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A Bayesian Hierarchical Model for Yield Improvement in Senegalese Transport Maintenance Depot Systems

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ABSTRACT

Background: Transport maintenance depots are critical infrastructure for economic development, yet systematic evaluation of their operational yield in West Africa remains underdeveloped. Current assessments often lack robust statistical frameworks to account for hierarchical data structures and inherent uncertainties.

Purpose and objectives: This study aims to develop and validate a Bayesian hierarchical model to quantify and analyse yield improvement within transport maintenance depot systems. The objective is to provide a methodological framework for identifying key performance drivers and predicting system efficiency.

Keywords: Bayesian hierarchical modelling, yield improvement, transport maintenance depots, West Africa, operational efficiency, infrastructure systems, Senegal

Article Highlights

- Bayesian model quantifies link between technician training and depot yield.
- Framework handles hierarchical data and quantifies uncertainty in West African systems.
- Provides a tool for policymakers to benchmark performance and allocate resources.
- Reveals substantial heterogeneity in performance across depot networks.

Methodological Contribution

Introduces a Bayesian hierarchical model to analyse multi-level depot data, incorporating random effects and covariates to isolate key drivers of operational yield.

This study provides a novel statistical framework for evaluating transport infrastructure in developing contexts.

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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