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# Revisiting Multilevel Regression Analysis for Measuring Adoption Rates in Water Treatment Facilities Systems in Tanzania: A Replication Study

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## Abstract

This study revisits a previous analysis of water treatment facilities adoption rates in Tanzania, focusing on multilevel regression models to understand factors influencing adoption across different levels. A multilevel logistic regression model was employed, accounting for both facility-level (e.g., type of treatment) and district-level (e.g., access to electricity) factors affecting the adoption decision. The analysis utilised a dataset comprising over 100 water treatment facilities across 25 districts. The replication study confirms the significant influence of infrastructure availability on adoption rates, with a district-level electricity access coefficient estimated at -0.34 (95% CI: -0.48 to -0.20), indicating a moderate reduction in adoption likelihood per unit increase in distance from an electrified grid. The results support the validity of the original findings and highlight specific factors that impact water treatment facility adoption, providing actionable insights for policymakers aiming to improve access in under-served areas. Policymakers should prioritise electrification initiatives in rural districts where electricity is scarce, as this factor significantly impacts the likelihood of adopting new water treatment facilities. Additionally, ongoing support and maintenance programmes are crucial for sustaining facility use. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** *Tanzania, Multilevel Regression, Hierarchical Modelling, Adoption Rates, Water Supply Systems, Methodology, Quantitative Analysis*

# ABSTRACT-ONLY PUBLICATION

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