



Multilevel Regression Analysis for Assessing Risk Reduction in Water Treatment Facilities across Nigeria: A Comparative Study

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Abstract

Water treatment facilities in Nigeria are critical for ensuring safe drinking water supplies, yet their performance varies significantly across different regions. Multilevel regression analysis was employed to assess the impact of socioeconomic, environmental, and infrastructural variables on the reliability of water treatment processes across Nigeria. Data from 20 randomly selected facilities were analysed using mixed-effects models. Mixed-effects models revealed that socio-economic factors significantly influenced the risk reduction in water treatment facilities (e.g., population density had a coefficient of -0.5 with robust standard errors within ± 0.2). The findings suggest that multilevel regression analysis offers an effective tool for understanding and improving the performance of water treatment systems in Nigeria. Policy makers should prioritise investments in facilities located in areas with higher population densities to achieve greater risk reduction. Water Treatment, Multilevel Regression Analysis, Risk Reduction, Nigeria 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: Nigerian, multilevel, regression, stratified, evaluation, efficacy, disparities

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