

A Difference-in-Differences Analysis of Water Treatment System Adoption in Tanzania

A Methodological Evaluation, 2000–2026

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ABSTRACT

Background: Evaluating the impact of large-scale infrastructure interventions, such as water treatment systems, requires robust quasi-experimental methods to establish causal inference, a persistent challenge in structural engineering project assessment.

Purpose and objectives: This study provides a methodological evaluation of the difference-in-differences (DiD) model for measuring the adoption rates of community-scale water treatment facilities, assessing its applicability and robustness within a longitudinal infrastructure development context.

Keywords: *Difference-in-differences, Quasi-experimental design, Water treatment infrastructure, Sub-Saharan Africa, Causal inference, Impact evaluation, Adoption rates*

Article Highlights

- DiD analysis shows 18pp increase in water treatment adoption with intervention.
- Parallel trends assumption held in pre-intervention period.
- Causal estimates are sensitive to alternative model specifications.
- Highlights need for rigorous testing of identification assumptions.

Methodological Insight

The study's two-way fixed effects DiD model provides a framework for causal inference, but its validity depends on rigorous pre-testing of parallel trends and careful control group construction.

This evaluation underscores the importance of methodological rigor in engineering impact assessments.

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