

A Randomised Field Trial Methodology for Risk Reduction in Nigerian Transport Depot Maintenance Systems

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ABSTRACT

Background: Maintenance systems in transport depots are critical for operational safety and efficiency, yet they are often managed using ad-hoc, reactive approaches. In Nigeria, the lack of structured, evidence-based methodologies for evaluating and improving these systems contributes to persistent operational risks and infrastructure failures.

Purpose and objectives: This article presents a novel methodological framework for conducting randomised field trials (RFTs) specifically designed to evaluate engineering interventions within transport depot maintenance systems. The primary objective is to provide a rigorous protocol for measuring causal impacts on risk reduction metrics.

Keywords: *Randomised controlled trial, Maintenance engineering, Risk assessment, Transport depot management, Sub-Saharan Africa, Field experiment, Reliability engineering*

Article Highlights

- Presents a novel cluster-randomised, stepped-wedge field trial methodology for depot maintenance.
- Framework designed to detect a minimum 30% reduction in critical failure rates with 80% power.
- Emphasises embedding lead engineers as co-researchers to ensure intervention fidelity.
- Addresses real-world challenges like contamination between units and sequential rollout.

Core Analytical Model

Impact is estimated using a generalised linear mixed model: $\text{logit}(P(Y_{it}=1)) = \beta_0 + \beta T_{it} + \gamma_t + u_i + \varepsilon_{it}$, with inference based on cluster-robust standard errors.

This is a methodology article presenting a novel experimental framework, not empirical results from a completed trial.

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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