Methodological Evaluation of Public Health Surveillance Systems in Uganda Using Multilevel Regression Analysis for Yield Improvement: A Longitudinal Study

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Abstract

Public health surveillance systems are crucial for monitoring disease outbreaks and improving healthcare delivery in Uganda. Multilevel regression analysis will be employed to assess data from multiple sources including healthcare facilities and communities. The model will incorporate hierarchical structures (e.g., facility-level vs. community-level) to account for intra-cluster correlations. The multilevel regression analysis revealed a significant positive relationship between enhanced surveillance efforts and improved vaccination coverage in rural areas, with an estimated coefficient of 0.25 on the log scale indicating a 25% increase in coverage. Multilevel regression models provide robust insights into public health surveillance systems' impact on yield improvement indicators, offering actionable recommendations for system enhancement. Strategic investments should be directed towards strengthening community engagement and infrastructure to further improve surveillance outcomes. Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\,p\,X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Uganda, Geographic Information Systems, Multilevel Modelling, Longitudinal Data Analysis, Public Health Surveillance, Cluster Randomization, Outcome Evaluation*

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