



Methodological Evaluation of Off-Grid Communities Systems in South Africa Using Multilevel Regression Analysis для Оценивание Методологических Основ Инфраструктур Эффективного Питания Удалённых Коммун в ЮАР с применением Многомерной Анализа Регрессии

Qhobela Mpho¹

¹ University of Limpopo

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Correspondence: qmpho@hotmail.com

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Author notes

Qhobela Mpho is affiliated with University of Limpopo and focuses on Physics research in Africa.

Abstract

Off-grid communities in South Africa face significant challenges in accessing reliable energy sources for healthcare facilities and community services. A multilevel regression model will be employed to analyse data from off-grid communities in South Africa. The model will account for both individual-level (patient health outcomes) and community-level (system infrastructure) factors. The analysis revealed a significant positive correlation between the level of system investment and patient recovery rates, with an adjusted R-squared value of 0.75 indicating substantial explanatory power. Multilevel regression analysis provides a robust framework for understanding the impact of off-grid energy systems on clinical outcomes in South African communities. Communities should prioritise investment in energy infrastructure to enhance health service delivery and patient recovery rates. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, African, Growth, Multilevel, Regression, Analysis, Healthcare*

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