



# Multilevel Regression Analysis of Public Health Surveillance Systems in Ghana: A Methodological Assessment and Cost-Effectiveness Evaluation

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## Abstract

Public health surveillance systems are critical for detecting and responding to infectious diseases in Ghana. However, their efficiency varies across different regions and levels of administration. A meta-analysis approach was employed to synthesize data from multiple studies on public health surveillance systems in Ghana. Multilevel regression models were used to analyse the effectiveness and cost implications at different levels (national, regional, district). Uncertainty intervals were calculated using robust standard errors. The analysis revealed significant variation in system performance across regions, with a proportion of systems that showed cost-effectiveness exceeding 70% when considering both efficiency and cost parameters. Our findings suggest that targeted improvements are needed to enhance the cost-effectiveness of public health surveillance systems in Ghana. This could include better resource allocation and training for field personnel. We recommend policymakers prioritise investments in areas identified as underperforming, based on our analysis. Additionally, continuous monitoring and periodic review of system performance should be conducted to ensure sustainability and effectiveness. public health surveillance systems, Ghana, cost-effectiveness, multilevel regression analysis

Treatment effect was estimated with  $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *Sub-Saharan, Ghanaian, multilevel, regression, evaluation, cost-effectiveness, surveillance*

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