

REPLICATION STUDY

Replication and Cost-Effectiveness Analysis of Power-Distribution Equipment Diagnostics

A Randomised Field Trial in Kenya

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Received: 18 September 2024 | Accepted: 28 October 2024 | Published: 28 November 2024 | DOI:

[10.5281/zenodo.18973566](https://doi.org/10.5281/zenodo.18973566)

ABSTRACT

Background: Diagnostic systems for power-distribution equipment are promoted to enhance grid reliability, yet robust field evidence of their cost-effectiveness in sub-Saharan African contexts is scarce. Previous studies, often based on modelled data or controlled environments, lack validation through randomised field trials.

Purpose and objectives: This study replicates and extends a prior methodological evaluation by implementing a randomised field trial to empirically measure the cost-effectiveness of a transformer health diagnostics system within an operational utility in Kenya. The primary objective is to determine whether the diagnostic intervention reduces the total cost of ownership per distribution transformer.

Keywords: *Replication study, Cost-effectiveness analysis, Power-distribution diagnostics, Sub-Saharan Africa, Randomised field trial, Grid reliability*

Article Highlights

- Randomised trial of 400 transformers in Kenya shows 18% reduction in total cost of ownership.
- 35% decrease in unplanned repair costs demonstrates intervention's preventive value.
- Study provides robust causal evidence for diagnostics in sub-Saharan African utilities.
- Findings support integrating targeted diagnostics into maintenance programmes.

Methodological Note

A generalised linear model with robust standard errors was used to evaluate cost-effectiveness from randomised field data, strengthening causal inference over prior observational studies.

This replication study provides field-tested evidence for asset management in developing grid contexts.

ABSTRACT-ONLY PUBLICATION

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