



Methodological Evaluation of Off-Grid Healthcare Systems in Senegal: Estimating Clinical Outcomes Using Panel Data Analysis

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Abstract

Off-grid healthcare systems in Senegal are critical for rural communities lacking access to traditional electricity sources. These systems often rely on solar panels and battery storage. Panel data from 10 off-grid health centers were analysed over three years. A fixed effects model was employed to control for unobserved heterogeneity and estimate treatment effects. The analysis revealed a significant improvement in clinical outcomes, with an estimated increase of 20% in patient satisfaction scores compared to the baseline year. This study provides evidence that off-grid healthcare systems can effectively enhance patient care quality in Senegal. Future research should consider broader regional impacts and cost-effectiveness. Further studies are recommended to assess long-term sustainability and scalability of these systems across different regions of Senegal. Off-Grid Healthcare, Panel Data Analysis, Clinical Outcomes, Senegal The empirical specification follows $Y = \beta_{0+\beta} p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Agricultural-Economics, Panel-Data, Healthcare-Systems, Solar-Power, Fossil-Fuel-Replacement, Emerging-Economies*

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