

# Methodological Evaluation and Time-Series Forecasting for Public Health Surveillance System Optimisation in Uganda

*A Systematic Review*

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## ABSTRACT

**Background:** Public health surveillance systems are critical for early detection and response to disease outbreaks. In Uganda, the optimisation of these systems through robust methodological evaluation and forecasting remains a significant challenge, impacting the efficacy of risk reduction strategies.

**Purpose and objectives:** This systematic review aims to critically evaluate methodological approaches used in the assessment of public health surveillance systems in Uganda and to synthesise evidence on the application of time-series forecasting models for measuring risk reduction.

**Keywords:** *public health surveillance, methodological evaluation, time-series forecasting, Uganda, sub-Saharan Africa, outbreak detection, system optimisation*

### Article Highlights

- Identifies predominant focus on malaria and influenza-like illness surveillance in Uganda.
- Finds methodological rigour in system evaluation is variable across studies.
- Notes forecasting utility is constrained by data quality and contextual integration.
- Recommends integrated, multi-disease frameworks with improved data granularity.

### Core Analytical Model

The review evaluated an ARIMA formulation:  $X_t = c + \sum \phi_i X_{t-i} + \sum \theta_i \epsilon_{t-i} + \epsilon_t$ , with parameter uncertainty assessed via 95% confidence intervals.

*This review provides the first consolidated methodological critique of surveillance system evaluation and forecasting in Uganda.*

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