



Methodological Evaluation of Public Health Surveillance Systems in South Africa Using a Difference-in-Differences Model to Assess System Reliability

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Abstract

Public health surveillance systems are critical for monitoring infectious diseases in South Africa. However, their reliability can be questioned due to inconsistencies and delays. A Difference-in-Differences model was employed to assess system performance over time. The DiD approach compares changes within treated units before and after treatment with changes in similar, untreated units. The analysis revealed that the public health surveillance system experienced a significant improvement in reporting accuracy from pre-diagnosis to post-diagnosis periods ($p < 0.05$). The DiD model demonstrated high reliability for measuring system performance and can be used as a robust method for evaluating future surveillance systems. Public health officials should continue to refine the DiD methodology to ensure consistent data quality and enhance public trust in surveillance systems. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, Geographic Information Systems, Spatial Analysis, Temporal Data Models, Time Series Analysis, Logistic Regression, Precision Medicine*

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