TECHNICAL BRIEF

FACILITY MAPPING FOR EVIDENCE-BASED PLANNING OF DISTRICT MATERNAL, NEWBORN, AND CHILD HEALTH PROGRAMMES

The Sukshema project focused on improving maternal, newborn, and child health (MNCH) outcomes among the rural poor in eight priority districts in northern Karnataka: Bagalkot, Bellary, Bidar, Bijapur, Gulbarga, Koppal, Raichur, and Yadgir. The goal of the project was to support the state of Karnataka and India to improve MNCH outcomes in rural populations through the development and adoption of effective operational and health system approaches within the National Rural Health Mission (NRHM). In order to achieve this goal, the districts needed a comprehensive understanding of the current status of health services.

This technical brief describes facility mapping, an innovative approach that the project used to carry out a comprehensive baseline assessment of the status of health facilities at the project's inception. Mapping can help to identify and plan for minimizing the gaps that exist in the availability and accessibility of critical reproductive and MNCH services.

TECHNICAL INTERVENTION

For each level of health facility in India, the government provides detailed guidelines on the population catchment area, staffing, and services expected at that level. However, district officials have had limited data to assess the extent to which district facilities comply with these guidelines. Facility mapping can establish a comprehensive profile of public and private facilities at the district level, including details on the populations and geographic areas they cover. Mapping can also examine infrastructure, human resources, drugs, equipment, and supplies to assess facilities' capacity for service delivery.

Previously, districts had lists of public facilities by level of facility (including the guidelines on population catchment areas to be covered and services and infrastructure to be provided at each level), but no information was compiled or analysed on the services, staffing, equipment, or other resources actually available in those facilities. Districts had limited capacity to compare available resources with the guidelines to ascertain needs and identify gaps at each level of health facility. Further, it was difficult for them to compare the population levels of the surrounding service areas

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Improved Maternal, Newborn & Child Health

to the size of the populations each level of facility was expected to serve. The mapping exercise was designed to collect this type of information and allow district officials to take stock of current capacity and gaps.

The project engaged a team of experts representing the NRHM and project partners to develop and pretest mapping tools (specific to facility type) in accordance with appropriate service and operational guidelines. The tools were designed to capture details of population/ villages covered, physical infrastructure, staff, drugs, equipment, supplies, services (antenatal care, delivery, postpartum, postnatal, abortion, newborn, and child), and MNCH service statistics.

Next, the project identified the facilities to include in the mapping effort. This began with initial identification of facilities based on lists provided by state and district officials. Snowball sampling techniques were then used to identify unlisted public facilities. Specifically, higher-level facilities were asked about the other health facilities that administratively report to them or are within their catchment area. Primary Health Centre (PHC) was inquired about all the Health Sub Centres (SCs) reporting to them, subsequently, Community Health Centres (CHCs) were asked about all the PHCs and SCs reporting to them, and, similarly, taluka/block health facilities were asked about all the CHCs reporting to them. To ensure that the mapping team did not miss any public facilities, the lower-level health facilities were also asked about the facilities to which they report. Together, these efforts generated an updated list of public facilities that was provided to district officials.

Private facilities were defined as all private hospitals, nursing homes, or clinics providing any inpatient or outpatient MNCH services. Clinics that only provided diagnostic services were not included. After district health offices provided an initial list of private facilities in the district, field investigators physically verified the presence of the listed facilities and also inquired at each known private facility whether they knew of any other private facility fitting the above-mentioned criteria.

Both the public and private lists were elaborated to include details on the specific location of each facility.

The project conducted the mapping exercise in all eight districts, collecting data on 2,991 facilities as follows:

Type of facility	Total in 8 districts
Sub centres (SC)	1,962
Primary Health Centre (PHC)#	403
Community Health Centre (CHC)	33
Community Health Centre (FRU)*	36
Taluka Hospital (TH)*	34
District Hospital (DH)*	8
Urban Family Welfare/Urban Health Centres	27
Private facilities	488
Total	2,991

Expected to provide basic emergency obstetric and neonatal care (BEmONC)

* Expected to provide comprehensive EmONC

To gather the required data on each facility, the project deployed a team of eight to ten field investigators and two supervisors in each of the eight districts to collect data over a two-month period. In all, the exercise required 70 field investigators and 17 supervisors. All field investigators were trained and provided with data collection manuals and forms. In addition, a monitoring and evaluation specialist and a clinical programme specialist monitored the quality of data collection in each district, and a central team of public health experts assessed data quality through field visits and spot checks.

The field investigators carried out site visits to each facility, approaching the facility's in-charge with a letter from the government requesting their support and participation in the study. The primary respondent at each facility was typically the facility head, which varied by facility type. At the SCs, facility heads were generally auxiliary nurse-midwives (ANMs). Respondents were medical officers at PHCs, CHCs, and taluka hospitals (THs), and district surgeons at the district hospitals (DHs).

At the private facilities, the medical doctor in charge was the primary respondent. In some cases, multiple facility visits were required to ensure a meeting with the appropriate respondent.

For each MNCH care component at each facility level, the primary respondent was asked about which services their facility routinely offered, according to a package of critical services listed in the NRHM guidelines. The field investigators elicited both spontaneous and probed responses. Spontaneous responses provided insights into role clarity, knowledge of guidelines, and provider preparedness, while probed responses ensured that respondents provided comprehensive answers. The field investigators also inventoried equipment, supplies, and drugs; reviewed facility service statistics records; and interacted with other staff, if required. As one example, field investigators physically verified whether the facility had a separate labour room available for conducting deliveries.

The approximate time required to complete all data collection if the key respondent was available ranged from one to three hours depending on the size of the facility. Each data collection team was able to visit two facilities per day on average. Depending on the availability of respondents, geographical proximity, and the facility level, the field investigators sometimes were able to cover more than two facilities per day.

A team of data entry operators entered data from the paper-based data collection forms into a database managed through CSPro software. The project monitoring and evaluation team aggregated and analysed the data to report on the availability of infrastructure, drugs, supplies, and staffing – by type of health facility – for each district and for all districts combined. The team also prepared GIS-compatible datasets on facilities and services that enabled data to be displayed on maps showing the distribution of health facilities throughout the district and spatially depicting key indicators such as staffing availability. This facilitated identification of gaps.

IMPLICATIONS

Identification of service and coverage gaps.

The data generated through the mapping exercise highlighted specific information on the state of the districts' health infrastructure, staffing availability, service provision, drugs, equipment, supplies, and population coverage. The mapping also identified gaps for each MNCH care component and at each level of the health system, assessed against the national and state guidelines. District-level lists summarized, for each taluka hospital in the district, where specific inputs would be required to meet national guidelines.

The mapping data were especially useful in developing a deeper understanding of where deliveries were taking place. For example, the analysis revealed that there is an undue burden on first referral units (FRUs) and higher facilities for deliveries. It identified PHCs as an underdeveloped resource for providing delivery services. It also provided evidence on the utilization of private facilities.

In terms of gaps, the mapping data showed some clear patterns and identified gaps in certain areas that cut across all facilities. In particular, the availability of staffing, supplies, and equipment was often less than specified in the guidelines and

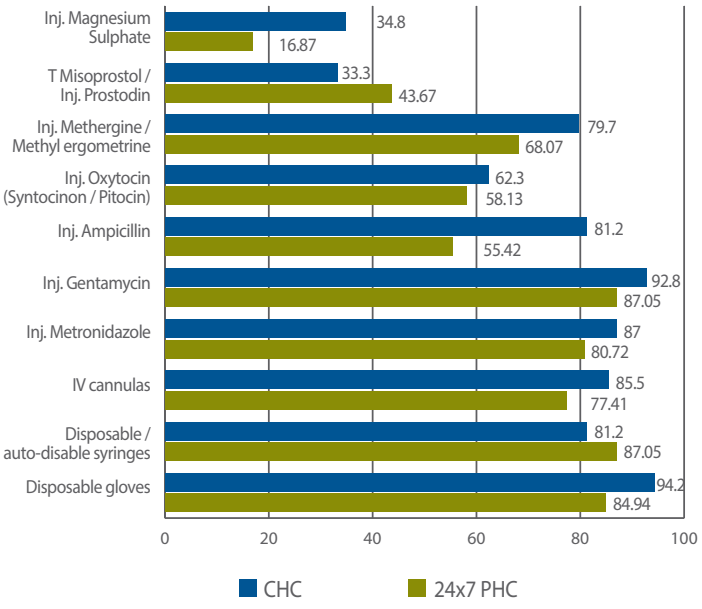

Figure 1. Availability of drugs in CHCs and PHCs

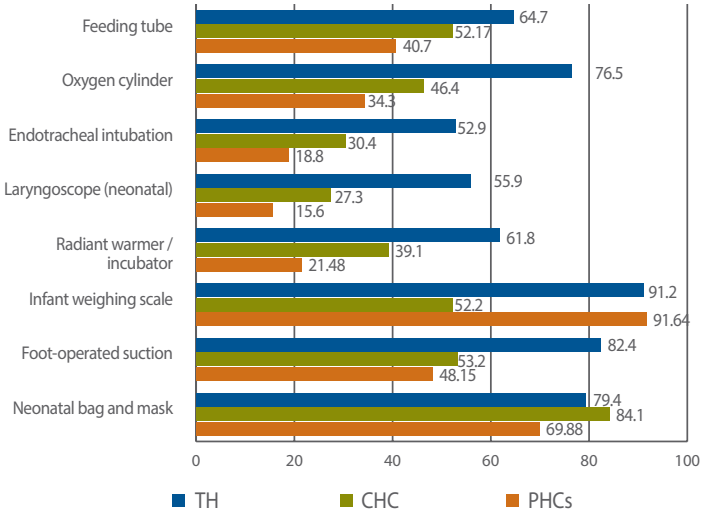

Figure 2. Equipment availability in THs, CHCs, and PHCs

MNCH standards for each type of facility, despite NRHM investments. This information pointed out specific shortfalls in public facilities and helped districts determine where to focus their efforts.

Figure 1 shows the availability of drugs and supplies essential for providing basic emergency obstetric care at 24/7 PHCs and CHCs. Fewer than 40% of facilities had the usually prescribed anti-hypertensive, less than 50% had misoprostol, and only around 60% had oxytocin available.

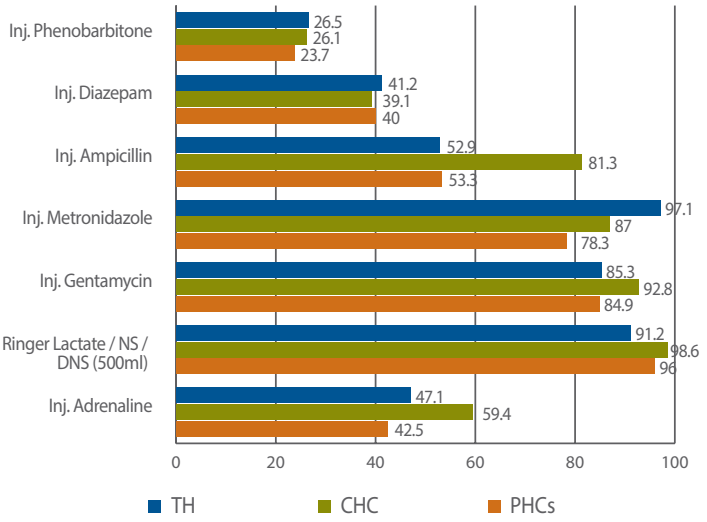

Figure 3. Drug and supply availability in THs, CHCs, and PHCs

Figure 2 illustrates the availability of functional equipment for providing emergency newborn care services at PHCs, CHCs, and THs.

Similarly, Figure 3 presents the availability of drugs and supplies essential for providing emergency newborn care services at PHCs, CHCs, and THs.

The mapping exercise contributed valuable data to better understand coverage patterns. Figure 4 illustrates the geographic distribution of different levels of facilities in one district. Overlaid with population data (Figure 5), district officials could easily see that certain facilities were serving a much larger population coverage area than prescribed in the government guidelines. For instance, in one district with 55 PHCs, 11 of the centres were serving a population of over 40,000 – substantially in excess of the population coverage threshold of 30,000.

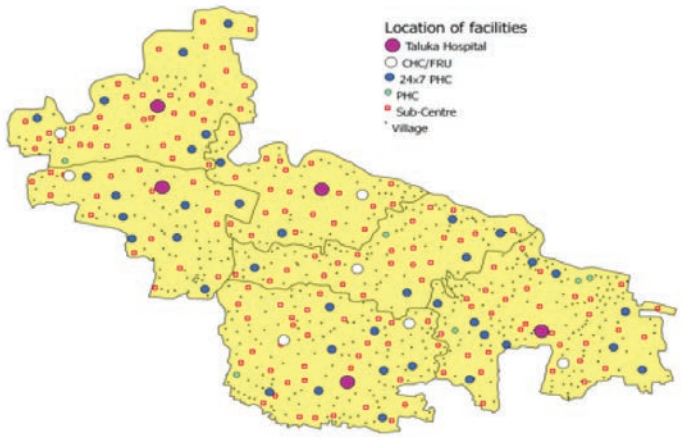

Figure 4. Map of Bagalkot district showing the location of government health facilities

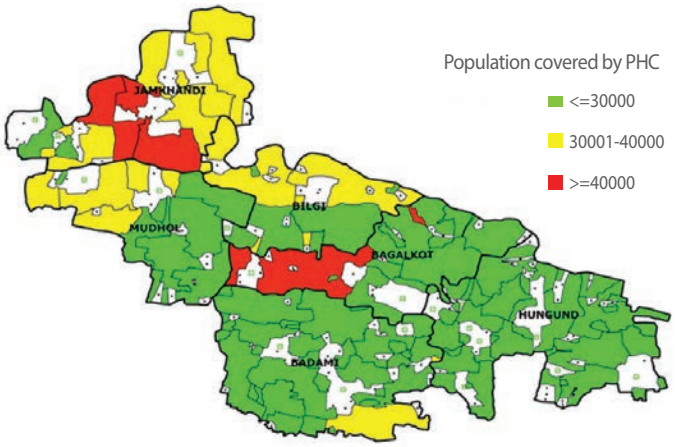

Figure 5. Map of Bagalkot district showing the population coverage by PHCs

Use of data in district-level planning and budgeting. The information gathered during the mapping exercise directly influenced the NRHM's planning process through its programme implementation plans. Sukshema district monitoring and evaluation officers and programme specialists prepared and shared the mapping information with district health officials. Facility mapping provided the districts with an accurate and up-to-date situation analysis of the current condition of MNCH capacity, along with the status of key components such as human resources, procurement, training, and infrastructure.

Government officials used the mapping data to address deficiencies in access and coverage. Where PHCs exceeded population coverage norms, districts took a variety of actions, either building more PHCs, or upgrading PHCs to CHCs to be able to serve a larger population, or redrawing boundaries and reassigning administrative areas among adjacent PHCs to improve population coverage levels. District officials also used the mapping information to direct more resources to filling staffing gaps at facilities through hiring contract nurses. The mapping data also influenced procurement plans, pointing out where more attention was needed to ensure that facilities had needed drugs and supplies.

The following maps (Figures 6 and 7) depict an example of reallocation of PHC and CHC administrative areas from one *taluka*/block in the district of Koppal. Figure 7 shows the change in administrative areas in comparison with the situation shown in Figure 6. Certain administrative areas were reassigned to bring the population coverage levels closer to the expected norms for each type of facility. For example a SC that was reporting to a PHC that was serving more than a 30,000 population would be reassigned to another nearby PHC that could more easily service patients from that SC because that PHC had less than 30,000 population in its administrative area. The reallocation was done to enhance the efficiency of reporting among the lower-level facilities. The logic of geographical location was used to help the district officials to undertake this exercise.

Gangawati Taluka

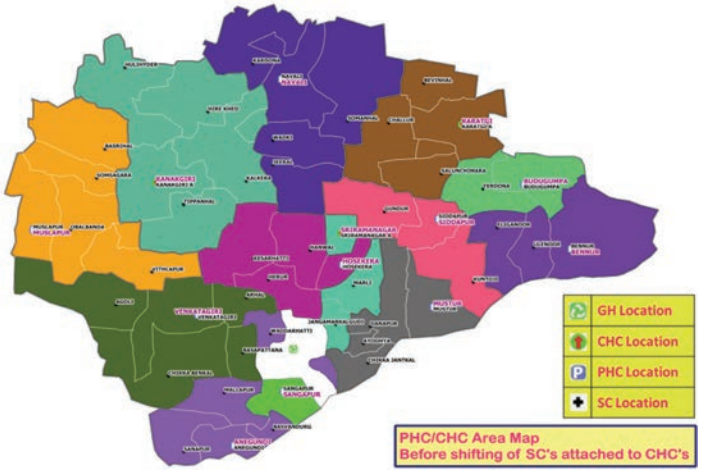

Figure 6. Administrative areas for health centres before reallocation

Gangawati Taluka

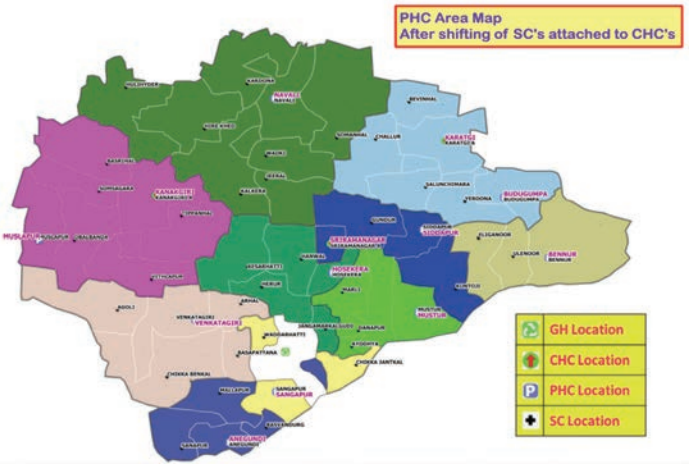

Figure 7. Reallocated administrative areas for health centres

LESSONS LEARNED

The mapping analysis gave the project clear insights into the existing conditions at public and private health facilities. The mapping results were useful in refining project interventions and established a baseline that could be compared with subsequent assessments to monitor gaps related to quality and coverage of MNCH services.

The mapping results also informed programme planning at the district level. The assessment of health facilities enabled district officials to focus their efforts on addressing gaps in staffing, supplies, and infrastructure. Prior to this comprehensive assessment, only limited data were available to help district officials adequately identify and budget for resources needed to address gaps in their annual programme implementation plans.

Implementation of the mapping exercise was a significant but doable undertaking. With effective training, coordination, and resources, the entire activity required just two months. Further, the project created valuable study guidelines and training resources that could readily be adapted to train field investigators in other contexts or for other mapping exercises.

The mapping process lends itself to outsourcing by the government to a research organization. This is because mapping is a discrete activity that requires a cadre of trained field investigators, takes place over a time-limited period, and needs careful management and oversight to coordinate logistics and ensure data quality. Alternatively, the government could use its own staff resources to conduct a mapping exercise but would need to determine how to relieve staff from their present duties to take on the special assignment. Consideration would also have to be given to assessing whether an internally driven approach would introduce any biases that could compromise the integrity of data compared to data collected by a disinterested third party.

Future efforts at facility mapping could be enhanced through greater use of technology to capture and report data. The process the project used was largely paper-based and required data entry into a software programme to perform data analysis. The data collection tools could be converted to an online platform that would eliminate the need for a separate data entry function and make it easier to access data and perform analytics.

The mapping exercise was not without its limitations and challenges. First, we learned that facility mapping is most effective for capturing information on government facilities. Investigators found it more challenging to identify private facilities and to enlist their cooperation in participating in the data collection process. For example, some private facilities were reluctant to provide information on the number of deliveries conducted or allow an audit of drug supplies. As a result, the mapping exercise likely underrepresented private providers of MNCH services and their actual capacities and gaps. Since the project was focused on strengthening public facilities this was not a serious constraint but could be for efforts that are aimed at working with the private sector.

Second, in environments undergoing rapid change, mapping data can quickly become outdated unless concerted efforts are made to update them or to incorporate the mapping exercise into routine practices. Undertaking an inventory of health facilities to understand their actual situation might be required every two to three years. Carrying out facility mapping on a regular basis would ensure that districts have adequate and accurate information to inform their programme implementation plans.

CONCLUSION

The facility mapping exercise proved to be a valuable approach. Facility mapping generated much-needed evidence to refine programme interventions and provided districts with rich and robust data and an analysis of gaps that they could act on in their planning and budgeting processes. This relatively straightforward mapping approach can assist planners and programme managers at the district, state, and national levels to make more data-informed decisions to improve health outcomes.

Photo: *Collecting data with PHC staff*

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Funded by the Bill & Melinda Gates Foundation, the Sukshema project supports the Government of Karnataka to develop and implement strategies to improve maternal, newborn, and child health (MNCH) in alignment with the Government of India National Rural Health Mission (NRHM). The project is implemented by Karnataka Health Promotion Trust in collaboration with University of Manitoba, St John's Medical College, IntraHealth International, and Karuna Trust. The six-year project started in September 2011.

The goal of Sukshema is to:
Develop and adopt effective operational and health system approaches within the NRHM to support the state of Karnataka and India to improve maternal, newborn, and child health outcomes in rural populations.

To achieve this goal, the project integrated and aligned key aspects of the Foundation's MNCH strategy with the NRHM in eight districts in northern Karnataka, with the following four key objectives:

1. Enable expanded availability and accessibility of critical MNCH interventions for rural populations.
2. Enable improvement in the quality of MNCH services for rural populations.
3. Enable expanded utilization and population coverage of critical MNCH services for rural populations.
4. Facilitate identification and consistent adoption of best practices and innovations arising from the project at the state and national levels.

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