African Critical Care Nursing

Bayesian Hierarchical Model for Evaluating System Reliability in Community Health Centres across Nigeria

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Abstract

Community health centres in Nigeria have faced challenges in maintaining system reliability over time. A Bayesian hierarchical model was employed to analyse data collected from multiple sources, accounting for both within-centre variability and centre differences. The model accounts for uncertainties in the reliability estimates through robust standard errors. The analysis revealed significant variability in system reliability across different health centres, with some showing a decrease over time despite interventions aimed at improving service delivery. The Bayesian hierarchical model provided insights into the factors influencing system reliability and highlighted areas needing further improvement to enhance service quality. Health authorities should prioritise targeted interventions for health centres exhibiting declining reliability, focusing on resource allocation and staff training. Treatment effect was estimated with $text\{logit\}(\pi) = beta\,0 + \vec{\beta}\, p\, X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Bayesian statistics, hierarchical modelling, reliability analysis, community health systems, sub-Saharan Africa, empirical methods, statistical inference*

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