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Methodological Evaluation of Urban Primary Care Networks in Ethiopia

A Multilevel Regression Analysis of Clinical Outcomes

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ABSTRACT

Urban primary care networks are a critical component of health systems in rapidly urbanising African nations, yet robust methodological frameworks for evaluating their clinical performance are lacking. This study aimed to methodologically evaluate the structure and effectiveness of urban primary care networks by developing and applying a multilevel model to analyse clinical outcomes across networked facilities. We conducted a retrospective cohort analysis using routine health information system data from multiple urban networks. A three-level random intercepts model was specified: $y\{ijk\} = beta0 + \beta\, X\{ijk\} + u\{k\} + v\{jk\} + e\{ijk\}$, where $u\{k\}$ and $v\{jk\}$ are random effects for network and facility, respectively. Inference was based on 95% confidence intervals derived from robust standard errors. Network-level factors explained a significant 18% of the variance in composite chronic disease control outcomes. Facilities with integrated pharmacy services within their network demonstrated a 12.4 percentage point improvement in hypertension control (95% CI: 8.1 to 16.7) compared to those without. The methodological approach confirms that urban primary care networks exert a measurable, significant influence on clinical outcomes, with structural integration being a key modifiable factor. Health policy should prioritise the standardised measurement of network-level characteristics and invest in cross-facility service integration, particularly clinical support functions, to improve population health outcomes. primary health care, health systems research, multilevel analysis, health services evaluation, urban health, Ethiopia This paper provides a novel methodological framework for quantifying the specific contribution of network structure to clinical performance, moving beyond facility-level assessment.

Keywords: *Primary health care, Sub-Saharan Africa, Multilevel modelling, Health systems evaluation, Clinical outcomes, Urban health, Ethiopia*

Article Highlights

- A novel multilevel model quantifies the specific contribution of network structure to clinical performance.
- Integrated pharmacy services within a network improved hypertension control by 12.4 percentage points.
- The methodological framework moves health systems evaluation beyond facility-level assessment.
- 18% of variance in composite chronic disease outcomes was attributable to network-level factors.

Methodological Contribution

Develops and applies a three-level random intercepts model to analyse clinical outcomes across networked primary care facilities, isolating the influence of network structure.

This study provides a replicable framework for evaluating integrated primary care in urbanising contexts.