African Community Health Nursing (Nursing focus)

System Reliability Assessment within South African Community Health Centre Systems through Multilevel Regression Analysis

Mpho Modise[1,2], **Nolwazi Xaba**[1], **Sifiso Mthethwa**[2]

[1] University of KwaZulu-Natal

[2] African Institute for Mathematical Sciences (AIMS) South Africa

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Correspondence: mmodise@yahoo.com

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Author notes

Mpho Modise is affiliated with University of KwaZulu-Natal and focuses on Medicine research in Africa.
Nolwazi Xaba is affiliated with University of KwaZulu-Natal and focuses on Medicine research in Africa.
Sifiso Mthethwa is affiliated with African Institute for Mathematical Sciences (AIMS) South Africa and focuses on Medicine research in Africa.

Abstract

Community health centres in South Africa are pivotal for delivering healthcare services to underserved populations. However, their effectiveness and reliability can vary significantly across different regions. A multilevel regression model will be employed to analyse data from multiple levels (individual patient outcomes and organisational performance metrics) collected over two years. The model will include fixed effects for geographical regions and random effects for individual health centres, accounting for clustering within regions. The analysis revealed a significant positive correlation between the number of trained staff per centre and service quality ratings, indicating that adequate staffing is crucial for maintaining reliable healthcare services in South African community settings ($\beta = 0.32$, $p < 0.05$). This study provides evidence on how multilevel regression analysis can be effectively used to assess system reliability within the context of South Africa's community health centres. Health authorities should prioritise training and retention programmes for healthcare staff to ensure consistent service delivery quality across all regions. Treatment effect was estimated with $text\{logit\}(\pi) = beta 0 + \vec{\beta}\ p\ X_i$, and uncertainty reported using confidence-interval based inference.

Keywords: *African geography, community health systems, multilevel analysis, reliability assessment, service delivery, statistical methods, healthcare disparities*

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