



# Methodological Evaluation of Community Health Centre Systems in Ethiopia Using Multilevel Regression Analysis to Assess System Reliability

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## Abstract

Community health centres in Ethiopia play a crucial role in providing healthcare services to rural populations. However, their effectiveness and reliability are subject to scrutiny. A multilevel regression model was employed to analyse data from various levels, including individual patient records and aggregated centre-level variables. The model accounts for both fixed effects (e.g., staffing, infrastructure) and random effects (e.g., variability between centres). The analysis revealed that the proportion of patients who received timely treatment within a week was significantly higher in high-performing compared to low-performing health centres ( $p < 0.05$ ), indicating improved system reliability. This study highlights the importance of robust multilevel regression analyses for evaluating healthcare systems, providing evidence-based insights into improving community health centre performance in Ethiopia. Based on the findings, recommendations include targeted training programmes for staff and investment in infrastructure to enhance treatment timeliness and patient satisfaction. Treatment effect was estimated with  $\text{text}\{ \text{logit} \}(\pi) = \beta_0 + \beta_1 X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** Ethiopia, Geographic Differentiation, Multilevel Analysis, Regression Modelling, Reliability Assessment, Cluster Sampling, Data Quality Assurance

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