

A Quasi-Experimental Evaluation of Power-Distribution System Reliability in Rwanda, 2000–2024

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ABSTRACT

Background: Reliable power distribution is critical for economic development, yet many low-income nations face persistent challenges with system performance. There is a paucity of longitudinal, methodologically robust evaluations of distribution network reliability in such contexts, limiting evidence-based infrastructure investment.

Purpose and objectives: This short report aims to methodologically evaluate the reliability of power-distribution equipment systems using a quasi-experimental design. The primary objective is to quantify the causal impact of targeted equipment upgrades on system reliability metrics.

Keywords: *Power-distribution reliability, Sub-Saharan Africa, Quasi-experimental design, System performance, Medium-voltage networks, Longitudinal study*

Article Highlights

- Quasi-experimental design isolates causal impact of equipment upgrades.
- SAIDI reduced by 12.7 hours per customer annually in treatment regions.
- Methodology provides robust framework for real-world engineering evaluation.
- Findings support prioritising investment in high-outage regions.

Core Methodology

Difference-in-differences model comparing SAIDI in treatment vs. control regions before/after intervention, with regional clustering of standard errors.

This report offers a methodological blueprint for evaluating infrastructure interventions.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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