Bayesian Hierarchical Model for Risk Reduction Evaluation of Water Treatment Facilities in Senegal,

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Abstract

Bayesian hierarchical models have been increasingly applied in evaluating water treatment systems to reduce risks associated with microbial contamination. A Bayesian hierarchical model was employed to analyse data from existing water treatment facilities. The model incorporates uncertainty and variability inherent in field conditions by estimating parameters at multiple levels: individual plants, regional networks, and national scale. The analysis revealed a significant proportion (75%) of facilities meeting the risk reduction targets set for microbial contamination, with substantial variation across different regions. Bayesian hierarchical models provide a robust framework for evaluating water treatment systems, offering insights into variability and uncertainty in field conditions. Further studies should consider incorporating additional variables to enhance model accuracy and applicability in diverse settings. The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Bayesian, Hierarchical, Modelling, Epidemiology, Contamination, Risk*

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