

Evaluating Surveillance System Yield in Ethiopia

A Difference-in-Differences Analysis of Methodological Interventions, 2000–2026

Meklit Abebe¹|Tewodros Getachew¹

Debre Markos University

Correspondence: mabebe@gmail.com

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ABSTRACT

Public health surveillance systems in low-resource settings often suffer from under-reporting and data quality issues, limiting their utility for timely outbreak detection and response. Methodological interventions to improve system yield require rigorous evaluation, yet robust counterfactual analyses are seldom applied in this context. This study aimed to quantify the causal impact of a multi-component methodological intervention—integrating community-based event reporting, streamlined data flow, and performance feedback—on the yield of a national surveillance system. We employed a quasi-experimental, difference-in-differences design, comparing longitudinal surveillance metrics from intervention and comparison regions. The primary model was specified as $Y_{it} = \beta_0 + \beta_1 (Intervention_i \times Post_t) + \gamma_{it} + \delta_{it} + \varepsilon_{it}$, where γ_{it} and δ_{it} are region and time fixed effects. Inference was based on cluster-robust standard errors. Preliminary analysis indicates a positive and statistically significant average treatment effect. The intervention was associated with a 34% increase in the mean monthly reporting of priority syndromes (95% CI: 22 to 48). The effect appeared sustained over the observation period. The methodological package substantially improved surveillance yield, demonstrating that structured enhancements to data capture and feedback mechanisms can effectively strengthen system performance. Programme implementers should adopt integrated, community-engaged interventions with built-in feedback loops. Future research should assess the cost-effectiveness of these components and their impact on specific disease detection timelines. surveillance evaluation, health systems, difference-in-differences, health metrics, data quality This study provides novel empirical evidence for the causal efficacy of a specific methodological intervention on surveillance output, using a robust counterfactual design rarely applied in operational public health research in Africa.

Keywords: *Public health surveillance, Sub-Saharan Africa, Difference-in-differences, Health systems research, Ethiopia, Intervention study, Data quality*

Article Highlights

- Quasi-experimental design quantifies causal impact of surveillance interventions.
- Intervention linked to 34% increase in priority syndrome reporting.
- Integrated approach combined community reporting and feedback mechanisms.
- Study provides robust counterfactual evidence for health system strengthening.

Methodological Insight

Employed a difference-in-differences model with region and time fixed effects to isolate the causal effect of the intervention on surveillance metrics.

This analysis offers novel evidence for strengthening public health surveillance through structured methodological enhancements.

ABSTRACT-ONLY PUBLICATION

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