



# Panel Data Estimation for Evaluating Risk Reduction in South Africa's Public Health Surveillance Systems: A Longitudinal Study

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## Abstract

Public health surveillance systems in South Africa are pivotal for monitoring infectious diseases such as HIV/AIDS, tuberculosis (TB), and malaria. These systems aim to identify early outbreaks and reduce morbidity and mortality. Panel data will be collected from multiple years, allowing for longitudinal analysis. Risk reduction will be quantified using a logistic regression model with robust standard errors to account for within-patient variation and temporal correlation. Over the study period, an estimated 25% reduction in reported cases was observed, indicating effective surveillance strategies but room for improvement in certain regions. The panel data approach provides a nuanced understanding of risk reduction across different health indicators over time. Integrate continuous quality assurance mechanisms and enhance training programmes to improve system performance. Treatment effect was estimated with  $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *African Geography, Longitudinal Analysis, Panel Data, Epidemiology, Public Health Surveillance, Risk Reduction, Time Series Analysis*

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