Strengthening Government Data Ecosystem and Evidence Driven Decision Making in Uttar Pradesh, India

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CONTENTS

LIST OF FIGURES

ABBREVIATIONS

ACMO	Additional Chief Medical Officer
ANM	Auxiliary Nurse and Midwife
ASHA	Accredited Social Health Activist
CBTS	Community Behaviour Tracking Survey
CHC	Community Health Centre
CMO	Chief Medical Officer
DH	District Hospital
DHIS2	District Health Information Software
DVDMS	Drugs and Vaccines Distribution and Management System
FLW	Frontline Workers
FP	Family Planning
GIS	Geographic Information System
GoI	Government of India
GoUP	Government of Uttar Pradesh
HMIS	Health Management Information System
HPD	High Priority District
HR	Human Resources
IHAT	India Health Action Trust
M&E	Monitoring and Evaluation
MIS	Management Information Systems
MNCH	Maternal, Newborn and Child Health
MOIC	Medical Officer In charge
MPR	Monthly Progress Report
NFHS	National Family Health Survey
PCTS	Pregnancy, Child Tracking and Health Services
PHC	Primary Health Centre
PNC	Post Natal Care
RCH	Reproductive and Child Health
RFS	Rolling Facility Survey
SC	Sub Centre
SRS	Sample Registration System
UoM	University of Manitoba
UPHMIS	Uttar Pradesh Health Management Information System
UP TSU	Uttar Pradesh Technical Support Unit
VCM	Validation Committee Meeting

BACKGROUND

The policymaking function of government is powerful in creating enabling conditions for population health. One of the major components that can enable this process is the presence of a robust data-driven system that forms the foundation of informed decision-making for public health[1]. Data-driven approach allows government-generated data to produce insights, communicate information, and assess the health impact of policies and programs[2]. To effectively plan and manage public health services and tackle public health issues and crises, access to reliable and timely data is of utmost importance.

Government of India (GoI) uses Health Management Information System (HMIS) to monitor a vast variety of health programs and provides key inputs for policy formulation and appropriate program interventions. The national HMIS is a web-based monitoring information system that has been implemented and adopted across all states. Through the HMIS, GoI monitors several national health schemes, tracks the performance of district health systems, and captures data on service delivery, training, and infrastructure[3].

[1] https://www.afro.who.int/news/data-decision-making-health

[2] https://globalhealthdata.org/data-for-public-health-policy/

[3] About us: Introduction: National Health Mission. Government of India, HMIS-Health Management Information System. Updated June 23, 2022. Accessed July 8, 2022. https://hmis.nhp.gov.in/#!/aboutus

THE HEALTH MANAGEMENT INFORMATION SYSTEM IN UTTAR PRADESH

The Government of Uttar Pradesh (GoUP) first implemented the national HMIS platform in 2009. However, several challenges affected both data quality and usability for programmatic decision-making in Uttar Pradesh. These included:

01 Challenges in downloading the data from the national portal for more detailed analyses by the state to identify gaps in data availability and quality, as well as programmatic gaps

02 Short-comings of all relevant programmatic data fields in the national HMIS, which led the state to design and implement separate manual (paper-based) data collection systems to capture missing indicators

03 Challenges with integrating other state health data systems, such as the Human Resource Management System and the Drugs and Vaccines Distribution Management System, with the national HMIS.

Gaps in Data Availability, Quality & Use

Domain	Prior context Gaps
 **Data Availability**	■ Paper-based data collection, compilation, reporting (MPR) and duplication of efforts ■ Critical data elements were missing ■ All health facilities were not mapped ■ Untimely or no reporting of data from facilities
 **Data Quality**	■ Platform and system were not in place ■ Quality of data was not appropriate
 **Data Use**	■ No uniform framework for reviews and data use ■ Reviews mostly focused on financial progress ■ Complex data fetching mechanism made data use difficult ■ Lack of resources to analyse the data for use by programs

In October 2013, the University of Manitoba and India Health Action Trust established the Uttar Pradesh Technical Support Unit (UP TSU) as a part of a memorandum of understanding between the Government of Uttar Pradesh (GoUP) and the Bill & Melinda Gates Foundation to support GoUP in enhancing the efficiency and effectiveness of implementing the reproductive, maternal, neonatal, child, and adolescent health program. A key activity of UP TSU is to support GoUP in improving the collection, quality, and use of routinely collected health data across all levels of the health system in the HMIS, as well as data reported in national-level initiatives.

A Monitoring and Evaluation (M&E) Unit was established within UP TSU to support GoUP. This mainly includes - improving the availability, accessibility, quality and use of data. The core objective of this unit is to provide techno-managerial support to the Health Department of GoUP to enhance the use of data for decision-making. The specific objectives can be listed as follows:

- Strengthen the availability and quality of government data systems
- Increase the use of data for problem-solving by gap analysis and prioritization at different levels (state, division, district and block)
- Establish a concurrent monitoring system for effective planning and decision-making

UP TSU adopted a multi-layered approach to enhance the use of data for programmatic decisions. This was based on three core pillars.

STRENGTHEN GOVERNMENT DATA SYSTEM

Strengthen the government data system to ensure the timely availability of correct data, enhance the data use and visualisation, effective data-based review platforms, and ensure the sustainability of the data use platform beyond the transition.

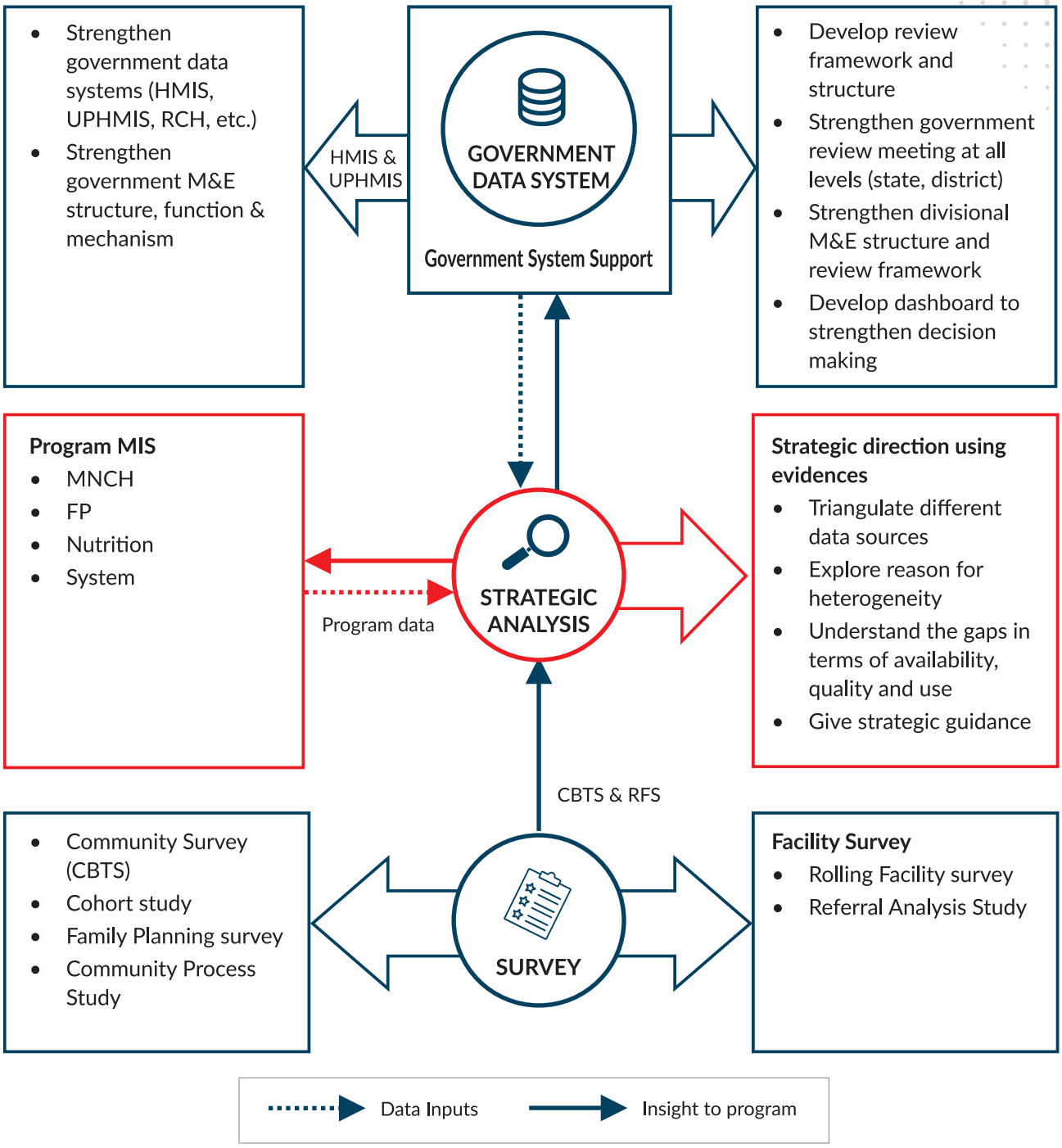
CONCURRENT MONITORING SYSTEM

Establish a concurrent monitoring system to routinely track the progress of outputs and outcomes.

STRATEGIC ANALYSIS

Conduct strategic analysis and provide program intelligence for effective program design, implementation and corrective actions.

FIGURE 1: Functions of Monitoring and Evaluation



UP TSU is supporting GoUP towards enhancing the use of data for decision-making in terms of data availability, accessibility, quality and use for improved health outcomes. The enhanced use of data for the decision-making process envisaged that setting up a clear pathway is key to achieving the desired health outcomes. This involves designing a clear trajectory for data use to (1) track impact level indicators (2) identify the intermediate indicators that have an immediate effect on the impact (3) highlight actionable inputs and processes which will lead to improvement in outcome and impact level health indicators. To demonstrate such evidence-based programming, UP TSU supported GoUP in establishing different platforms for data quality assessment, and data-based review meetings, designed and implemented easy-to-use tools and facilitated on-site mentoring and capacity building support at the state, district and block levels.

APPROACHES AND INNOVATION
Brief Summary

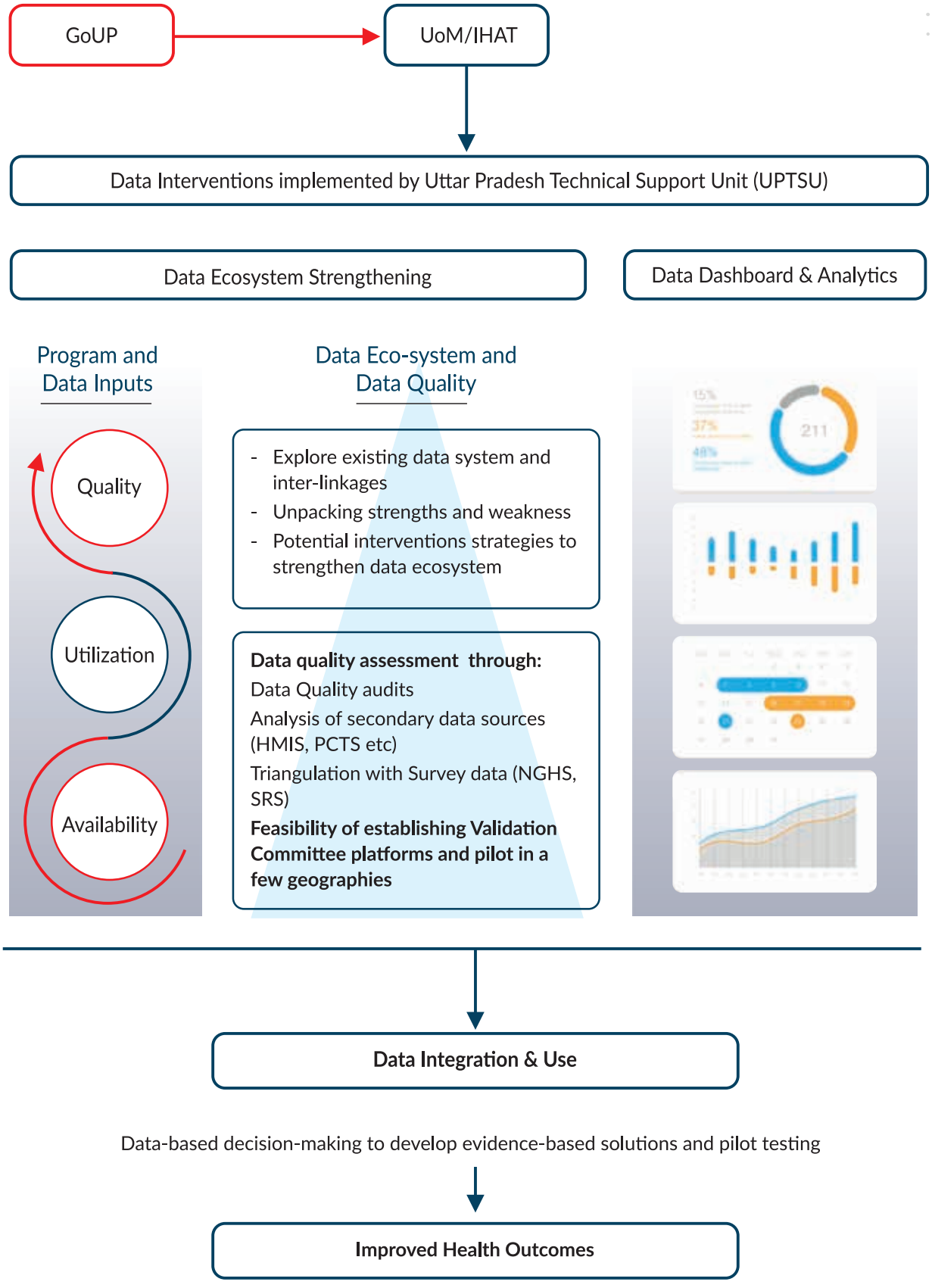
One of the key approaches adopted to improve the health outcomes in UP was to make effective use of data for program planning and decision-making. To do so, the interventions were geared towards strengthening the data ecosystem in the state, bringing newer data analytics frameworks and enhancing the data use through multiple interventions. The interventions were also designed in such a way that they are sustained even after transitioning to GoUP.

Evidence driven interventions

All the planned interventions were evidence-driven. During the initial phase (2014-2018), when the intervention was in a developing phase, an in-depth assessment was done using the **"availability", "quality", and "utilization"** framework to understand **different data** sources used for program planning in the state, their **strengths and weaknesses**, and the extent to which these data are being utilized for decision-making. The assessment also included a discussion with government stakeholders to understand the data requirements (including establishing any new system), opportunities for integration of service coverage with service availability data (like availability of trained HR, drugs, logistics etc), and the areas which require further strengthening within the existing system.

The idea was to bring a **comprehensive and integrated system** of data capturing/ aggregation of critical data elements, enabling stakeholders at each level to better analyse gaps and conduct reviews of health interventions. During this phase, **UP TSU pioneered and established new systems and strengthened the existing ones, following a systematic approach**, including the establishment of a new integrated data system (UPHMIS) reporting both service uptake and multiple input and process data for a comprehensive analysis. Further, **concurrent surveys** were introduced to measure community-and-facility-based outcomes and **set up data quality audit systems**, a comprehensive **health dashboard** for monthly district and block ranking based on program performance, and a **Divisional level M&E hub** to sustain the efforts.

FIGURE 2: Approaches and innovations to strengthen data-ecosystem and data use

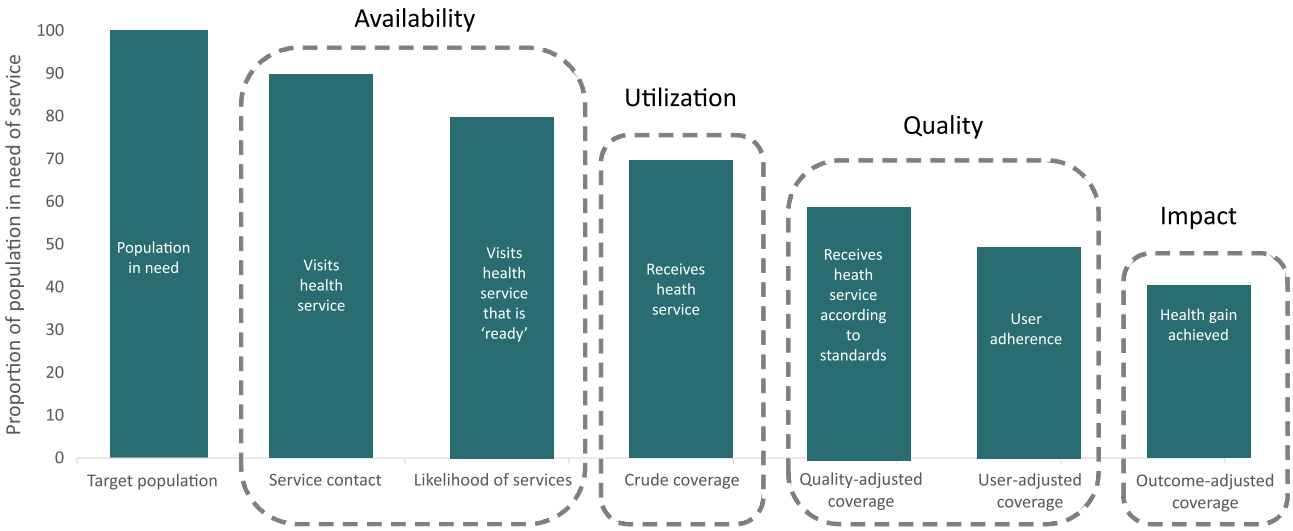


Effective coverage and equity approach

Building upon the efforts of the initial phase, the subsequent phase (2019 onwards) leveraged the existing data for programmatic use. We adopted the **'effective coverage and equity lens'** in identifying the program coverage gaps and helping the program with appropriate evidence-based decisions **to bridge the identified gaps**. Effective coverage is defined as the fraction of potential health gain that is delivered through an intervention which is actually delivered[4]. It is comprised of three components: **need, use and quality**.

Need refers to the individual/population in need of a particular service, ***use*** refers to the use of services, and ***quality*** refers to the actual health benefit experienced from the service[5]. Cross-cutting through this analytical and intervention process to improve effective coverage, we gave specific emphasis on **reducing inequities** driven by the combined influences of gender disparities, socio-economic position, geography, and other drivers of inequity. The analysis brought an understanding of inequity at various levels (geographic or individual) within the low and better-performing geographies depending on the overall coverage of the indicator and persisting disparities. Various interventions implemented in the domains of data availability, data quality, and to promote data use within the government system have been described below.

Effective Coverage Cascade



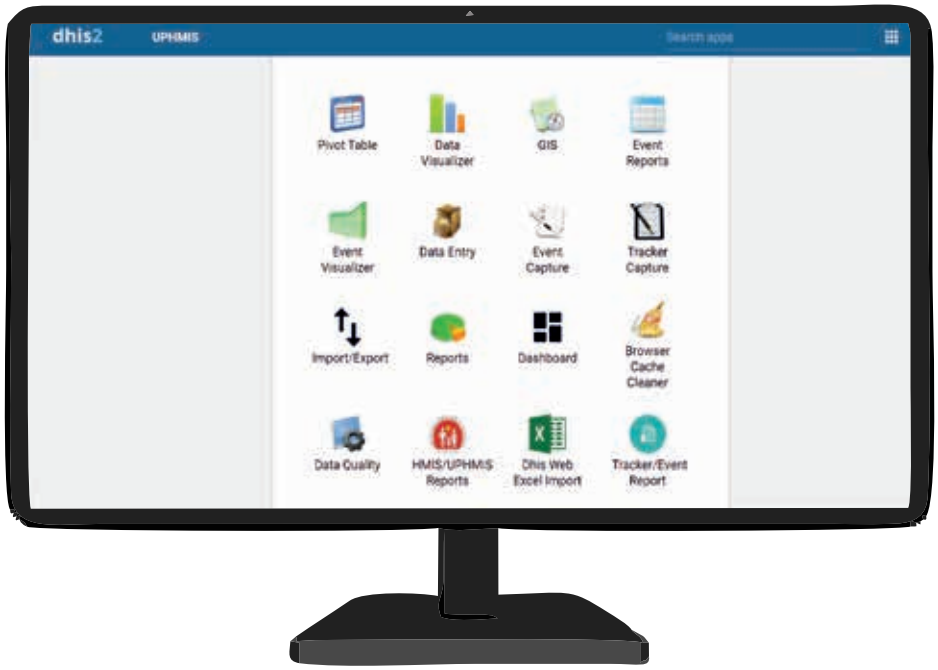
Adapted from Amouzou A, Leslie HH, Ram M, et al. Advances in the measurement of coverage for RMNCH and nutrition: from contact to effective coverage. BMJ Glob Health 2019;4:i114–i124. doi:10.1136/ bmjgh-2018-001297

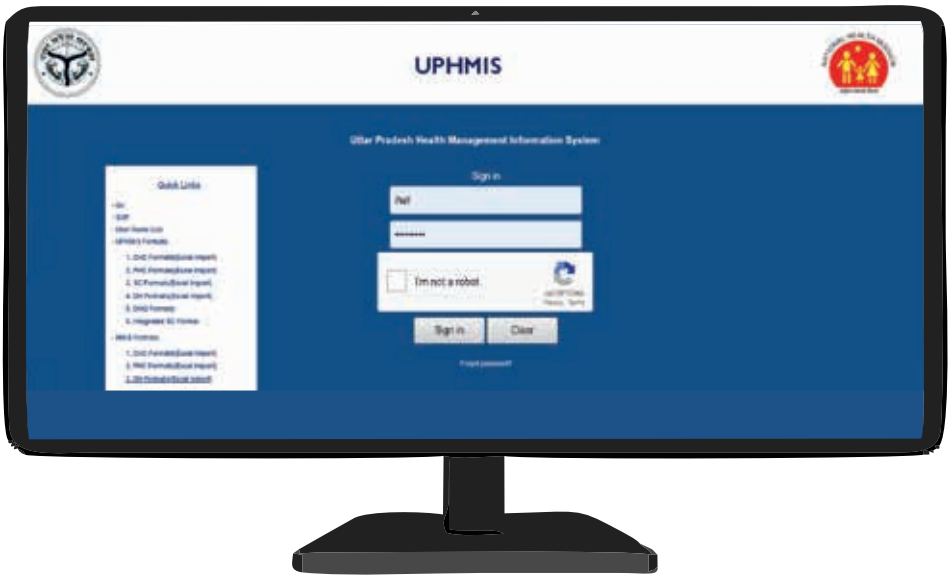
[4] Jannati A, Sadeghi V, Imani A, and Saadati M, Effective coverage as a new approach to health system performance assessment: a scoping review. BMC Health Serv Res, 2018. 18(1): p. 886.

[5] Ng M, Fullman N, Dieleman JL, Flaxman AD, Murray CJ, and Lim SS, Effective coverage: a metric for monitoring Universal Health Coverage. PLoS Med, 2014. 11(9): p. e1001730.

A. DATA AVAILABILITY

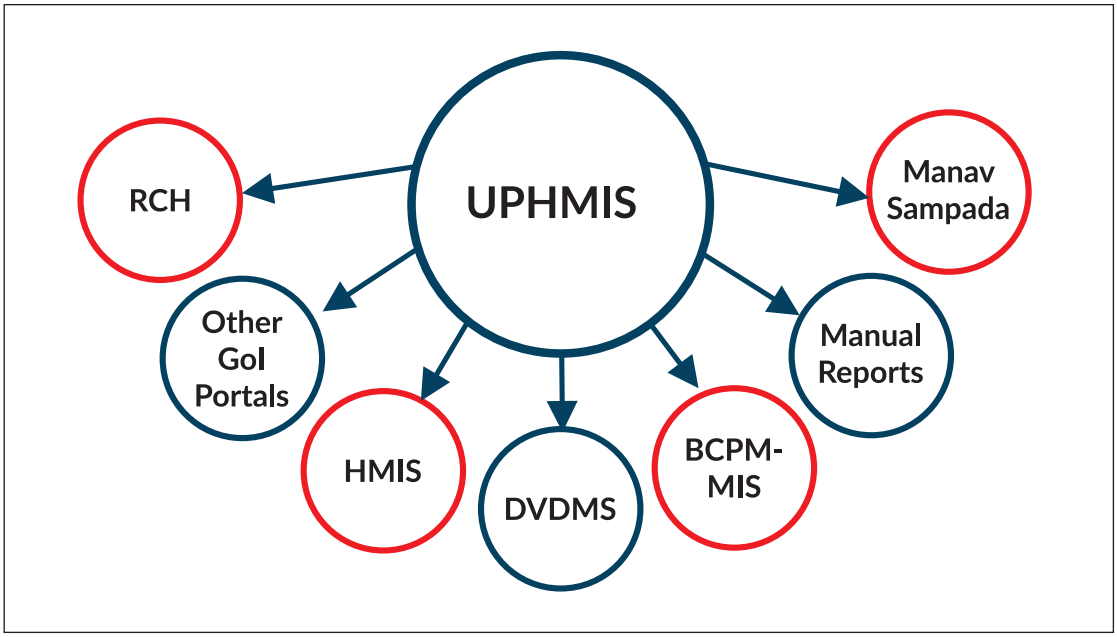
1. Uttar Pradesh Health Management Information System





Uttar Pradesh used multiple data systems with over 80 data collection formats. Despite this, there was a lack of reliable (accurate, complete and timely) data. Often the data collected was not relevant for effective decision-making as the data did not provide real-time availability of trained staff or availability of equipment/drugs/ supplies.

In 2015, with the support of UP TSU, GoUP created its own comprehensive data platform, the Uttar Pradesh HMIS (UPHMIS), to capture data elements missing from HMIS but important to in context to UP. The UPHMIS was designed to capture these data elements to holistically measure and monitor the performance of health programs and inform decision-making at the district and state levels. In addition, the GoUP implemented complementary initiatives to improve data quality and data use processes. To improve HMIS/UPHMIS data quality, the GoUP established data validation committee meetings at the block, district, and state levels. To promote the use of these validated data, in 2017, the GoUP developed and implemented the UP Health Dashboard, which ranks each of UP's 75 districts on a set of key HMIS priority health indicators (details are provided in subsequent sections).



The major features of UPHMIS are:

01 Built upon the DHIS2 platform globally used for HMIS platforms

02 Integrated portal for all data sources like HMIS, GoI portals, manual reporting (MPR)

03 An integrated data set can be generated and analysed through UPHMIS

04 UPHMIS hosts the comprehensive data for the Dashboard display

05 GIS map can be populated through UPHMIS

2. Data entry at the source

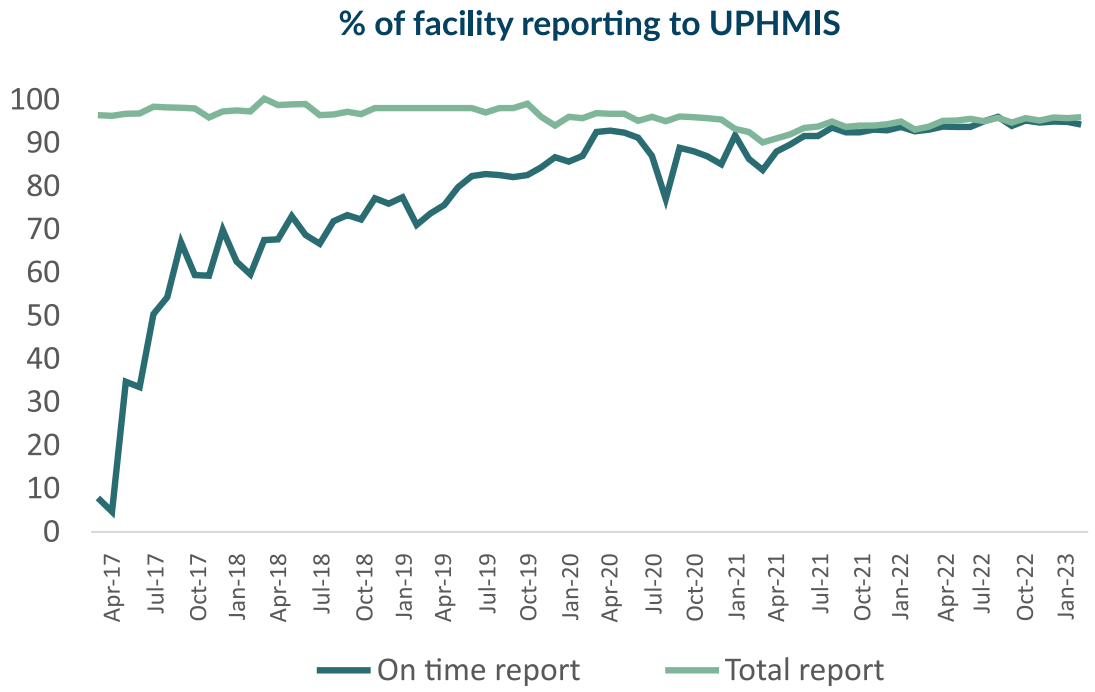
One of the key challenges with the data system was the paper-based report preparation followed by data entry. Much information was either lost or wrongly entered into the HMIS while transferring the data from paper-based reports to a digital system. In UP, around 25,848 (81% of the total public health facilities) are sub-centres (SCs), the lowest level of rural public health facilities catering to about 5000 population. These SCs were reporting data in hard copies, which were subsequently sent to blocks for data entry. This led to different issues as below:

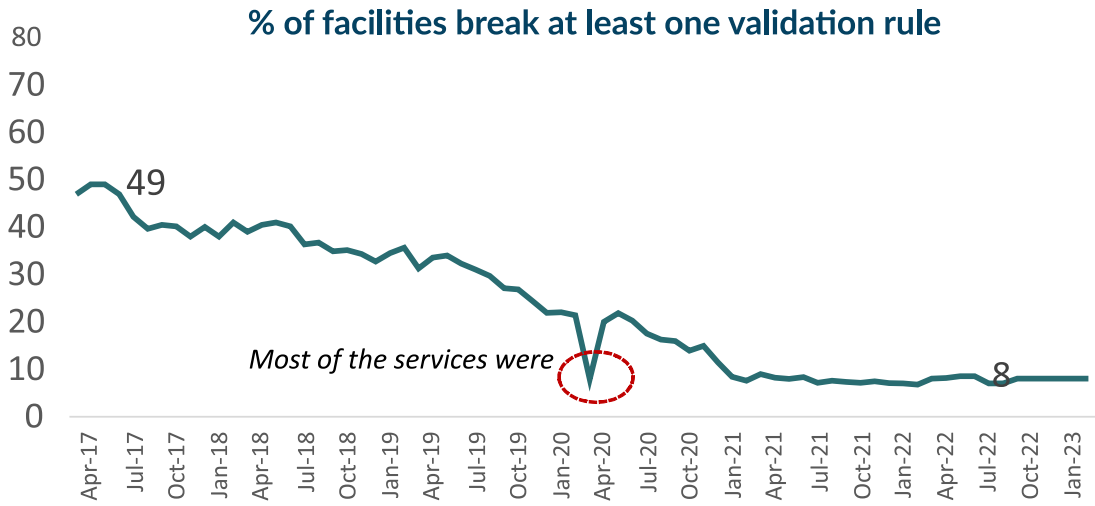
- → Burden on Data Entry Operator- ~50 formats (Considering 25 SCs in a block), 2-3 working days
- → Delay in Data Entry
- → Data entry error and manipulations at the block level
- → Burden of data compilation in different formats

To overcome these issues, UP TSU supported GoUP in digitizing the process of data reporting at source to ensure the accountability of service providers towards the submission of timely and quality data. An android-based UPHMIS SC application (integrated for HMIS & UPHMIS both) was developed and implemented across 75 districts of Uttar Pradesh by GoUP. Within a short period, about 99% SCs started using the application for data reporting. This not only eased down the data entry burden and timely reporting of data but also led to reduced data errors as enhanced validation checks were in-built into the new system (Figure 3).

ANMs filling healthcare data in the UPHMIS app

FIGURE 3: Improvement in data availability over time





3. Facility mapping and standardization of facility numbers and nomenclatures

One of the most prevailing issues under the health system in UP was the differences in the number of health facilities reported across different data sources. A significant deviation has been observed even among a higher level of facilities. Along with the health department, we conducted a comprehensive exercise of mapping and geo-coding of all the public health facilities in UP. Along with this, we fixed a common nomenclature and numbers of DH, CHC, PHC and SC in the state. To do this, we devised a mapping strategy, developed tools, ensured field implementation and conducted data quality checks. All the public health facilities across the state were visited and geo-cordinates were captured the geo-coordinates with a picture of the facility. An in-depth analysis was conducted to identify the unique public health facilities in the state and the final list of facilities was notified by the state for public

use. Further, a mechanism of addition or deletion for a facility was established to keep the master facility list updated. This helped in setting up a common 'denominator' of public health facilities so that the same number could be used across different health platforms and implementing partners. This helped in standardising the measurement of progress in the health outcomes across the facilities.

FIGURE 4: Facility Mapping Process

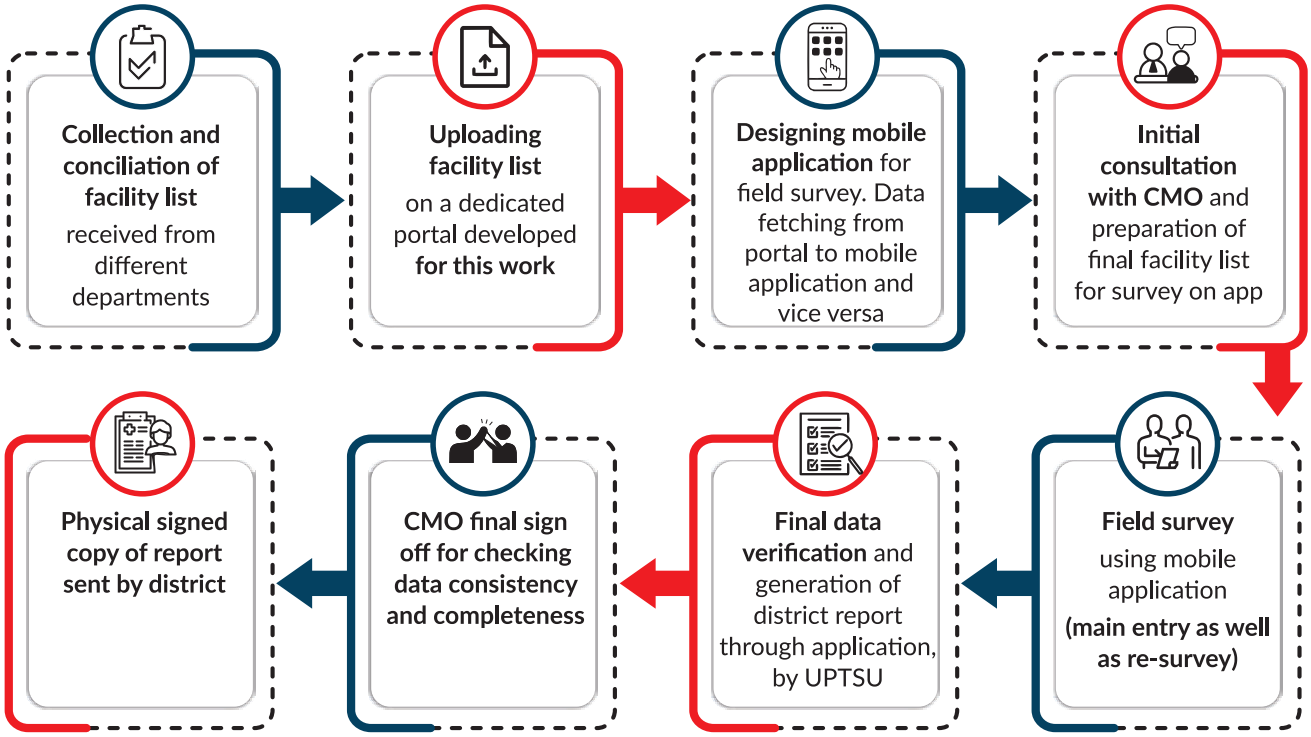
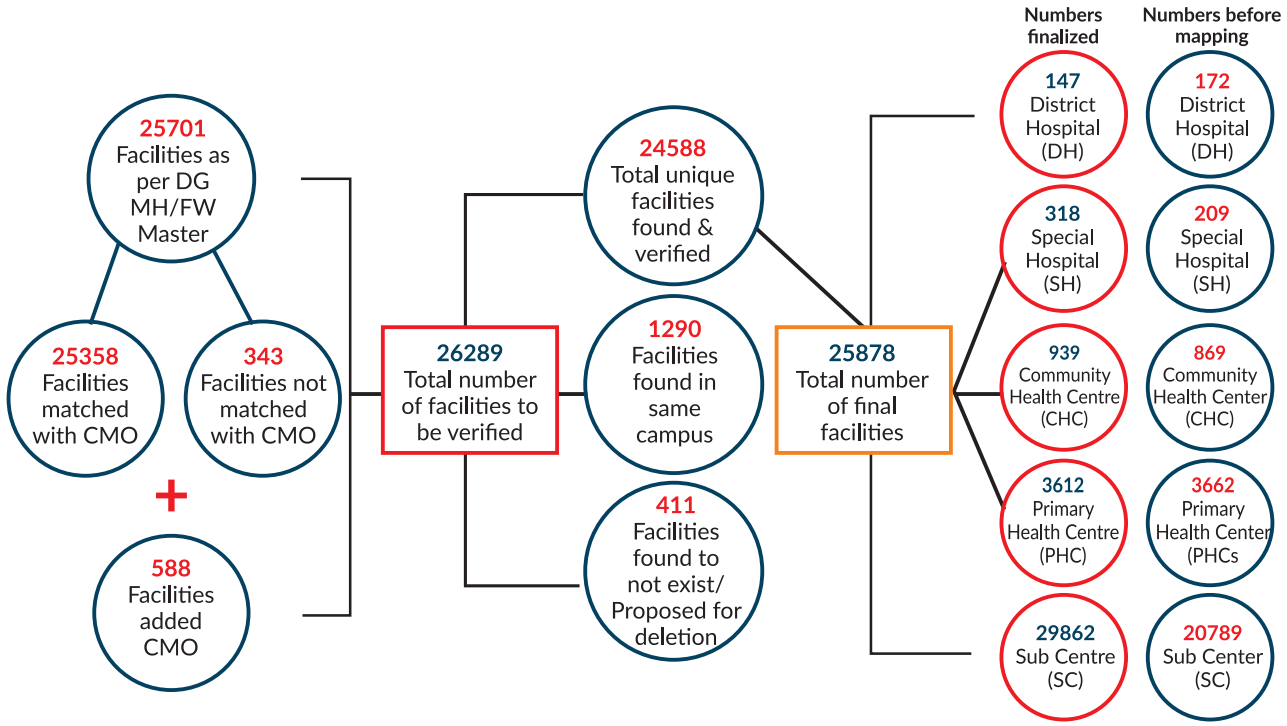


FIGURE 5: Summary Status of Public Health Facilities of UP



4. Concurrent Monitoring (Surveys)

Establishing a concurrent monitoring system was one of the most critical components to assist GoUP in improving data-based decisions and validating the quality of data reported by routine data systems. UP TSU designed and implemented periodic large-scale surveys/assessments to monitor the coverage of key interventions at the community, facility and frontline workers (FLW) level.

Several rapid large-scale studies, using community and facility platforms, were conducted to assess the progress and identify programmatic gaps. These studies provided various insights from time-to-time to enable the government to take important policy decisions. Below is the list of studies undertaken over the last 6-8 years:

- → Community Behaviour Tracking Surveys (CBTS)- 6 rounds (25 HPDs)
- → Family Planning Survey- 1 round (25 HPDs)
- → Rolling Facility Survey- 4 rounds (25 HPDs)
- → Rolling Facility Survey Plus – 1 round (25 HPDs)
- → Integrated Family Planning Survey-1 round (18 divisions covering the state)
- → Rapid Assessment Survey for Immunization -1 round (100 priority blocks, 34 districts)
- → Cohort studies in the poorest performing geographies-1 round (118 ASHA areas)

These surveys and studies have been continuously addressing the data needs of the State, which large-scale surveys like the National Family Health Survey (NFHS) do not provide at the lower levels frequently. The evidence/data generated through the various surveys and studies have played a vital role in program planning and mid-course corrections.

Major Program	Concurrent Monitoring Survey	Survey Conducted	Description
• MNCH (Community Community Program) • Nutrition • Family Planning	Community Behaviour Tracking Survey (CBTS)	• CBTS-1 (May 2014-Feb 2015) • CBTS-2 (Feb - Mar 2016) • CBTS-3 (Apr-Jul 2016) • CBTS-4 (Jan – Mar 2017) • CBTS-5 (Apr-Jun 2017) • CBTS-6 (Jun 2018- Aug 2018)	- 100 Blocks (Block level estimate); SS: 2,56,191 - 20 Blocks (Block level estimate); SS: 47,135 - 25 HPDs (District level estimate); SS: 58,598 - 20 Blocks (Block level estimate); SS: 48,059 - 100 Blocks (Project level estimate); SS: 6,642 - 25 HPDs (Sample Block level estimate); SS: 37,700
• MNCH (Facility Program)	Rolling Facility Survey (RFS)	• RFS-1 (Apr-Aug 2015) • RFS-2 (Feb-Apr 2016) • RFS-3 (Feb - Apr 2017) • RFS-4 (Oct - Feb 2019)	- 100 Blocks (Project level estimate) - 100 Blocks (Project level estimate) - 25 HPDs (Combined estimate: Optimization and Scale-Up)
• MNCH (Facility Program)	Rolling Facility Survey Plus	• RFS+ (Oct - Feb 2020-21)	- 25 HPDs (23 DH and 25 CHC/FRUS)
• Family Planning	Family Planning Survey (FPS) Facility Mapping Survey	• FPS-1 (Apr - Aug 2016) • FMS-1 (2013) • FMS-2 (2018) • IFPS (2020-21)	- 25 HPDs (District level estimate); SS: 13,812 - 25 HPDs - 75 Districts - 75 Districts (360-degree survey); SS: 13500

B. DATA QUALITY

1. Data Quality Audit

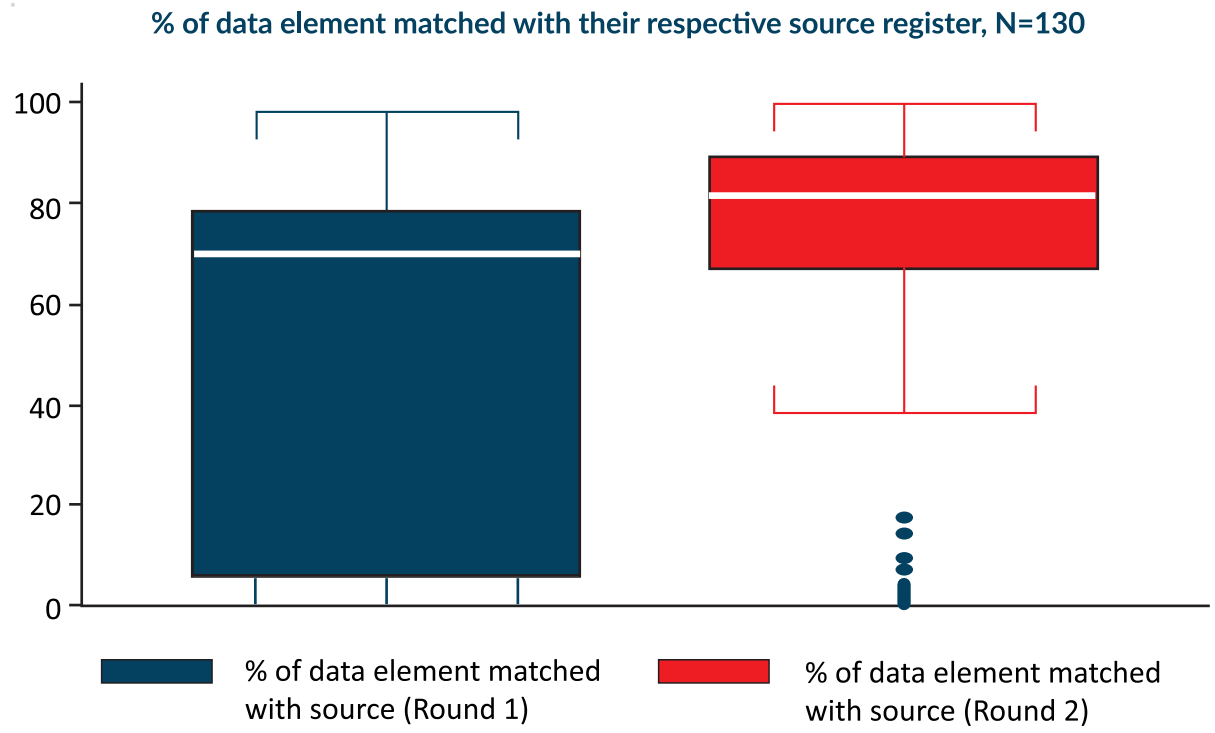
To improve the quality of routine monitoring data, we institutionalized periodic data quality audits and supportive supervision within the government system. The objective of the audit was to improve the quality of critical data elements by validating the reported data with the source document, identifying the gaps and developing the capacity of facility staff on reporting accurate data. Data quality audit was a supportive supervision approach to improve the quality of the government data system by assessment of data quality at the facility level for corrective actions. This process included handholding support, joint problem-solving and capacity building. Initially, UP TSU conducted the data quality audits in selected facilities from its resources, however, due to the observed successes in the initial rounds itself (Table 1 & Figure 4), GoUP constituted a state data quality audit team to visit and conduct an audit regularly.

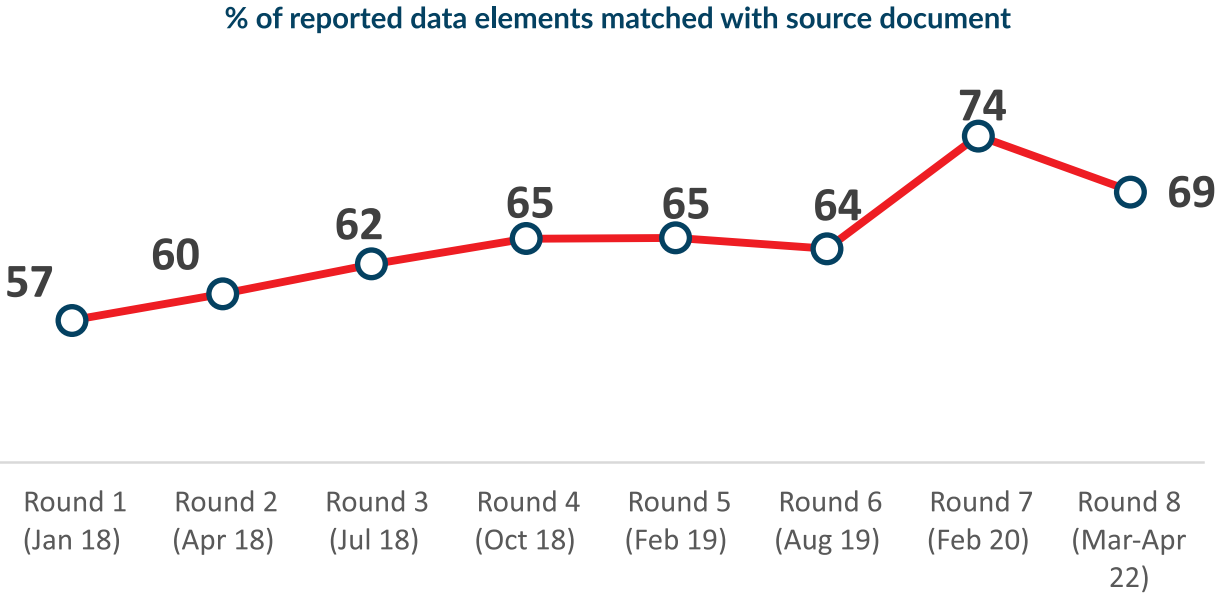
The supportive supervision initiative significantly improved data quality of critical data elements reported in the online HMIS/UPHMIS portal such as delivery, complication management & referral, and pregnancy outcomes etc. (Table 1). A substantial improvement in the accuracy of data was found in the second visit of the data quality audit, particularly in the District Hospitals and Block-level health facilities. The heterogeneity across facilities in the proportion of data elements matched with the source document also reduced substantially after the data quality audit and supportive supervision (Table 1 & Figure 6).

TABLE 1: Demonstration of data quality audit as an intervention for data quality improvement

Type of facilities (No. of data elements)	No. of facilities	% of data elements matched with source (Round 1)		% of data elements matched with source (Round 2)		Mean Difference (Round 2 -Round 1)	Paired t-test (p-value)
		Mean	SD	Mean	SD		
DH (98)	26	47	32	72	28	25	*0.007*
BCHC/BPHC (97)	58	52	36	70	29	17	*0.001*
CHC (97)	20	51	37	66	33	15	0.178
PHC (97)	17	33	38	69	39	36	*0.002*
SC (97)	9	53	40	70	37	17	0.142
Total	**130**	**49**	**36**	**70**	**31**	**21**	**0.000**

FIGURE 6: Improved data accuracy and reduced heterogeneity in facilities having matched data with source document





2. Validation committee meeting

Along with the data audits, we established a dedicated platform- Validation Committee Meeting (VCM) to review the data quality every month. This platform focused on identifying the errors in the data to take corrective actions. This meeting also ensured the timely availability of quality data for review and planning. Subsequently, GoUP released guidelines to form the validation committee at block, district and district hospital levels. This activity initially started in 25 high priority districts which then scaled up across all 75 districts in the state since August 2021.

C. DATA USE

1. Ranking and UP Health Dashboard

Map view of Health Ranking Dashboard - Uttar Pradesh

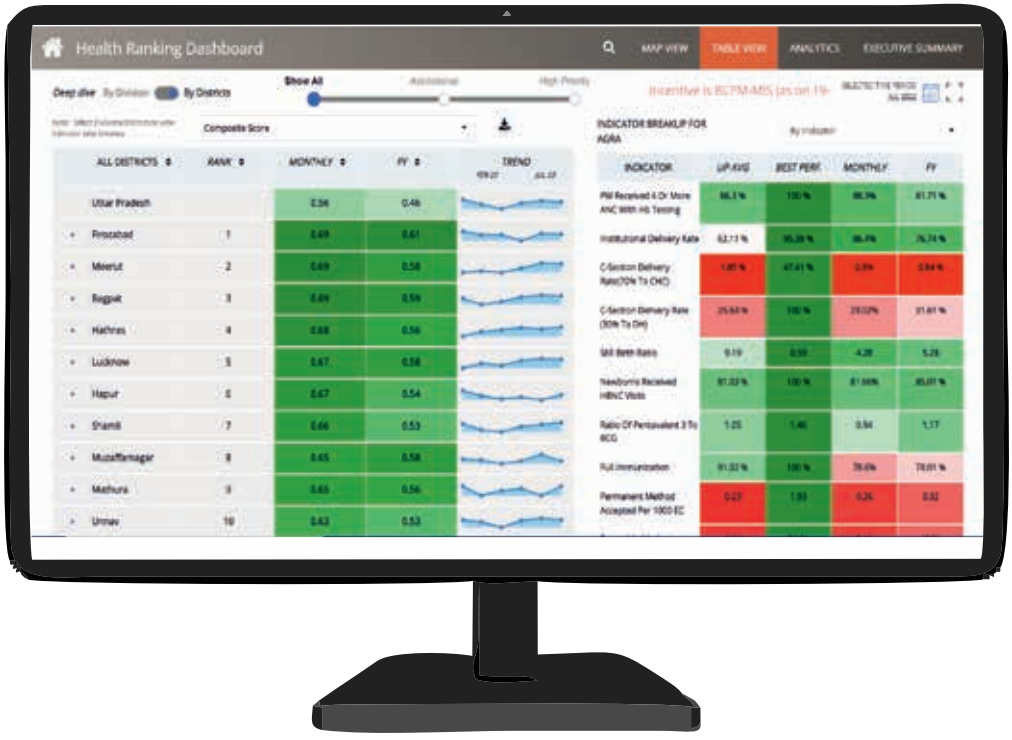


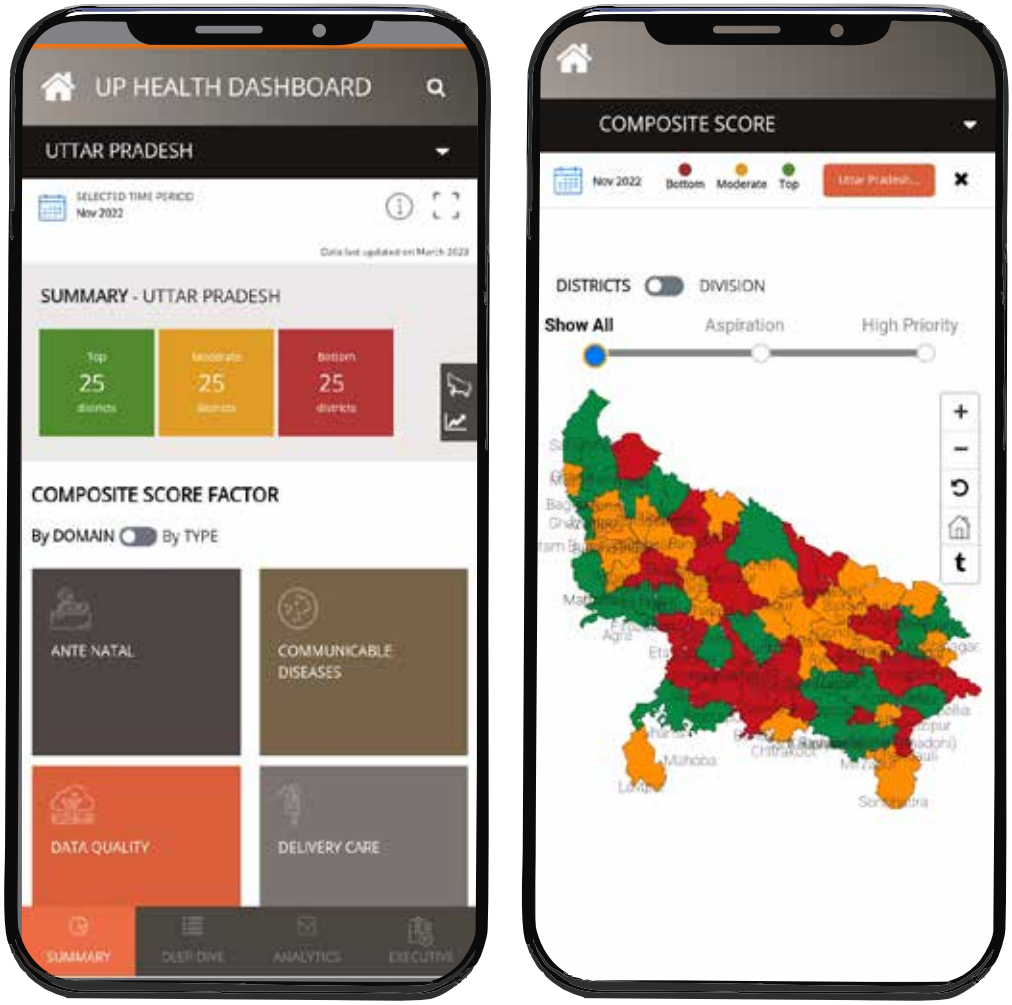
Table view of Health Ranking Dashboard - Uttar Pradesh

To enable data use in a much simpler way, we established a robust state-specific health dashboard using the ranking concept to facilitate the use of data for decision-making at different levels of program managers. The objectives of the district and block ranking were:

→ To measure the relative performances of districts using composite health indicators to a district with the best performance (internal benchmarking)

→ To help district administrations to identify the low-performing geographies, and reasons for relatively low performance (availability, quality or utilization) and help take appropriate actions.

We prioritized 12 outcomes (80% weightage) and 2 data quality (20% weightage) indicators from various domains of health across coverage and quality



Mobile view of Health Ranking Dashboard - Uttar Pradesh

A comprehensive mobile and web-based dashboard was developed to allow program managers to pull data from multiple sources and visualize it multi-dimensionally. The key elements of dashboard are as follows:

→ Result-oriented indicators for District Ranking are used in the Dashboard

→ Smart ways to measure and track health services performance across the state, drilling down to districts and blocks, enabling program managers to identify gaps and make decisions

→ UPHMIS hosts the comprehensive data for the Dashboard display

→ Dashboard has access to cross-linked data sources for analytics

2. Strengthening of Review Meeting

Along with setting up the dashboard, significant focus was given to institutionalising routine program review following a robust framework. To ensure government ownership, a detailed guideline was issued by GoUP in December 2018 to strengthen the review meetings.

The platforms for the state, district or sub-district level review meetings were developed. Officials were trained on the data-use approach and review meeting framework using the dashboard and other data sets.

The review meeting process included the following 6 steps:

a. **Gap Analysis**: Analysis of coverage gaps

b. **Pre-meeting:** Presentation of analysis to block officials/ANMs, seeking their qualitative inputs

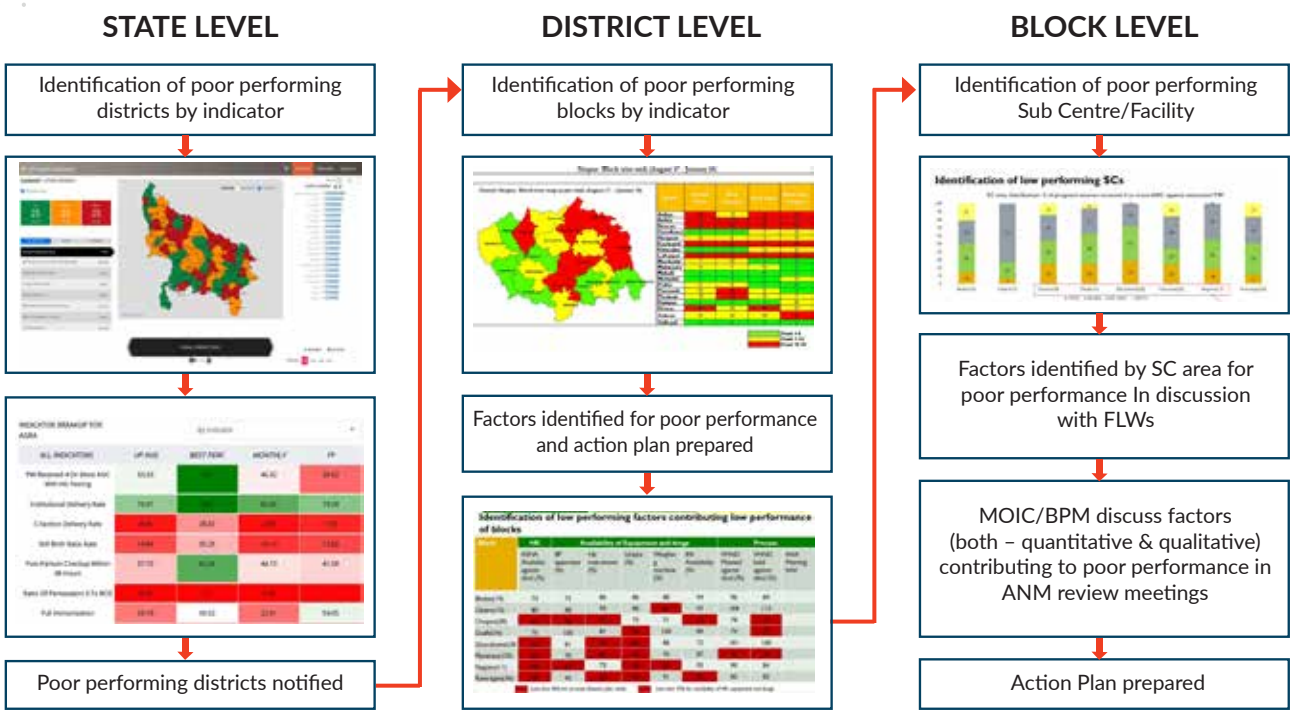
c. **Review meeting:** Discussion with CMO, ACMO, and program nodals on gaps

d. **Action Planning:** Preparation of action plan using gap analysis

e. **Implementation:** Implementation of interventions (program/data-related)

f. **Decision tracking:** Follow up on the implementation of action based on data-driven decisions using a decision-tracker tool

FIGURE 7: Review mechanisms at various levels using UPHMIS/DASHBOARDS



3. Decision tracker

The **Decision tracking** follows the data-driven decisions taken during a review meeting with the help of a ***decision tracker tool.*** *The main objective of the decision tracker* was to equip the program manager to track the status of data-based decisions taken during review meetings. This helped to track the change in health outcomes and the status of implementation/ completion of the data-based decision taken by program managers.

The tracker was a semi-automated system in-built into the UPHMIS application using the digitized actions captured following the 5Ws and 1H as below:

Key question	Description	Variable in decision tracker
What/which	Which is the low-performing indicator?	Indicator and domain
Where	Where is the geography of low-performing indicator?	Low performing geography
Why	Why is the particular geography poor in a particular indicator?	Gap identified and category
Who	Who is responsible to fill the gap?	Person responsible
When	When can the gap be expected to be filled?	Timeline
How	How can the gap can be filled?	Action Planned

Since its inception in 2019 to March 2023, district/division-level program managers have taken and tracked more than 1700 data-based decisions. The distribution of decision domains is delivery care (20.3%), antenatal care (15.4%), routine immunization (14.1%), and family planning (15.3%), with the remaining related to PNC, communicable diseases, data quality and other program domains.

District Program Manager accessing the decision tracker in UPHMIS

D. SUSTAINABILITY

Establishment and capacity building of divisional M&E hub

GoUP implemented various interventions to improve the data ecosystem and use of data for better planning and decision making. Along with these efforts, it was essential to build a strong support structure within the Government system. Since Uttar Pradesh is a huge state with 75 districts, it was difficult to manage all the data-strengthening interventions directly from the state. In this regard, the government proposed and institutionalised divisional M&E hubs across all 18 divisions of UP (each division comprised of 4-5 districts). The overall goal of the divisional M&E hub was to enhance the use of data for decision-making by divisional and district-level program managers. These hubs are crucial to ensure the sustainability of interventions implemented by GoUP and to improve the availability, quality and use of data for decision-making at the district and division levels. Divisional M&E hubs include one divisional M&E officer and one M&E assistant.

Considering its importance for sustainability, continuous capacity-building efforts were planned. UP TSU also placed their own trained M&E staff to augment the data use interventions at the division level. The UP TSU divisional staff are involved in conducting classroom-based training, on-job handholding support, mentoring visits and helping divisional and district staff to conduct review meetings and track outcomes.

Divisional level trainings for M&E staff

India Health Action Trust
S&S Elite
2nd Floor, No. 197
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