Multilevel Regression Analysis for Measuring Adoption Rates in Municipal Water Systems Across Tanzania: A Methodological Evaluation

Kamwiro Sserunkuma[1], Nyakwarira Kazembere[2]

[1] Department of Research, Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam

[2] National Institute for Medical Research (NIMR)

Correspondence: ksserunkuma@outlook.com

Author notes

Kamwiro Sserunkuma is affiliated with Department of Research, Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam and focuses on Physics research in Africa.
Nyakwarira Kazembere is affiliated with National Institute for Medical Research (NIMR) and focuses on Physics research in Africa.

Abstract

This study addresses a current research gap in Physics concerning Methodological evaluation of municipal water systems systems in Tanzania: multilevel regression analysis for measuring adoption rates in Tanzania. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A mixed-methods design was used, combining survey and interview data collected over the study period. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of municipal water systems systems in Tanzania: multilevel regression analysis for measuring adoption rates, Tanzania, Africa, Physics, original research This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, Tanzania, Multilevel, Regression, Analysis, Evaluation, Methodology*

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