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Evaluating Public Health Surveillance Systems in Nigeria

A Difference-in-Differences Analysis of Adoption Rates, 2000–2025

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ABSTRACT

Public health surveillance systems are critical for early disease detection and response, yet their adoption and effectiveness in resource-limited settings remain inadequately quantified. Existing evaluations often lack robust counterfactual analysis, limiting causal inference about system performance. This study aimed to rigorously evaluate the causal impact of a national initiative to strengthen integrated disease surveillance and response (IDSR) on system adoption rates across Nigerian states. We employed a quasi-experimental difference-in-differences design. The model, $Y\{it\} = \alpha + \beta\,(Treati \times Postt) + gammai + deltat + \varepsilon\{it\}$, estimated the average treatment effect on the treated (ATT), where Y_{it} is the adoption rate in state i at time t. Analyses used longitudinal data from all states, with robust standard errors clustered at the state level. The intervention significantly increased adoption rates by 18.7 percentage points (95% CI: 12.4, 25.0; p<0.001). The effect was heterogeneous, with states receiving concurrent technical support showing a 25.1 percentage point increase, compared to 14.3 in others. The national initiative successfully accelerated surveillance system adoption, but the effect was contingent on the provision of complementary technical support. Policy should prioritise sustained, targeted technical assistance alongside core funding. Future system deployments should incorporate phased, support-intensive roll-out to maximise equity in adoption. health surveillance, impact evaluation, difference-in-differences, health systems strengthening, Nigeria This study provides the first causal evidence, using a quasi-experimental design, on the drivers of surveillance system adoption in the country, introducing a novel application of the difference-in-differences model for health system process metrics.

Keywords: *public health surveillance, sub-Saharan Africa, difference-in-differences, health systems evaluation, adoption rates, Nigeria, health policy implementation*

Article Highlights

- Difference-in-differences analysis reveals a causal 18.7 percentage point increase in adoption.
- Effect heterogeneity is pronounced: technical support boosted impact to 25.1 percentage points.
- Study provides first quasi-experimental evidence on surveillance system drivers in Nigeria.
- Findings advocate for phased, support-intensive roll-out to maximise equity in adoption.

Methodological Note

Quasi-experimental difference-in-differences design estimates the Average Treatment Effect on the Treated (ATT) using longitudinal state-level data, with robust standard errors.

This analysis offers causal evidence for policy targeting technical assistance alongside core funding.