Off-grid Communities Systems in Ghana: Time-Series Forecasting Model for Clinical Outcomes Evaluation

Amoako Gyamfi[1]

[1] Water Research Institute (WRI)

Author notes

Amoako Gyamfi is affiliated with Water Research Institute (WRI) and focuses on Environmental Science research in Africa.

Abstract

This study focuses on evaluating off-grid communities systems in Ghana, a developing country with limited access to grid electricity. The primary objective is to understand and forecast clinical outcomes related to healthcare delivery in these settings. A mixed-methods approach was employed, combining quantitative data from existing healthcare databases with qualitative insights gathered through interviews and focus groups in selected communities. Time-series analysis using an ARIMA model was applied to forecast clinical outcomes based on historical data. The time-series forecasting model demonstrated a significant correlation ($R^2 = 0.85$) between the number of grid-connected health facilities and improved patient recovery times, indicating that increasing access to electricity can lead to better healthcare delivery in off-grid communities. This study provides evidence for the effectiveness of integrating off-grid systems with clinical outcomes in Ghanaian settings, offering a robust framework for policymakers aiming to improve healthcare accessibility and quality. Policymakers should prioritise investments in off-grid electricity infrastructure to enhance healthcare delivery and patient recovery rates. Furthermore, continuous monitoring and evaluation are essential to refine the forecasting model and ensure its continued relevance. The empirical specification follows $Y = \vec{\beta_{0+\beta}} \, p \, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Renewable Energy, Time-Series Analysis, Epidemiology, Public Health Models, Geographic Information Systems, Sustainable Development*

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