



# Bayesian Hierarchical Model Assessment of Transport Maintenance Depot Systems in Senegal: A Methodological Study

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## Abstract

Transport maintenance depots in Senegal face challenges related to yield improvement, necessitating a methodological evaluation of their operational effectiveness. A Bayesian hierarchical model was employed to analyse data from Senegalese transportation maintenance depots. The model accounts for variability across different depots while estimating system-wide performance metrics. The analysis revealed significant variation in depot yields, with certain depots achieving a 15% higher efficiency rate than others. The Bayesian hierarchical model provided insights into the operational dynamics of Senegalese maintenance depots, highlighting areas for improvement and suggesting targeted strategies to enhance yield. Deployment of targeted interventions in low-performing depots is recommended to achieve a 15% increase in overall system efficiency within two years. The maintenance outcome was modelled as  $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** African geography, Bayesian statistics, Hierarchical modelling, Methodology, Quantitative analysis, System evaluation, Transport logistics

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