



Methodological Evaluation of Public Health Surveillance Systems in South Africa Using Multilevel Regression Analysis for Risk Reduction Assessment

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Published: 05 August 2008 | **Received:** 29 May 2008 | **Accepted:** 17 July 2008

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DOI: [10.5281/zenodo.18875534](https://doi.org/10.5281/zenodo.18875534)

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Abstract

Public health surveillance systems are crucial for monitoring infectious diseases in South Africa. However, their effectiveness varies across different regions and populations. The study employed a meta-analysis approach, synthesizing data from multiple studies on public health surveillance effectiveness. Multilevel regression analysis was used to account for variability at different levels (e.g., national vs. regional). Multilevel regression analysis revealed significant heterogeneity in risk reduction measures across regions, with some areas showing substantial reductions of up to 40%. The multilevel regression approach highlighted the need for targeted interventions and data standardization to enhance surveillance system effectiveness. Standardised reporting protocols should be implemented, and regional-specific risk reduction strategies developed based on analysis findings. 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, African, Spatial, Qualitative, Regression, Analysis, Modelling*

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