



Evaluating System Reliability in South African District Hospitals Using Panel Data Analysis: A Methodological Assessment

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Abstract

South African district hospitals play a crucial role in healthcare delivery but face significant challenges. Panel data from 10 district hospitals over three years was analysed to assess system reliability. Mixed-effects models were used to account for hospital-specific and time effects. System reliability varied significantly across hospitals, with a median improvement of 25% in service delivery efficiency after implementing quality control measures. The mixed-effects model revealed that investment in human resources training led to substantial improvements in system performance. District hospital managers should prioritise continuous staff training and resource allocation for enhanced patient care. Treatment effect was estimated with $\text{text}\{logit\}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Sub-Saharan, African, Hospitals, Systems, Epidemiology, Reliability, Panel_Data*

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