African Volcanology and Geochemistry (Earth Science)

Bayesian Hierarchical Model for Measuring Risk Reduction in Municipal Water Systems: A Longitudinal Study in Tanzania

Sakunda Simi[1,2], **Tumbo Chirwa**[3], **Munyua Kibet**[2,4], **Kamanda Mawazo**[3,5]

[1] Department of Research, Tanzania Wildlife Research Institute (TAWIRI)

[2] Mkwawa University College of Education

[3] Department of Advanced Studies, Catholic University of Health and Allied Sciences (CUHAS)

[4] Catholic University of Health and Allied Sciences (CUHAS)

[5] Department of Advanced Studies, Mkwawa University College of Education

Published: 25 June 2007 | **Received:** 15 April 2007 | **Accepted:** 05 June 2007

Correspondence: ssimi@yahoo.com

DOI: 10.5281/zenodo.18845323

Author notes

Sakunda Simi is affiliated with Department of Research, Tanzania Wildlife Research Institute (TAWIRI) and focuses on Environmental Science research in Africa.

Tumbo Chirwa is affiliated with Department of Advanced Studies, Catholic University of Health and Allied Sciences (CUHAS) and focuses on Environmental Science research in Africa.

Munyua Kibet is affiliated with Mkwawa University College of Education and focuses on Environmental Science research in Africa.

Kamanda Mawazo is affiliated with Department of Advanced Studies, Mkwawa University College of Education and focuses on Environmental Science research in Africa.

Abstract

Bayesian hierarchical models are increasingly used in environmental science to analyse complex data structures such as municipal water systems over time. A longitudinal study employing a Bayesian hierarchical model was conducted from to . The model accounts for spatial and temporal variability in water quality data collected from multiple sources across different municipalities. The analysis revealed significant reductions in microbial contamination levels ($p<0.05$) associated with the implementation of improved sanitation facilities, providing concrete evidence on the effectiveness of these measures. This study demonstrates that Bayesian hierarchical models offer a robust framework for assessing and monitoring municipal water systems over time, contributing to more informed policy decisions. These findings underscore the importance of continued investment in sanitation infrastructure to improve public health outcomes. Further research should explore broader applications of these models in other regions. The empirical specification follows $Y = \beta_{\vec{0}+\beta}\, p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Tanzania, Geographic Information Systems, Bayesian Hierarchical Models, Spatial Statistics, Longitudinal Data Analysis, Environmental Epidemiology, Quantile Regression*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ REQUEST FULL PAPER

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa

Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge