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# Bayesian Hierarchical Model for Assessing System Reliability in Community Health Centres, Tanzania

**Kamadhenu Kijivu**[1,2], **Gakoma Wabinga**[3,4], **Safiri Mwalimu**[3], **Mwai Nsimba**[5]

[1] Tanzania Wildlife Research Institute (TAWIRI)

[2] Department of Pediatrics, Sokoine University of Agriculture (SUA), Morogoro

[3] University of Dar es Salaam

[4] Department of Clinical Research, Catholic University of Health and Allied Sciences (CUHAS)

[5] Catholic University of Health and Allied Sciences (CUHAS)

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**Correspondence:** kkijivu@outlook.com

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**Author notes**

*Kamadhenu Kijivu is affiliated with Tanzania Wildlife Research Institute (TAWIRI) and focuses on Medicine research in Africa.*

*Gakoma Wabinga is affiliated with University of Dar es Salaam and focuses on Medicine research in Africa.*

*Safiri Mwalimu is affiliated with University of Dar es Salaam and focuses on Medicine research in Africa.*

*Mwai Nsimba is affiliated with Catholic University of Health and Allied Sciences (CUHAS) and focuses on Medicine research in Africa.*

## Abstract

Bayesian hierarchical models are increasingly used in healthcare systems to assess reliability and efficiency. A Bayesian hierarchical model was applied to data collected from CHCs across Tanzania between and . The model accounts for within-centre variability while estimating overall system reliability. The model identified a significant proportion (35%) of CHCs with unreliable service delivery, influenced by factors such as inadequate staffing and infrastructure. Bayesian hierarchical models provide robust insights into the reliability of healthcare systems in Tanzania's community health centres. Investment in training staff and upgrading facilities is recommended to improve system reliability. Bayesian Hierarchical Model, Community Health Centres, System Reliability, Tanzania Treatment effect was estimated with $text\{logit\}(\pi) = beta0 + \vec{\beta}\, p\, X_i$, and uncertainty reported using confidence-interval based inference.

**Keywords:** *Tanzania, Bayesian hierarchical model, reliability assessment, community health centers, Markov chain Monte Carlo, spatial analysis, statistical inference*

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