Multilevel Regression Analysis of Process-Control Systems in South Africa: Evaluating Risk Reduction Efforts

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Abstract

Process-control systems are employed in various sectors to ensure safety and efficiency. In South Africa, these systems have been implemented across industries such as mining and construction to mitigate risks associated with workplace accidents. A multilevel regression model was utilised, incorporating data from multiple sources including incident reports and employee surveys. Hierarchical random effects were incorporated to account for variations within and between organizations. The analysis revealed a significant reduction in workplace incidents at the organisational level (odds ratio = 0.75; CI: 0.68-0.83), indicating that process-control systems are effective in lowering risk levels across industries. Process-control systems have demonstrated an ability to reduce workplace incidents, particularly at the organisational level. Future research should explore long-term sustainability and broader impact of these systems. Organizations should continue implementing and refining their process-control systems based on this study's findings. Additionally, ongoing training for workers is recommended to ensure system effectiveness.

Keywords: *Sub-Saharan, multilevel regression, nested data, hierarchical analysis, process safety, quality control, econometrics*

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