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Multilevel Regression Analysis to Evaluate and Enhance Public Health Surveillance Systems in Kenya: An Efficiency Gain Assessment

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Abstract

Public health surveillance systems in Kenya are crucial for monitoring infectious diseases such as malaria and tuberculosis. However, their efficiency varies across different levels of governance and implementation. Multilevel regression models were employed to analyse data from Kenya's national and subnational surveillance databases. The models accounted for both fixed and random effects, including hierarchical clustering based on administrative regions. The multilevel model revealed that subnational surveillance systems had a 15% higher efficiency in detecting disease outbreaks compared to the national level (95% CI: 7%, 23%). Our findings suggest that targeted improvements are needed in subnational levels to enhance overall surveillance efficiency. Policy recommendations include increasing funding for subnational health departments and promoting data sharing among regional health agencies. Public Health Surveillance, Multilevel Regression Analysis, Efficiency Gain Assessment, Kenya Treatment effect was estimated with $text\{logit\}(\pi) = beta0 + \vec{\beta} p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Kenya, Multilevel Regression Analysis, Public Health Surveillance, Methodological Evaluation, Efficiency Gain Assessment, Geographic Information Systems, Spatial Analysis*

ABSTRACT-ONLY PUBLICATION

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

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