AFRICAN FOOD SYSTEMS RESEARCH (INTERDISCIPLINARY - INCL AGRI/ENV)
Vol. 1 | No. 1 | 2022

Methodological Evaluation and Time-Series Forecasting of Public Health Surveillance System Adoption in Nigeria, 2000–2026

Adebayo Adeyemi[1], **Chinwe Okonkwo**[2,3]
[1] *Department of Pediatrics, University of Benin*
[2] *Department of Epidemiology, University of Benin*
[3] *Nigerian Institute of Advanced Legal Studies (NIALS)*
Correspondence: aadeyemi@aol.com

Published: 26 April 2022 **Received:** 23 November 2021
Accepted: 27 February 2022 **DOI:** 10.5281/zenodo.18949053

Author notes
Adebayo Adeyemi is affiliated with Department of Pediatrics, University of Benin and focuses on Medicine research in Africa.
Chinwe Okonkwo is affiliated with Department of Epidemiology, University of Benin and focuses on Medicine research in Africa.

ABSTRACT

{ "background": "Public health surveillance systems are critical for disease control, yet their adoption across Nigeria remains uneven and inadequately quantified. Existing evaluations are often cross-sectional, lacking the longitudinal rigour needed to forecast trends and inform strategic investment.", "purpose and objectives": "This protocol details a methodological evaluation and the development of a time-series forecasting model to measure and predict the adoption rates of integrated disease surveillance and response (IDSR) systems. The primary objective is to generate robust, forward-looking evidence to guide policy.", "methodology": "We will conduct a retrospective analysis of national and state-level surveillance adoption data. A seasonal autoregressive integrated moving average (SARIMA) model, specified as $\varphi(B)\varphi(B^s)nabla^d\ nablas^D\ yt\ = \theta(B)\theta(B^s)\varepsilon_t$, will be fitted to the historical data. Model diagnostics will include checks for residual autocorrelation using the Ljung-Box test, with forecasts generated alongside 95% prediction intervals to quantify uncertainty.", "findings": "As this is a protocol, no empirical findings are presented. The anticipated output of the completed research will be a validated forecasting model projecting state-level adoption rates. A key expected result is the identification of a significant positive temporal trend, with model forecasts suggesting a potential increase in national adoption of at least 15 percentage points over the forecast horizon.", "conclusion": "The proposed methodology will provide a novel, evidence-based tool for assessing the trajectory of surveillance system adoption, moving beyond descriptive evaluation towards predictive analytics.", "recommendations": "Future research should integrate this forecasting approach with socio-economic covariates to identify determinants of adoption. Policymakers should utilise such models for

targeted resource allocation and to monitor progress towards national coverage targets.", "key words": "public health surveillance, forecasting, time-series analysis, health systems research, Nigeria", "contribution statement": "This protocol introduces a novel application of SARIMA modelling to forecast public health surveillance adoption, generating a replicable methodological framework for

Keywords: *Public health surveillance, Nigeria, methodological evaluation, time-series forecasting, health systems strengthening, Sub-Saharan Africa, adoption rates*

Article Highlights

- Retrospective analysis of national and state-level surveillance adoption data in Nigeria.
- Development of a SARIMA model to forecast adoption rates with 95% prediction intervals.
- Anticipates a significant positive trend, projecting a 15-point national increase.
- Provides a replicable framework for evidence-based policy and targeted resource allocation.

Methodological Core

A seasonal ARIMA (SARIMA) model will be fitted to historical data, with diagnostics including Ljung-Box tests for residual autocorrelation.

This article presents a study protocol; empirical findings are forthcoming.