



# Bayesian Hierarchical Model Cost-Effectiveness Evaluation of Public Health Surveillance Systems in Kenya: A Meta-Analysis

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### Abstract

Public health surveillance systems play a critical role in monitoring infectious diseases such as malaria and tuberculosis (TB). In Kenya, these systems are underutilized due to resource constraints. We conducted a meta-analysis on published studies from Kenya, estimating costs and effectiveness using a Bayesian hierarchical model to assess the impact of surveillance systems. The analysis revealed that public health surveillance systems are cost-effective with an estimated return on investment (ROI) ranging between 1.5 to 2.0, indicating significant financial benefits outweighing initial investments. Our Bayesian hierarchical model provides a robust framework for evaluating the cost-effectiveness of public health surveillance systems in Kenya, highlighting their value as key tools for disease control and prevention. Policy makers should prioritise investment in these systems to maximise their impact on public health outcomes. Treatment effect was estimated with  $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** Kenya, Bayesian Hierarchical Model, Cost-Effectiveness, Surveillance Systems, Public Health, Africa, Methodology

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