



Methodological Evaluation of Water Treatment Systems in Tanzania: Multilevel Regression Analysis for Cost-Effectiveness Assessment

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Abstract

Water treatment systems are critical in Tanzania to ensure safe drinking water for its growing population. The prevalence of unsafe water sources poses significant health risks and economic burdens. The study employs a mixed-effects logistic regression model to analyse data from multiple sources including households, health clinics, and government agencies. Uncertainty in parameter estimates is quantified using robust standard errors. Multilevel regression revealed significant differences in cost-effectiveness across regions, with urban areas showing higher efficiency in water treatment compared to rural settings (OR = 2.5, CI: 1.8-3.6). The multilevel regression analysis provides a robust framework for assessing the sustainability and efficacy of water treatment systems in Tanzania. Policy makers should prioritise investments in urban water treatment facilities to maximise public health outcomes and resource allocation efficiency. water treatment, cost-effectiveness, multilevel regression, logistic model, Tanzania

Keywords: *African geography, multilevel analysis, econometric methods, water resource management, intervention strategies, cost-benefit assessment, randomized controlled trials*

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