African Physical Geography (Earth Science focus)

Methodological Evaluation of Municipal Water Systems in Tanzania: Panel Data Estimation for Clinical Outcomes Assessment

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Abstract

Municipal water systems in Tanzania are critical for public health but often suffer from inefficiencies and malfunctions. Panel data analysis was conducted using a generalized linear mixed model (GLMM) to estimate the impact of water system quality and maintenance on diarrheal incidence rates over time. The GLMM revealed that maintaining at least one functional tap per household reduced diarrheal disease prevalence by approximately 20% compared to households with no taps, with a robust standard error (SE) of ±5.3%. The study underscores the importance of regular maintenance and adequate water supply infrastructure in improving public health outcomes. Investment in water system upgrades and improved maintenance practices is recommended for reducing diarrheal disease incidence. Municipal Water Systems, Panel Data Analysis, Diarrheal Disease, Tanzania The empirical specification follows $Y = \vec{\beta_{0+\beta}} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African Geography, Panel Data, Mixed Models, Water Supply Systems, Epidemiology, Public Health, Malfunctions*

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