



Methodological Evaluation of Municipal Water Systems in Rwanda Using Difference-in-Differences Models for Cost-Effectiveness Analysis

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Abstract

Rwanda's municipal water systems face challenges in cost-effectiveness, necessitating rigorous evaluation methods to ensure sustainable and efficient service delivery. A comprehensive search strategy was employed across multiple databases including PubMed and Web of Science. Studies were screened based on predefined inclusion criteria to ensure methodological rigor. The review identified several studies employing DiD models, with a notable finding being the significant reduction in cost per unit water supplied when comparing pre- and post-intervention periods for certain systems. DiD models have demonstrated effectiveness in measuring cost-effectiveness of municipal water systems in Rwanda. However, variability across different contexts suggests further research is needed to refine model application. Future studies should consider integrating additional control variables and longitudinal data collection methods to enhance the robustness of DiD analyses. The empirical specification follows $Y = \beta_{0+\beta} X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Rwanda, Difference-in-Differences, Econometrics, Water Supply Systems, Sustainability, Cost-Benefit Analysis*

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