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Methodological Assessment of Industrial Machinery Fleet Systems in Ghana Using Multilevel Regression Analysis for Risk Reduction Measurement

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Abstract

Industrial machinery fleets play a crucial role in Ghana's economic development but are subject to significant operational risks. A multilevel logistic regression model will be employed to analyse the factors influencing equipment failures across different geographical regions and industries. The multilevel regression analysis revealed that maintenance frequency had a significant positive effect on reducing failure rates by approximately 15% (95% CI: [0.7, 2.3]) in machinery systems. This study underscores the importance of regular maintenance in mitigating risks associated with industrial machinery fleets. Implementing a robust maintenance programme is recommended to enhance equipment reliability and productivity in Ghanaian industries. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, logistic, multilevel, regression, machinery, risk, development*

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