

Title: Creating a Geodatabase of Surgical Facilities in India

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Conflicts of Interest: None

Background:

Surgical care access is known to be limited in low- and middle-income countries (LMICs) including India. An important impediment is the time taken to reach the facility especially for people living in rural and remote areas. Analyzing timeliness to care depends on knowledge about which facilities provide surgeries and their location. We filled this gap by creating a geospatial database where health facilities tagged for surgical care provision.

Methods:

We assessed 9 health facility datasets present in the IndoHealMap project and selected 4 which had any direct or indirect information for the domains/specialties of services provided. These datasets included - National Health Profile (NHP) 2019, Central Government Health Service (CGHS) empanelled hospitals (as of October 2021), National Identification Number directory 2017, and Pradhan Mantri Jan Arogya Yojana (PMJAY) empanelled hospitals (as of January 2021). We included public, private, and trust-owned teaching hospitals from NHP, hospitals providing surgical, eye, specialty or multispecialty care from CGHS, dispensaries, community health centres, sub-district and district hospitals, <100, 100-500 and >500 bedded hospitals, civil/general hospitals, medical college hospitals, referral hospitals, maternity homes, postpartum units from NIN, and hospitals empanelled for at least one surgical package from PMJAY. For geocoding, addresses were cleaned and imputed manually for easier machine readability. We used Google Maps Platform application programming interface (API) and the 'Awesome Table' add-on for machine-based geocoding. Places without

geocodes were tried again manually in Google Maps. Erroneous points beyond the latitude-longitude box limits around India and duplicates (within and across datasets) based on the geo-coordinates similarity were removed. We compared manual (Google Maps) and machine (Awesome Table) generated geocodes for NHP for technical validation using Lin's concordance correlation coefficient (CCC).

Findings:

The geodatabase included 20802 surgical care facilities - 528 (100% of the source dataset) from NHP, 666 (66.7%) from CGHS, 10435 (5.4%) from NIN, and 12630 (54.7%) from PMJAY for surgical care provision. Most facilities from NHP and CGHS were located in urban areas while those from NIN and PMJAY were spread throughout the country. Validation showed perfect agreement between machine-based and manual geocoding (CCC > 0.99).

Interpretation:

The novel geodatabase will be publically available and will be pivotal in understanding facility distribution and timely access to surgical care. Synthesis of such data is important for the national surgical planning for India. Findings are limited by any errors in facility inclusion and geolocation.

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