Bayesian Hierarchical Model for Evaluating Community Health Centre Systems in Senegal: A Methodological Assessment

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Abstract

Community health centres (CHCs) in Senegal are pivotal for addressing healthcare needs across diverse geographical regions. Despite their importance, evaluation of CHC systems' effectiveness often relies on conventional statistical methods which may not fully capture the complexity and variability inherent within these settings. A Bayesian hierarchical model was developed to analyse data from multiple CHCs. This model accounts for both individual-level variability and aggregate-level effects, allowing for the estimation of systematic differences between CHCs while controlling for unobserved heterogeneity. In our analysis, we observed a significant reduction in health risk by 15% across all CHC networks over two years, with this trend being consistent across different regions. This suggests that the BHM effectively captures variations in risk reduction strategies among CHCs. The application of the Bayesian hierarchical model provides insights into the effectiveness and variability of CHC systems in reducing health risks, offering a nuanced understanding beyond traditional methods. Given the findings, we recommend further research to validate these results and explore potential interventions that can improve the efficiency and impact of CHCs. Treatment effect was estimated with $text\{logit\}(\pi) = beta\, 0 + \beta^{\rightarrow}\, p\, X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African, Bayesian, Hierarchical, Model, Methodology, Risk, Evaluation*

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