



Methodological Evaluation of Public Health Surveillance Systems in Kenya Using Multilevel Regression Analysis for Cost-Effectiveness Assessment

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Abstract

Public health surveillance systems in Kenya are critical for monitoring infectious diseases such as malaria and tuberculosis (TB). However, their effectiveness varies across different regions. Multilevel regression models were employed to analyse data from multiple sources, including healthcare facilities and community surveys. Data was collected over a five-year period across various regions in Kenya. Uncertainty in model estimates was quantified using robust standard errors. The analysis revealed significant differences in surveillance system performance between urban and rural areas ($p < 0.05$). Cost-effectiveness varied by region, with an estimated cost-saving potential of

12 per capita annually for the most effective systems. This study provides a comprehensive evaluation of public health surveillance systems in Kenya.

The logit model is defined as $\text{logit}(\pi) = \beta_0 + \beta_1 X_1 + \dots + \beta_k X_k$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Multilevel regression, Cost-effectiveness analysis, Public health surveillance, Epidemiology, Geographic information systems, Stochastic models*

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