

Ecological Associations between Surgical Rates and Surgeon Densities across India’s District Hospitals

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Introduction

- India: Unmet need of **49 million** surgeries annually [1]. Scaling up surgical volumes needs adequate workforce.
- District Hospitals (DHs):** public hospitals that provide subsidized surgical care.
- Aim: To investigate association between surgical workforce availability and surgeries conducted across DHs.*

Materials & Methods

Design: Cross-sectional secondary data analysis of 629 DHs in 2018-19
Data Source: NITI Aayog [2]
Model: Zero-inflated negative binomial mixed effects regression, gives incident rate ratio (IRR)

	Variable	Median (IQR)
Outcome	Major Surgery	522 (97, 1225)
Exposure	General Doctors & Specialist Surgeons	35 (23, 54)
Covariates	Nursing & Paramedical Staff	115 (67, 189)
	Beds	175 (100, 300)
	Service Coverage (%)	76.19 (66.67, 83.33)
Offset	Population	1253938 (669919, 2034763)

Random effects: 36 states & union territories
Zero-inflation: Modeled as dependent on General Doctors & Specialist Surgeons
Statistical significance: p-value < 0.05, in bold
Analysis platform: R

Discussion & Conclusions

- This novel pan-India analysis found surgical workforce is **significantly associated** with surgical rates per 100,000 people at Indian District Hospitals, after adjusting for covariates.
- Surgical workforce scale-up should be accompanied with improved coverage of **core, diagnostic, and support services** for better surgical rates.

Results

Variable	IRR (95% CI)
Negative Binomial Conditional Model - Fixed Effects	
Intercept	0.00022 (9.13e-05, 0.000545)
General Doctors & Specialist Surgeons	1.00 (1.00, 1.01)
Nursing & Paramedical Staff	1.00 (0.99, 1.00)
Beds	1.00 (1.00, 1.00)
Service Coverage	1.00 (1.00, 1.02)
Zero-inflation model	
Intercept	7.00 (2.33, 21.2)
General Doctors & Specialist Surgeons	0.83 (0.78, 0.89)
Negative Binomial Conditional Model - Random Effects	
States (SD)	0.95 (0.72, 1.26)

