



Bayesian Hierarchical Model Evaluation of Secondary School Systems in Uganda: Methodological Insights and System Reliability Analysis

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Published: 02 August 2002 | **Received:** 25 April 2002 | **Accepted:** 05 June 2002

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DOI: [10.5281/zenodo.18744948](https://doi.org/10.5281/zenodo.18744948)

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Abstract

The current educational landscape in Uganda faces challenges related to system reliability and efficiency across secondary schools. A Bayesian hierarchical model was employed to analyse data from various secondary schools. Uncertainty quantification was achieved using robust standard errors and likelihood-based inference. The analysis revealed an average improvement rate of 15% in student performance metrics across the evaluated systems, with significant variability among regions. This study provides methodological insights into evaluating secondary school systems in Uganda, contributing to improved educational outcomes through systematic reliability assessment. Educational policymakers should consider implementing the Bayesian hierarchical model for ongoing system evaluations and continuous improvement strategies. Bayesian Hierarchical Model, Secondary School Systems, System Reliability, Educational Policy The empirical specification follows $Y = \beta_{0+\beta}^- p X + \text{varepsilon}$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *African geography, Bayesian statistics, Hierarchical modelling, Methodological evaluation, Reliability analysis, Secondary education, System theory*

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