

DATA DESCRIPTOR

Methodological Evaluation and Risk Reduction Metrics for Industrial Machinery Fleets in Ghana

A Randomised Field Trial Dataset

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ABSTRACT

Background: Industrial machinery fleets in developing economies face significant operational risks, yet there is a scarcity of high-fidelity field data to evaluate risk reduction methodologies. Existing studies often rely on retrospective analyses or self-reported data, limiting the robustness of evidence for engineering interventions.

Purpose and objectives: This data descriptor presents a novel, randomised field trial dataset designed to methodologically evaluate a proactive maintenance and operator training protocol. The primary objective was to generate empirical evidence on the efficacy of structured interventions for reducing machinery downtime and safety incidents.

Keywords: *Industrial machinery, Fleet management, Risk reduction, Randomised field trial, Sub-Saharan Africa*

Article Highlights

- Dataset comprises 1,247 machine-months of observations from a randomised controlled trial.
- Intervention combined scheduled condition-based maintenance with simulator-based operator training.
- Analysis employed a generalised linear mixed model with machine-specific random effects.
- Provides empirical evidence for engineering risk management in developing industrial contexts.

Core Analytical Model

The primary analysis models monthly downtime hours using: $\log(E(Y_{it})) = \beta_0 + \beta_1 T_{it} + \beta_2 X_{it} + u_i + \varepsilon_{it}$, where T_{it} is the treatment indicator and u_i is a machine-specific random effect.

This data descriptor provides the foundation for further analysis of interaction effects and cost-benefit evaluations.

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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