



Methodological Evaluation of District Hospital Systems in Senegal Using Multilevel Regression Analysis for System Reliability Measurement

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Abstract

In Senegal, district hospitals play a crucial role in healthcare delivery, yet their effectiveness varies significantly across regions. The study employs multilevel regression analysis to assess system performance at both individual facility (level-1) and regional (level-2) levels, addressing potential sources of variability in service delivery. Multilevel regression revealed that factors such as infrastructure investment and staff training have a significant impact on hospital reliability, with infrastructure investment contributing up to 30% improvement in system performance. The multilevel approach provided insights into the hierarchical nature of district healthcare systems, enabling targeted improvements for enhanced service delivery. Investment in both physical and human resources should be prioritised to improve reliability at district hospitals in Senegal. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *District Hospitals, Multilevel Regression, Healthcare Delivery, System Reliability, Senegal, Geographic Variation, Methodological Evaluation*

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