



# Methodological Assessment of Public Health Surveillance Systems in South Africa: A Panel-Data Approach to Cost-Efficiency Evaluation

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## Abstract

This study addresses a current research gap in Medicine concerning Methodological evaluation of public health surveillance systems systems in South Africa: panel-data estimation for measuring cost-effectiveness in South Africa. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A structured review of relevant literature was conducted, with thematic synthesis of key findings. 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 systems in South Africa: panel-data estimation for measuring cost-effectiveness, South Africa, Africa, Medicine, review article 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:** *Pan-African, Public Health Surveillance, Cost-Benefit Analysis, Panel Data, Econometrics, Evaluation Metrics, Geographic Information Systems*

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