African Genetics and Genomics (Core Life Science)

Bayesian Hierarchical Model for Assessing System Reliability in Nigerian District Hospitals: A Methodological Evaluation

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Published: 27 October 2013 | **Received:** 22 May 2013 | **Accepted:** 17 September 2013

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DOI: 10.5281/zenodo.18989799

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Abstract

Nigerian district hospitals play a crucial role in healthcare delivery across the country. However, their operational reliability and efficiency are often underreported due to inadequate data collection systems. A Bayesian hierarchical model was employed to analyse data from Nigerian district hospitals. This method allowed for the incorporation of both hospital-level and district-level variability, providing a comprehensive evaluation of system reliability. The analysis revealed that approximately 75% of district hospitals experienced significant operational delays in critical services, with varying degrees of impact across different regions. This study demonstrated the utility of BHM for assessing system reliability in Nigerian district hospitals. The findings highlight the need for targeted interventions to improve hospital performance and patient care. Policy makers should prioritise investments in data collection systems and infrastructure improvements within district hospitals to enhance operational efficiency and service delivery. Bayesian hierarchical model, Nigeria, District hospitals, System reliability, Healthcare Treatment effect was estimated with $text\{logit\}(\pi) = beta0 + \beta^{\rightarrow} p X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Nigerian, district hospitals, Bayesian, hierarchical, reliability, assessment, methodology*