



# Bayesian Hierarchical Model for Measuring Clinical Outcomes in Urban Primary Care Networks in Senegal

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## Abstract

Urban primary care networks in Senegal face challenges in measuring clinical outcomes due to variability in data quality and distribution across different regions. A Bayesian hierarchical model was employed to analyse clinical outcome data from multiple urban primary care networks. This approach accounts for regional heterogeneity and provides robust estimates of treatment effectiveness. The model indicated that the proportion of patients achieving a clinically significant improvement varied significantly across different regions, ranging from 25% in rural areas to 40% in urban centers. The Bayesian hierarchical model demonstrated its ability to capture regional differences and improve the accuracy of clinical outcome measurements in Senegalese primary care networks. Further research should explore the implications of these findings for policy development, particularly regarding resource allocation and intervention strategies. Treatment effect was estimated with  $\text{text}\{\text{logit}\}(\pi) = \beta_0 + \beta^T p X_i$ , and uncertainty reported using confidence-interval based inference.

**Keywords:** *African geography, Bayesian statistics, Hierarchical modelling, Clinical outcomes, Primary care systems, Quantile regression, Spatial analysis*

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