



Bayesian Hierarchical Model Evaluation of Municipal Water Systems in Kenyan Municipalities,

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Abstract

The evaluation of municipal water systems in Kenyan municipalities requires robust statistical methods to assess their performance over time. A Bayesian hierarchical model was applied to analyse data from multiple municipalities, accounting for both within- and municipality variability. The model revealed significant differences in water system efficiency among municipalities, with some showing up to a 25% improvement over others. Bayesian hierarchical modelling provided nuanced insights into municipal water systems' performance, highlighting areas for improvement. Policymakers should prioritise interventions based on the model's findings to enhance water system efficiency and ensure equitable access across municipalities. municipal water systems, Bayesian hierarchical models, clinical outcomes analysis, Kenyan municipalities Model estimation used $\hat{\theta} = \operatorname{argmin}\{\theta\} \operatorname{sumiell}(y_i, f\theta(\xi)) + \lambda \sqrt{\theta} \sqrt{\theta}^2$, with performance evaluated using out-of-sample error.

Keywords: Kenya, Bayesian Hierarchical Models, Spatial Statistics, Methodology, Public Health Analytics, Geographic Information Systems, Monte Carlo Methods

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