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Methodological Evaluation of Public Health Surveillance Systems in South Africa Using a Difference-in-Differences Approach for Cost-Effectiveness Analysis

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Abstract

Public health surveillance systems in South Africa are crucial for monitoring infectious diseases such as tuberculosis (TB). These systems often rely on manual reporting methods which can be inefficient and prone to delays. A difference-in-differences (DiD) econometric model was employed, incorporating time as an instrument for intervention effect. Model specification includes control variables such as population density and healthcare facility coverage to account for potential confounders. The DiD analysis revealed a significant reduction in TB incidence rates post-intervention compared to pre-intervention periods ($p < 0.05$). This suggests the effectiveness of the intervention, with an estimated cost-effectiveness ratio of 120 *per case prevented . The DiD model demonstrated promise for evaluating public health surveillance systems* \text{logit}(pi)=\beta0+\beta^\top X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, TB surveillance, D-I-D model, cost-effectiveness, epidemiology, intervention analysis, spatial data analytics*

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