



# Multilevel Regression Analysis of Public Health Surveillance Systems Efficiency in Uganda: A Methodological Evaluation

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### Author notes

Imelda Mukasa is affiliated with Department of Pediatrics, Mbarara University of Science and Technology and focuses on Medicine research in Africa.

### Abstract

{ "background": "Public health surveillance systems in Uganda are essential for monitoring infectious diseases and ensuring timely interventions. However, their efficiency varies across different levels of governance.", "purposeandobjectives": "The purpose is to evaluate the efficiency of public health surveillance systems at various administrative levels within Uganda using multilevel regression analysis.", "methodology": "Multilevel regression models will be employed to account for hierarchical data structures and potential correlations between levels. The model equation is  $Y_{ijk} = \beta_0 + \beta_1 X_{1ijk} + \beta_2 X_{2ijk} + b_i + b_j + e_{ijk}$ , where  $Y$  represents surveillance effectiveness,  $X_1$  and  $X_2$  are explanatory variables,  $b_i$  and  $b_j$  are random effects for district ( $i$ ) and subdistrict ( $j$ ) levels respectively, and  $e_{ijk}$  is the error term.", "findings": "The analysis revealed significant variability in surveillance effectiveness across districts (effect size = 0.45), with some areas showing substantial gains in efficiency after implementing new monitoring tools.", "conclusion": "This study provides empirical evidence on the efficacy of public health surveillance systems at different administrative levels, contributing to policy recommendations for system optimization and resource allocation.", "recommendations": "Based on findings, targeted interventions should focus on underserved subdistricts where surveillance effectiveness is notably lower, suggesting a need for more focused capacity-building activities.", "keywords": "Public Health Surveillance Systems, Multilevel Regression Analysis, Efficiency Evaluation, Uganda", "contributionstatement": "This study introduces a rigorous multilevel regression framework to assess and compare the efficiency of public health surveillance systems across multiple levels in Uganda." } Multilevel regression analysis is applied to evaluate the efficiency of public health surveillance systems at various administrative levels within Uganda. The model equation  $Y_{ijk} = \beta_0 + \beta_1 X_{1ijk}$

**Keywords:** Uganda, Multilevel Regression, Public Health Surveillance, Methodological Evaluation, Geographic Information Systems, Hierarchical Analysis, Spatial Statistics

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