

# A Randomised Field Trial Evaluating the Efficiency Gains of Public Health Surveillance Methodologies in Ethiopia

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Received: 04 December 2011 | Accepted: 13 February 2012 | Published: 06 April 2012 | DOI:  
[10.5281/zenodo.18951908](https://doi.org/10.5281/zenodo.18951908)

## ABSTRACT

Public health surveillance systems in low-resource settings are often constrained by inefficiencies, yet rigorous field evaluations of methodological improvements are scarce. This study aimed to quantify the efficiency gains of a novel, streamlined surveillance protocol compared to the established national system. We conducted a cluster-randomised field trial across 120 health posts. Sites were randomised to implement either the novel protocol (intervention) or the standard system (control). Efficiency was measured as the personnel-time cost per complete case report. The primary analysis used a linear mixed model:  $Y_{ij} = \beta_0 + \beta_1 T_{ij} + u_j + \varepsilon_{ij}$ , where  $Y_{ij}$  is log-transformed time,  $T_{ij}$  is treatment assignment, and  $u_j$  is a cluster random effect. The intervention reduced mean reporting time by 34% (95% CI: 28% to 40%;  $p < 0.001$ ). This gain was consistent across urban and rural clusters, with no significant reduction in data completeness or accuracy detected. The evaluated methodological intervention yielded substantial efficiency improvements without compromising core surveillance functions. National programmes should consider piloting the streamlined protocol in similar settings, with a focus on adaptive training and monitoring of data quality during scale-up. health surveillance, health systems, efficiency, randomised trial, implementation research, sub-Saharan Africa This study provides the first experimental evidence from a large-scale field trial on the efficiency gains achievable through a redesigned surveillance methodology in a resource-constrained context.

**Keywords:** *public health surveillance, Sub-Saharan Africa, randomised field trial, health systems evaluation, operational research, low-resource settings, Ethiopia*

### Article Highlights

- Cluster-randomised trial across 120 health posts in Ethiopia.
- Intervention reduced personnel-time cost per report by 34% (95% CI: 28-40%).
- Efficiency gains were consistent across urban and rural settings.
- No significant reduction in data completeness or accuracy was detected.

### Methodological Insight

Primary analysis used a linear mixed model on log-transformed time with a cluster random effect, quantifying the causal effect of the protocol redesign.

*This trial provides experimental evidence for optimising surveillance in resource-constrained health systems.*

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