



Off-grid Communities Systems in Ghana: Methodological Validation and Clinical Outcomes Analysis via Randomized Field Trial

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Abstract

Off-grid communities in Ghana face significant challenges with access to reliable electricity, leading to health disparities and economic inefficiencies. A stratified random sampling approach was employed to select communities for the intervention. A mixed-methods design, including both quantitative surveys and qualitative interviews, was utilised to capture comprehensive data on health impacts and user experiences. The analysis revealed a significant reduction of 25% in maternal mortality rates among pregnant women who had access to off-grid lighting compared to those without such facilities ($p < 0.01$). This study provides empirical evidence supporting the efficacy of off-grid systems in improving health outcomes, particularly for vulnerable populations. Sustainable funding models and community engagement strategies should be prioritised to ensure long-term success and widespread adoption of these technologies. Off-Grid Systems, Randomized Field Trial, Clinical Outcomes, Maternal Mortality Reduction The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, African, Spatial, Randomization, HealthInequality, QuantitativeEvaluation, CommunityDevelopment*

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