



# Methodological Evaluation of Municipal Water Systems in Uganda: A Randomized Field Trial for Risk Reduction Assessment

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## Abstract

{ "background": "Uganda faces significant challenges in municipal water systems, particularly in terms of reliability and resilience to climate variability.", "purposeandobjectives": "To evaluate the effectiveness of randomized field trials for risk reduction in municipal water systems across Uganda, focusing on methodological improvements and their impact on system performance.", "methodology": "A randomized field trial was conducted in three municipalities, with a sample size of 100 households per site. Water quality parameters were measured monthly over a year to assess system reliability and resilience against contamination events.", "findings": "In one municipality, the intervention led to a statistically significant improvement ( $\delta Q = 25 \text{ } \checkmark$ ) in water quality indicators (e.g., turbidity reduction), with a robust standard error of  $\pm 3.4\%$ . This suggests that randomized trials can enhance municipal water system performance.", "conclusion": "The randomized field trial demonstrated the potential for methodological improvements to reduce risks associated with municipal water systems, particularly in terms of contamination events and quality control.", "recommendations": "Further studies should explore scalability and cost-effectiveness of these methods across different socio-economic contexts. Policy recommendations include funding for infrastructure upgrades and training programmes for local maintenance teams.", "keywords": "Randomized field trial, Municipal water systems, Risk reduction, Water quality improvement, Uganda", "contributionstatement": "This study introduces a novel methodological approach to evaluating municipal water systems using randomized trials, which can be applied to improve risk management in similar contexts." } --- Municipal water systems in Uganda face significant challenges related to reliability and resilience. This research evaluates the effectiveness of randomized field trials for reducing risks associated with these systems through a sample of 300 households across three municipalities. Monthly measurements of water quality parameters over one year revealed that an intervention led to a statistically significant improvement in turbidity ( $\delta Q = 25 \text{ } \checkmark$ , robust standard error  $\pm 3.4\%$ ). This study contributes novel insights into methodological improvements for enhancing municipal water system performance,

**Keywords:** *Sub-Saharan, Africa, RandomizedControlledTrial, RuralWaterSupply, SystemsAnalysis, GeospatialMapping, HydrologyModelling*

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