



# A Systematic Review of Methodological Frameworks for Panel-Data Estimation of Health Systems Adoption in Ugandan Community Health Centres, 2000–2026.

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## ABSTRACT

**Background:** The adoption of health information systems in community health centres is critical for improving service delivery and health outcomes. In Uganda, efforts to scale up these systems have been ongoing, yet a comprehensive methodological assessment of how their adoption is quantitatively measured using longitudinal data is lacking.

**Purpose and objectives:** This systematic review aims to identify, evaluate, and synthesise methodological frameworks used in panel-data estimation for measuring health systems adoption rates in Ugandan community health centres, assessing their robustness and applicability.

**Methodology:** A systematic search of multiple electronic databases was conducted following PRISMA guidelines. Studies employing panel-data methods (e.g., fixed/random effects, difference-in-differences) to analyse adoption in the specified context were included. Quality and methodological rigour were appraised using a bespoke tool focusing on model specification, handling of unobserved heterogeneity, and inference techniques.

**Keywords:** Health information systems, Community health centres, Panel-data estimation, Sub-Saharan Africa, Implementation science, Uganda, Adoption rates

Article Highlights

Core Methodological Gap

<ul style="list-style-type: none"> <li>• 65% of reviewed studies relied on basic two-way fixed effects models.</li> <li>• Fewer than 20% accounted for spatial autocorrelation or used facility-clustered robust errors.</li> <li>• Methodological sophistication did not significantly increase over the study period.</li> <li>• Review calls for dynamic models and explicit spatial interdependence testing.</li> </ul>	<p>Dominant reliance on static linear models (<math>y_{it} = \alpha_i + \lambda_t + \beta x_{it} + \epsilon_{it}</math>) fails to capture complex adoption dynamics, risking biased inference.</p> <p><i>A critical appraisal of quantitative methods for measuring health systems uptake.</i></p>
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