



Multilevel Regression Analysis of Public Health Surveillance Systems in Uganda: Methodological Evaluation and Efficiency Assessment Over Time

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Abstract

This study addresses a current research gap in Medicine concerning Methodological evaluation of public health surveillance systems in Uganda: multilevel regression analysis for measuring efficiency gains in Uganda. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A mixed-methods design was used, combining survey and interview data collected over the study period. The results establish bounded error under perturbation, a convergent estimation process under stated assumptions, and a stable link between the proposed metric and observed outcomes. The findings provide a reproducible analytical basis for subsequent theoretical and applied extensions. Stakeholders should prioritise inclusive, locally grounded strategies and improve data transparency. Methodological evaluation of public health surveillance systems in Uganda: multilevel regression analysis for measuring efficiency gains, Uganda, Africa, Medicine, longitudinal study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, Africa, Multilevel, Regression, Analysis, Evaluation, Public, Health*

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