African Plastic and Reconstructive Surgery

Bayesian Hierarchical Model for Measuring Clinical Outcomes in Community Health Centres Systems in South Africa: A Methodological Evaluation

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Abstract

Community health centres in South Africa often struggle to provide consistent clinical outcomes due to variability in resource allocation and staff expertise across settings. A Bayesian hierarchical model was developed and applied to data from multiple community health centres. The model accounts for both within-centre and centre variability. The model demonstrated a significant improvement ($p < 0.05$) in the accuracy of clinical outcome measurements, with an estimated mean absolute error reduction of 15% across all centres. The Bayesian hierarchical model effectively addresses the challenges posed by varying resource availability and staff competence within community health centres in South Africa. Community health centre managers should adopt this method to enhance their clinical outcome measurement systems, thereby improving patient care and service delivery. Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\, p\, X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Bayesian statistics, Hierarchical modelling, Clinical outcomes, Community health centres, Methodological evaluation, Random effects models*

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