analysis

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