



Bayesian Hierarchical Model for Evaluating Cost-Effectiveness in Public Health Surveillance Systems in Nigeria: A Methodological Assessment

Chinedu Nnamdi^{1,2}, Obioma Uzomachi^{3,4}, Uche Chukwuma², Nneka Ifeoma⁵

¹ Department of Clinical Research, University of Port Harcourt

² University of Maiduguri

³ University of Benin

⁴ University of Port Harcourt

⁵ Nigerian Institute of Social and Economic Research (NISER)

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Correspondence: cnnamdi@outlook.com

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Author notes

Chinedu Nnamdi is affiliated with Department of Clinical Research, University of Port Harcourt and focuses on Medicine research in Africa.

Obioma Uzomachi is affiliated with University of Benin and focuses on Medicine research in Africa.

Uche Chukwuma is affiliated with University of Maiduguri and focuses on Medicine research in Africa.

Nneka Ifeoma is affiliated with Nigerian Institute of Social and Economic Research (NISER) and focuses on Medicine research in Africa.

Abstract

Public health surveillance systems are crucial for monitoring infectious diseases in Nigeria. However, their cost-effectiveness varies significantly across different regions and healthcare settings. A Bayesian hierarchical model was developed to assess the cost-effectiveness of public health surveillance systems in Nigeria. The model accounts for variability across different regions and incorporates uncertainty through robust standard errors. The analysis revealed that certain regions benefited more from surveillance efforts, with a higher proportion (25%) demonstrating significant cost savings compared to others. The Bayesian hierarchical model provided insights into the optimal allocation of resources for enhanced surveillance effectiveness in Nigeria. Public health authorities should prioritise investments in regions where surveillance can yield substantial cost savings and improve outbreak response times. Bayesian Hierarchical Model, Public Health Surveillance, Cost-Effectiveness Analysis, Nigeria 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: *Nigeria, African geography, Bayesian statistics, hierarchical modelling, cost-benefit analysis, infectious diseases, surveillance systems*

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