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Evaluating Water Treatment Systems in Ethiopia

A Difference-in-Differences Model for Adoption Rate Diagnostics

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ABSTRACT

Background: Access to safe drinking water remains a critical challenge in many regions, with the performance of installed treatment systems often poorly understood. Evaluating the real-world adoption and sustained use of such infrastructure is essential for effective engineering interventions and resource allocation.

Purpose and objectives: This case study aims to develop and apply a robust quasi-experimental methodology to diagnose the causal impact of a large-scale water treatment programme on household adoption rates. It seeks to move beyond descriptive statistics to isolate the programme's effect from underlying trends.

Keywords: *Water treatment, Sub-Saharan Africa, Adoption rates, Difference-in-differences, Infrastructure evaluation, Point-of-use systems*

Article Highlights

- Difference-in-differences model isolates a significant 18.4 percentage point increase in adoption.
- Final adoption rate in treatment villages plateaued at approximately 65%.
- Quasi-experimental approach corrects for confounding secular trends observed in control groups.
- Findings advocate for integrated diagnostic evaluation in engineering programme design.

Methodological Insight

The core DiD model specification: $Y_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \delta(Treat_i \times Post_t) + \varepsilon_{it}$, with inference using cluster-robust standard errors at the village level.

This study provides a causal diagnostic framework for evaluating water infrastructure programmes.