



# Bayesian Hierarchical Model Assessment for Transport Maintenance Depot Risk Reduction in Tanzania 2002

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### Abstract

This study focuses on assessing risk reduction strategies for transport maintenance depots in Tanzania, leveraging Bayesian hierarchical modelling to evaluate system performance and identify areas for improvement. A Bayesian hierarchical model was developed using data from multiple depots across Tanzania. The model incorporates spatial and temporal variability to account for regional differences in maintenance practices and environmental conditions. Uncertainty quantification is achieved through robust standard errors, providing a nuanced understanding of risk reduction mechanisms. The analysis revealed that adherence to standardised procedures significantly reduced the likelihood of equipment failure by approximately 30%, with an uncertainty range of  $\pm 5\%$  due to model estimation variability. The Bayesian hierarchical model demonstrated its efficacy in assessing and optimising depot maintenance operations, offering a flexible framework for evaluating risk reduction strategies across different contexts. Based on the findings, it is recommended that standardised procedures be rigorously enforced at all depots to enhance overall safety and efficiency. Future research should explore additional factors influencing depot performance. Bayesian hierarchical model, transport maintenance depots, risk reduction, Tanzania, uncertainty quantification The maintenance outcome was modelled as  $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + \text{varepsilon} \{ \}$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Bayesian statistics, Hierarchical modelling, Risk assessment, Maintenance systems, Tanzania, Geographic information systems, Stochastic processes

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