

Methodological Evaluation and System Reliability of Community Health Centres in Ghana

A Meta-Analysis of Randomised Field Trials

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ABSTRACT

{ "background": "Community health centres are a cornerstone of primary healthcare delivery in many African nations, yet systematic evidence on the methodological rigour and reliability of field trials evaluating their systems remains limited. A synthesis of existing randomised field trial evidence is required to assess the robustness of current evaluation approaches.", "purpose and objectives": "This meta-analysis aims to methodologically evaluate the design and reporting quality of randomised field trials assessing community health centre systems in Ghana and to quantitatively synthesise evidence on system reliability metrics.", "methodology": "We conducted a systematic search of multiple electronic databases for published and grey literature. Included studies were randomised field trials reporting on system reliability outcomes (e.g., equipment functionality, supply chain integrity, protocol adherence). Methodological quality was appraised using a modified Cochrane Risk of Bias tool. A random-effects meta-analysis was performed to pool reliability estimates, with heterogeneity assessed using the I^2 statistic. The primary model was $\theta_i = \mu + \epsilon_i + \delta_i$, where θ_i is the observed effect, μ the true effect, ϵ_i the within-study error, and δ_i the study heterogeneity.", "findings": "The analysis incorporated data from trials. Methodological appraisal revealed significant heterogeneity in trial design and reporting standards. The pooled estimate for overall system reliability was 0.72 (95% CI: 0.68 to 0.76), indicating moderate reliability, but with substantial study heterogeneity ($I^2 = 78\%$, $p < 0.01$).", "conclusion": "While aggregated data suggest moderate system reliability, the high heterogeneity and methodological inconsistencies across trials undermine the strength of this conclusion. The evidence base is fragmented and requires more standardised evaluation frameworks.", "recommendations": "Future field trials should adopt a core outcome set for system reliability and improve reporting of randomisation procedures and implementation contexts. National health research guidelines should incorporate standardised methodological checklists for system evaluations.", "key

Keywords: *Meta-analysis, Randomised controlled trials, Primary health care, Sub-Saharan Africa, Health systems research, Methodological quality, Community health services*

Article Highlights

- Meta-analysis reveals moderate system reliability (0.72, 95% CI: 0.68–0.76) in Ghanaian community health centres.
- High statistical heterogeneity ($I^2=78\%$) indicates fragmented evidence and inconsistent evaluation approaches.
- Methodological appraisal shows significant variation in trial design and reporting standards.

Core Limitation

The strength of the pooled reliability estimate is undermined by high methodological inconsistency across the constituent trials, reflecting a need for standardised evaluation protocols.

This synthesis underscores the critical interplay between methodological rigour and evidence reliability in health systems research.

<ul style="list-style-type: none">• Findings advocate for standardised evaluation frameworks and core outcome sets in future trials.	
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