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Methodological Evaluation and Yield Optimisation of Public Health Surveillance Systems in Nigeria

A Systematic Review of Field Trial Evidence (2000–2026)

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ABSTRACT

{ "background": "Public health surveillance is critical for disease control, yet the methodological rigour of field trials evaluating such systems in Nigeria remains inadequately characterised. A systematic assessment of trial designs and their impact on surveillance yield is required to inform evidence-based optimisation.", "purpose and objectives": "This review systematically identifies and methodologically appraises randomised field trials conducted in Nigeria that evaluate interventions aimed at optimising the yield of public health surveillance systems. It aims to synthesise evidence on effective methodological approaches and quantify reported yield improvements.", "methodology": "A systematic search of multiple electronic databases was conducted following PRISMA guidelines. Included studies were randomised controlled trials (individual or cluster) evaluating surveillance system interventions. Methodological quality was assessed using the Cochrane Risk of Bias tool. Data were extracted on trial design, interventions, and outcomes. A random-effects meta-analysis model, $Yi = \mu + thetai + epsiloni$, where $thetai \sim N(0,\tau^2)$, was specified for yield outcomes, with heterogeneity quantified using the I^2 statistic.", "findings": "Of the 27 included trials, 18 (67%) employed cluster-randomised designs, primarily evaluating community-based reporting interventions. The methodological quality was variable, with frequent high risk of bias in blinding and allocation concealment. The pooled analysis indicated that structured community health worker networks significantly increased case detection yield (risk ratio 1.42, 95% CI 1.18 to 1.71), though with substantial heterogeneity ($I^2 = 76\%$).", "conclusion": "Field trial evidence demonstrates that community-focused interventions can substantially improve surveillance yield, but the methodological rigour of existing trials is often suboptimal, limiting the strength of inferences.", "recommendations": "Future trials should prioritise improved blinding procedures and detailed reporting of randomisation methods. Research should focus on cost-effectiveness analyses and the integration of digital reporting tools within evaluated frameworks.", "key words": "surveillance

Keywords: *public health surveillance, Nigeria, field trials, methodological evaluation, yield optimisation, Sub-Saharan Africa*

Article Highlights

- 67% of 27 included trials employed cluster-randomised designs.
- Pooled analysis shows significant yield increase (RR 1.42) from community-based interventions.
- High risk of bias frequently noted in blinding and allocation concealment.

Core Finding

Community-focused interventions demonstrably improve surveillance yield, but the evidence base is constrained by methodological limitations in trial design and reporting.

This review appraises the methodological foundations of evidence for optimising public health surveillance in Nigeria.

• Substantial heterogeneity (I^2=76%) observed in yield outcome synthesis.	