



Multilevel Regression Analysis for Evaluating Cost-Effectiveness of Water Treatment Facilities in Ghana's Rural Settings

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Abstract

Water treatment facilities are essential for ensuring safe drinking water in rural Ghanaian settings. However, their cost-effectiveness varies significantly across different regions and communities. A multilevel regression model was applied to analyse data collected from various villages in Ghana. The model accounts for both village-level and community-level variations in water quality outcomes. The multilevel regression analysis revealed that the cost-effectiveness of water treatment facilities is significantly influenced by regional economic factors, with a coefficient estimate of -0.85 (95% CI: -1.20 to -0.49). This study provides evidence on how regional disparities affect the cost-effectiveness of water treatment facilities and offers insights for policymakers. Policy recommendations should consider regional economic conditions when planning and funding water treatment facilities in rural Ghana. 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: *Sub-Saharan, Africa, SpatialStatistics, MultilevelModeling, Econometrics, ResourceAllocation, GhanaianContext*

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