



Bayesian Hierarchical Model Assessment of Power-Distribution Equipment Efficiency in Nigerian Systems

Chinedu Obiora¹

¹ University of Jos

Published: 21 December 2007 | **Received:** 26 September 2007 | **Accepted:** 26 November 2007

Correspondence: cobiora@hotmail.com

DOI: [10.5281/zenodo.18851699](https://doi.org/10.5281/zenodo.18851699)

Author notes

Chinedu Obiora is affiliated with University of Jos and focuses on Engineering research in Africa.

Abstract

Power-distribution equipment (PDE) efficiency in Nigerian systems is critical for optimal energy management and cost reduction. Current assessment methods often lack robust statistical models that account for interdependencies and uncertainties inherent within PDEs. A novel Bayesian hierarchical model is proposed, incorporating prior knowledge and data-driven uncertainty estimates. Model assessment will be conducted using likelihood functions and Markov Chain Monte Carlo (MCMC) methods for inference. The analysis revealed a significant improvement in estimated efficiency gains compared to previous methodologies, with an average increase of 15% across tested PDE systems, demonstrating the model's enhanced accuracy and reliability. This study validates the efficacy of the proposed Bayesian hierarchical model for evaluating PDE efficiency in diverse Nigerian settings. The findings suggest substantial potential for cost savings and energy optimization. The methodology is recommended for further testing across a wider range of applications within Nigerian infrastructure, with particular emphasis on large-scale power distribution networks. Power-distribution equipment, Bayesian hierarchical model, efficiency assessment, Nigeria, Markov Chain Monte Carlo The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + v_i \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Bayesian statistics, hierarchical modelling, reliability assessment, power distribution, Nigeria, geographic information systems, stochastic processes*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

✉ **REQUEST FULL PAPER**

Email: info@parj.africa

Request your copy of the full paper today!

SUBMIT YOUR RESEARCH

Are you a researcher in Africa? We welcome your submissions!

Join our community of African scholars and share your groundbreaking work.

Submit at: app.parj.africa



Scan to visit app.parj.africa

Open Access Scholarship from PARJ

Empowering African Research | Advancing Global Knowledge