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Methodological Evaluation and Efficiency Gains in Nigerian Public Health Surveillance

A Meta-Analysis Using Difference-in-Differences Models, 2000–2026

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ABSTRACT

Background: Public health surveillance is a cornerstone of effective health systems, yet its methodological rigour and efficiency in resource-constrained settings require systematic assessment. In Nigeria, numerous interventions have aimed to strengthen surveillance, but a consolidated quantitative synthesis of their impact is lacking.

Purpose and objectives: This meta-analysis aims to methodologically evaluate the application of difference-in-differences (DiD) models in assessing the efficiency gains of public health surveillance interventions in Nigeria and to synthesise the pooled effect estimates from these studies.

Keywords: *public health surveillance, Sub-Saharan Africa, health systems evaluation, difference-in-differences, methodological rigour, efficiency gains, Nigeria*

Article Highlights

- Pooled analysis shows a 3.2-day mean reduction in outbreak reporting time.
- Considerable heterogeneity (I^2=78%) reflects varied

Core Analytical Model

The key parameter δ in the DiD model $Y_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \delta(Treat_i \times Post_t) + \varepsilon_{it}$ captures the causal effect of surveillance interventions.

intervention contexts. • Difference-in-differences models provide robust evidence for efficiency gains. • Methodological rigour in evaluation design requires strengthening.	*This meta-analysis synthesises evidence from difference-in-differences evaluations across two decades.*