



Methodological Evaluation of Public Health Surveillance Systems in Ethiopia Using Panel Data for Efficiency Gains Analysis

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Published: 11 February 2012 | **Received:** 21 November 2011 | **Accepted:** 03 January 2012

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DOI: [10.5281/zenodo.18945768](https://doi.org/10.5281/zenodo.18945768)

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Abstract

This study addresses a current research gap in Medicine concerning Methodological evaluation of public health surveillance systems in Ethiopia: panel-data estimation for measuring efficiency gains in Ethiopia. The objective is to formulate a rigorous model, state verifiable assumptions, and derive results with direct analytical or practical implications. A mixed-methods design was used, combining survey and interview data collected over the study period. 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 in Ethiopia: panel-data estimation for measuring efficiency gains, Ethiopia, Africa, Medicine, longitudinal study This work contributes a formal specification, transparent assumptions, and mathematically interpretable claims. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta^T p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: Ethiopia, Geographic Information Systems (GIS), panel data, econometrics, health systems research, efficiency analysis, longitudinal studies

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