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Methodological Evaluation and Cost-Effectiveness of Public Health Surveillance Systems in Tanzania

A Meta-Analysis Using Difference-in-Differences Modelling

Juma Mwakisoma[1,2], **Amina Mwinyi**[1,2], **Neema Mushi**[3,4]

Tanzania Commission for Science and Technology (COSTECH) | Catholic University of Health and Allied Sciences (CUHAS) | Department of Epidemiology, Tanzania Commission for Science and Technology (COSTECH) | Department of Public Health, National Institute for Medical Research (NIMR)

Correspondence: jmwakisoma@gmail.com

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ABSTRACT

Background: Public health surveillance is a cornerstone of effective disease control, yet rigorous methodological evaluations of its cost-effectiveness in resource-limited settings are scarce. In Tanzania, multiple surveillance modalities have been implemented, but their comparative economic efficiency remains inadequately synthesised.

Purpose and objectives: This meta-analysis aimed to methodologically evaluate the cost-effectiveness of diverse public health surveillance systems in Tanzania by synthesising evidence from studies employing difference-in-differences (DiD) modelling, and to assess the robustness of this econometric approach in the surveillance context.

Keywords: *public health surveillance, cost-effectiveness analysis, difference-in-differences, Sub-Saharan Africa, health systems evaluation, meta-analysis, Tanzania*

Article Highlights

- Integrated community-based surveillance shows a pooled ICER of US$150 per DALY averted.
- Significant heterogeneity (I^2=78%) indicates substantial variation across study contexts.
- Only 25% of DiD applications adequately tested the critical parallel trends assumption.
- The study underscores a need for more rigorous econometric validation in health evaluations.

Core Analytical Model

The primary Difference-in-Differences specification was: $Y_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \delta(Treat_i \cdot Post_t) + \varepsilon_{it}$, where δ represents the average treatment effect on the treated.

This meta-analysis synthesises evidence but highlights crucial limitations in methodological application.