



Bayesian Hierarchical Model for Measuring Adoption Rates in Ghanaian Community Health Centre Systems: A Longitudinal Study

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Abstract

Community health centre systems in Ghana are critical for addressing healthcare disparities. However, understanding their adoption rates over time is essential for evaluating system effectiveness and resource allocation. A longitudinal study employing a Bayesian hierarchical model to estimate adoption rates across different time points. The model accounts for variability between centres and over time, incorporating data from multiple health centres within Ghana. Bayesian hierarchical modelling indicated an overall adoption rate of 75% with robust uncertainty estimates indicating that this figure could vary by up to ± 5 percentage points at any given centre. The Bayesian hierarchical model successfully captured the complex dynamics influencing adoption rates, providing a nuanced understanding of factors affecting health centre utilisation in Ghanaian contexts. Further research should explore the specific mechanisms driving adoption within different types of centres and investigate how these models can be applied to other healthcare systems globally. Treatment effect was estimated with $\text{logit}(\pi) = \beta_0 + \beta_1 X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *Geographic, Ghanaian, Longitudinal, Bayesian, Hierarchical, Model, Adoption, Evaluation*

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