African Thoracic Surgery

Bayesian Hierarchical Model for Evaluating Cost-Effectiveness of Public Health Surveillance Systems in South Africa: An Assessment Framework

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Abstract

Public health surveillance systems (PHSSs) play a critical role in monitoring infectious diseases such as tuberculosis and HIV/AIDS in South Africa. A Bayesian hierarchical model was employed to estimate costs and effectiveness across different regions in South Africa. Uncertainty quantification was achieved through robust standard errors. The analysis revealed significant variability in the cost-effectiveness of PHSSs, with a proportion exceeding 40% showing marginal cost-benefit ratios above one. The model provided insights into resource allocation for optimal surveillance system performance. Policy recommendations include prioritising regions with lower cost-effectiveness to maximise overall public health impact. Treatment effect was estimated with $text\{logit\}(\pi)=beta0+\vec{\beta}\ p\ X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Tuberculosis, HIV/AIDS, Bayesian statistics, Hierarchical modelling, Cost-effectiveness analysis, Public health, Surveillance systems, Africa*

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