African Population Geography
(Geography/Social/Demography)

Methodological Evaluation of Manufacturing Plant Systems in South Africa Using Multilevel Regression Analysis to Measure Yield Improvement

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Abstract

Recent studies have explored the yield improvement in manufacturing plants across South Africa but have employed varied methodologies. The study employs a comprehensive review of existing literature and utilizes multilevel regression analysis with random effects to examine the impact of various factors on yield improvement. Data from multiple studies are aggregated and analysed using statistical software that supports hierarchical data structures. An empirical finding suggests that adopting a multilevel regression model yields more accurate estimates of yield improvements compared to single-level models, particularly in accounting for variability at different levels of the manufacturing hierarchy. The findings underscore the importance of employing advanced statistical techniques such as multilevel regression analysis to enhance the precision and reliability of yield improvement assessments in South African manufacturing environments. Manufacturing organizations should consider adopting multilevel regression models for systematic evaluation of their operations, thereby facilitating more informed decision-making regarding process improvements and resource allocation. Multilevel Regression Analysis, Manufacturing Yield Improvement, South Africa, Hierarchical Data The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, multilevel modelling, nested sampling, randomized controlled trials, econometric analysis, resource allocation, yield gap assessment*

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