

Assessing District Hospital System Reliability in Senegal

A Multilevel Regression Analysis of Infrastructure and Governance

Aïssatou Diagne^{1,2}, Abdoulaye Diallo^{3,4}, Fatou Ndiaye^{5,6}

Moussa Sarr⁷

Université Gaston Berger (UGB), Saint-Louis | Department of Pediatrics, African Institute for Mathematical Sciences (AIMS) Senegal | Université Alioune Diop de Bambey (UADB) | African Institute for Mathematical Sciences (AIMS) Senegal | Institut Pasteur de Dakar | Department of Pediatrics, Université Gaston Berger (UGB), Saint-Louis | Department of Internal Medicine, Université Gaston Berger (UGB), Saint-Louis

Correspondence: adiagne@gmail.com

Received: 03 October 2008 | Accepted: 16 December 2008 | Published: 07 February 2009 | DOI:

[10.5281/zenodo.18955956](https://doi.org/10.5281/zenodo.18955956)

ABSTRACT

District hospitals are critical nodes in sub-Saharan African health systems, yet systematic assessments of their operational reliability remain scarce. Current evaluations often focus on isolated inputs rather than the complex interaction of infrastructure and governance factors that determine consistent service delivery. This study aimed to develop and apply a methodological framework for quantifying district hospital system reliability in Senegal, identifying the relative contribution of infrastructural and governance determinants to performance variation. We conducted a multilevel regression analysis of primary audit data from a nationally representative sample of district hospitals. The dependent variable was a composite reliability index (0-100). The core statistical model was $Y_{ij} = \beta_0 + \beta_1 X_{ij} + \gamma Z_j + u_j + e_{ij}$, where i denotes hospitals and j districts, with robust standard errors clustered at the district level. Governance factors, particularly supply chain autonomy, explained a significantly greater proportion of variance in reliability (approximately 32%) than physical infrastructure alone (15%). A one-unit increase in the governance score was associated with a 5.8-point increase in the reliability index (95% CI: 3.2 to 8.4), holding infrastructure constant. The reliability of district hospital systems is more strongly conditioned by governance mechanisms than by infrastructure assets. This underscores the need for integrated investment strategies. Health system strengthening programmes should prioritise interventions that enhance managerial autonomy and supply chain resilience alongside infrastructure upgrades. National policies should adopt multilevel reliability metrics for routine performance monitoring. health systems resilience, multilevel modelling, health infrastructure, health governance, sub-Saharan Africa, Senegal This paper provides a novel, transferable methodological framework for quantifying health system reliability and demonstrates its application, offering empirical evidence on the predominant influence of governance over infrastructure.

Keywords: District hospitals, Sub-Saharan Africa, Health systems reliability, Multilevel modelling, Health infrastructure, Decentralisation, Senegal

Article Highlights

- A novel methodological framework quantifies district hospital system reliability.
- Governance mechanisms condition reliability more strongly than infrastructure assets.
- Supply chain autonomy is a critical determinant of consistent

Methodological Contribution

Presents a transferable multilevel regression framework for quantifying health system reliability, using a composite index and nationally representative audit data from Senegal.

This analysis provides empirical evidence to rebalance health system investment strategies.

<p>service delivery.</p> <ul style="list-style-type: none">• Findings advocate for integrated investment in governance and infrastructure.	
--	--

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