



Bayesian Hierarchical Model for Measuring Risk Reduction in Municipal Water Systems of Rwanda: A Replication Study

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Abstract

This study aims to evaluate the effectiveness of municipal water systems in reducing risks associated with water-borne diseases in Rwanda. A Bayesian hierarchical model was employed to analyse data from municipal water systems. The model accounts for spatial and temporal variability by including random effects at different levels of aggregation. The analysis revealed a significant positive correlation between investment in infrastructure upgrades and reductions in reported water-borne disease cases, with an estimated effect size of 0.6 (95% credible interval: 0.4 – 0.8). This replication study confirms the efficacy of the original model and highlights the importance of targeted investments to enhance system performance. Future research should focus on expanding data coverage, particularly in rural areas, and implement continuous monitoring systems for early detection of potential issues. Bayesian hierarchical model, municipal water systems, risk reduction, Rwanda, environmental science

Keywords: *Rwanda, Bayesian, Hierarchical, Model, Risk, Epidemiology, Methodology*

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