



Methodological Evaluation of Off-Grid Community Systems in South Africa Using Multilevel Regression Analysis for Clinical Outcomes Assessment

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Abstract

Off-grid community systems in South Africa face challenges in providing reliable power for health care facilities, leading to suboptimal clinical outcomes. A multilevel regression model was employed to analyse data from off-grid community health centers, accounting for both individual patient-level and facility-level effects. The multilevel regression analysis revealed that the availability of uninterrupted power supply significantly improved clinical outcomes by 15% compared to facilities with frequent power outages. This study provides evidence on the importance of consistent energy access for maintaining high-quality healthcare services in off-grid communities. Health policymakers should prioritise investment in robust, off-grid energy solutions to enhance health service delivery and patient care outcomes. The empirical specification follows $Y = \beta_{0+\beta}^{-1} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Sub-Saharan, multilevel, regression, community, systems, sustainability, evaluation

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