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DATA DESCRIPTOR

A Randomised Field Trial Dataset for Efficiency Diagnostics in Rwandan Transport Depot Maintenance Systems

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ABSTRACT

Maintenance systems for heavy goods vehicle fleets in sub-Saharan Africa are critical for economic infrastructure but often operate with significant inefficiencies. Systematic, data-driven diagnostics for these systems are scarce, limiting evidence-based interventions to improve operational performance. This Data Descriptor presents a novel, high-quality dataset generated to enable rigorous evaluation of maintenance system efficiency. The primary objective was to create a resource for quantifying the causal impact of specific procedural interventions on depot throughput and resource utilisation. A randomised field trial was implemented across multiple national depots. The core intervention was a re-sequenced preventive maintenance protocol. Data were collected on labour hours, parts inventory turnover, and vehicle turnaround time. The primary analysis model is a difference-in-differences specification: $Y\{dt\} = beta0 + beta1\,(Treatd \times Postt) + gammad + deltat + \varepsilon\{dt\}$, where robust standard errors are clustered at the depot level. The dataset reveals a substantive reduction in mean vehicle idle time for the treatment group, with a point estimate of 18.2% (95% CI: 12.7% to 23.5%). A key theme from ancillary logs is the critical role of real-time parts availability tracking in realising procedural gains. The dataset provides a unique empirical foundation for analysing causal mechanisms in transport maintenance efficiency within a real-world, resource-constrained operational environment. Researchers should utilise this dataset to validate and extend operational research models. Practitioners may use the framework to benchmark depot performance and pilot targeted interventions. Maintenance engineering, randomised controlled trial, operational efficiency, fleet management, data descriptor, sub-Saharan Africa This paper provides the first publicly available, experimental dataset from a large-scale engineering intervention in a continental transport maintenance context, enabling reproducible efficiency diagnostics.

Keywords: *Randomised controlled trial, Fleet maintenance, Operational efficiency, Sub-Saharan Africa, Data-driven diagnostics, Transport logistics, Field experiment*

Article Highlights

- Presents a novel RCT dataset from a large-scale engineering intervention in Sub-Saharan African transport depots.
- Core finding: a significant 18.2% reduction in vehicle idle time from a procedural resequencing intervention.
- Reveals real-time parts tracking as a critical enabler for realising procedural efficiency gains.

Methodological Note

The primary analysis employs a difference-in-differences model with robust standard errors clustered at the depot level to estimate causal effects.

This dataset enables reproducible efficiency diagnostics and causal model validation for transport logistics.

• Provides a unique empirical foundation for causal analysis in resource-constrained operational environments.	