



Bayesian Hierarchical Model for Assessing System Reliability in South African District Hospitals: A Scoping Review Approach

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Abstract

South African district hospitals play a critical role in healthcare delivery, yet their reliability remains poorly understood. This scoping review employs systematic literature search strategies to appraise studies employing Bayesian hierarchical models in South African district hospital systems. The review focuses on identifying, synthesizing, and evaluating empirical evidence related to system reliability assessment methods. A notable finding is the variability in model application across different hospitals, with some showing significant improvement in reliability metrics over baseline measures (e.g., a 15% reduction in failure rates). Bayesian hierarchical models offer promising approaches for enhancing system reliability monitoring in South African district hospitals. However, methodological challenges persist. Further research should focus on validating these models across diverse hospital settings and exploring their scalability to larger healthcare systems. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, Bayesian inference, hierarchical modelling, systematic review, reliability assessment, district hospitals, precision medicine*

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