Quarterly Report January-March 2021

Health & Nutrition Trends in India

Includes baseline information from HMIS and ICDS, 2017-2021

IDinsight

CIFF CHILDREN'S INVESTMENT FUND FOUNDATION

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Abbreviations and Acronyms

ADP	Aspirational Districts Programme
AMB	Anemia Mukt Bharat
ANC	Antenatal Care
AWC	Anganwadi Centre
BCMO	Block Level Chief Medical Officer
CHC	Community Health Centers
CI	Confidence Intervals
CNNS	Comprehensive National Nutrition Survey
COVID-19	Coronavirus Disease 2019
DDL	Development Data Lab
DH	District Hospital
DHQ	District HeadQuarters
DPMU	District Programme Management Unit
Hb	Haemoglobin
HBNC	Home-based Newborn Care
HMIS	Health Management Information System
ICDS RRS	Integrated Child Development Scheme Rapid Reporting System
IFA	Iron Folic Acid
IFPRI	International Food Policy Research Institute
IQ	Intelligence Quotient
LGD	Local Govt Directory
MAM	Moderate Acute Malnutrition
MLM-RM	Multilevel Model with Repeated Measures
MMR	Maternal Mortality Ratio
MoHFW	Ministry of Health and Family Welfare
MoE	Margin of Error
MoWCD	Ministry of Women & Child Development
NFHS	National Family Health Survey
NHM	National Health Mission
NHRM	National Rural Health Mission
NIN	National Identification Number
NITI	National Institution for Transforming India
NRC	Nutrition Rehabilitation Centre
OLS	Ordinary Least Squares
PHC	Primary Health Care
POSHAN	Prime Minister's Overarching Scheme for Holistic Nutrition
PW	Pregnant Women
RSOC	Rapid Survey on Children
SAM	Severe Acute Malnutrition
SBA	Skilled Birth Attendant
SC	Sub-Centre
SDG	Sustainable Development Goal
SDH	Sub District Hospital
SNP	Supplementary Nutrition Provision
SRS	Sample Registration System
UN	United Nations
UNDP	United Nations Development Programme
UT	Union Territory
WHO	World Health Organization

Executive Summary

What is the purpose of this report?

The Prime Minister's Overarching Scheme for Holistic Nutrition, or POSHAN Abhiyaan, is the Government of India's flagship programme to improve nutrition outcomes among children, pregnant women and lactating mothers. Administrative data systems like HMIS and ICDS RRS are a rich source of regularly updated granular data on mother and child nutrition. These data are utilised to regularly track state and district performance and to inform programming. A range of efforts are underway to support improvements in the quality of these data. This report inspects varied dimensions of the quality of the data, and then generates substantive insights on mother and child nutrition across states in India over the last quarter. The report covers some critical topics over this period, including the effects of the COVID-19 pandemic on health and nutrition services. The report strengthens the quality of these insights by also using data from the last 48 months to contextualize the current quarter.

The objective of the report is to examine the following question drawing from available administrative data systems: *How did key maternal and child health and nutrition services and outcomes perform over January-March 2021 across India?*

How useful is administrative data for monitoring?

Administrative data are the cornerstone for supportive supervision of POSHAN Abhiyaan. Based on our assessment, HMIS is largely usable for programme monitoring, but should be complemented with data quality systems and regular sample surveys to ensure a holistic view of population outcomes and coverage.

HMIS data represent the efforts of millions of workers across India and maintaining data quality can be challenging. We found the data to be of moderate quality. Internal consistency as measured by missing values and outliers is generally high, but is low when looking at logical consistency between indicators[1]. For external consistency, we did benchmarking exercises against NFHS at both state and district level and found higher inconsistency at district level.

HMIS data should be used regularly for monitoring programme implementation, albeit with stronger data quality checks and a few important caveats. HMIS data represent the population registered within the public health system. For an accurate measure of where a state or district stands with regards to its achievement on key outcomes and coverage of services, the populations that are not included in the HMIS, but do also need public health services need to be accounted for; these are covered in representative sample surveys of the population. In addition, the supply side perspective of HMIS data needs to be complemented by the consumer side perspective from sample surveys – for instance data on distribution of IFA tablets from HMIS needs to be

1. For example institutional deliveries should not be greater than the total number of births

complemented with an understanding of consumption behavior to understand drivers of anemia. Similarly, administrative data does not provide feedback on quality of services, beneficiary knowledge, attitudes, practices. Since it is entered by providers, there may be incentives to over-report coverage.

For this report, based on availability of data, we have used several indicators from across India focused on January-March 2021 (the most recent quarter for which data is available) and also complemented these with data over 4 years.

The report covers:
- **735 districts (36 states/UTs)**
- **48 months**
- **21 indicators**
- **7.4 lakh data points**

Data Quality: Internal consistency & completeness

There has been varied performance on these checks across states and indicators.[2] These are identified for the latest quarter of **January to March 2021** below. While the average state is reporting few missing values or cumulative totals, logical consistency between indicators is still prevalent in a fourth of the data and should be corrected for.

5%
Average observations missing across indicators

0.23%
Average observations were outliers across indicators

<0.1%
districts report cumulative values across indicators

24%
values logically inconsistent with each other

Best States

- Delhi
- Madhya Pradesh
- Uttar Pradesh

- 29 states have 0% outliers

- 26 states have 0% outliers

- Goa
- Nagaland
- Manipur

Worst States

- Arunachal Pradesh
- Nagaland

- Manipur
- Sikkim
- Meghalaya

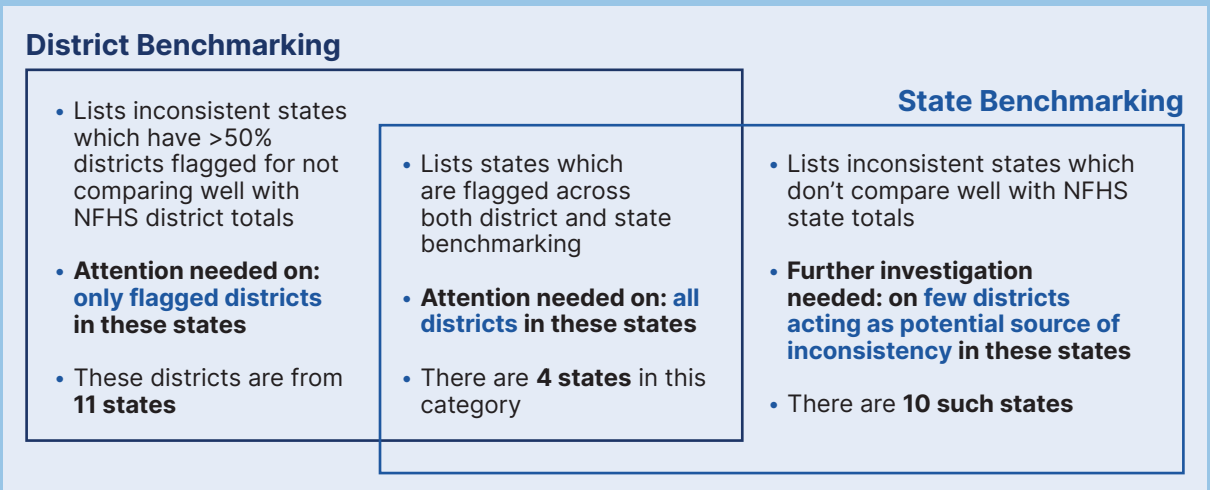
- Uttar Pradesh
- Assam

- Andhra Pradesh
- Karnataka
- Chhattisgarh
- Madhya Pradesh

Data Quality: External consistency (with NFHS[3])

To determine the consistency of HMIS data with external datasets, we primarily compare it with the National Family Health Survey (NFHS) - both **at the district and state level**[4]. The state level exercise reveals whether the state-rankings in HMIS matches with NFHS, while the district level exercise indicates if a district estimate is comparable to the NFHS estimates.

2. See Appendix C Table X.B1 for a full list of states flagged under internal checks
3. We used both NFHS-4 and NFHS-5 data for this exercise
4. Note that this comparison could be done only for a few indicators that were the most comparable across NFHS and HMIS. The details are shared in section 3.2 of the report.



There still are good reasons for these differences (see report for details), we provide a closer look in the report. At a high level, we infer that the HMIS data are usable for analysis and regular monitoring.

What do we learn from these data?

Overall, among those beneficiaries included in administrative data systems that we examined (i.e. HMIS and ICDS RRS), states perform relatively poorly on nutritional outcomes such as anemia control that require more sustained behavior change (like consuming IFA tablets), and also need a range of complementary nutrition-specific and sensitive inputs (like requiring a healthy diet). They perform well on process outcomes with lower follow-up requirements such as institutional delivery.

National Average (Jan-Mar 2021)	Top States	Bottom States	Rapidly Improving States
12% newborns have low birth weight	Manipur Andhra Pradesh Nagaland	Delhi West Bengal Odisha	Himachal Pradesh
92% pregnant women are moderately anemic	Representative state level estimates are not available (due to small N)		
5% pregnant women are severely anemic	Manipur Nagaland Mizoram	Tamil Nadu Telangana Haryana	Uttarakhand Telangana Haryana
85 maternal deaths per 100,000 live births	Representative state level estimates are not available (due to small N)		
10% Children suffering from MAM**	Manipur Arunachal Pradesh Mizoram	Bihar Kerala Chhattisgarh	Maharashtra Gujarat Andhra Pradesh
77% pregnant women receive 4+ ANC check-ups	Kerala Maharashtra Andhra Pradesh	Nagaland Arunachal Pradesh Manipur	Rajasthan Uttar Pradesh Uttarakhand
90% pregnant women receive 180+ IFA tablets	Andhra Pradesh Chhattisgarh Tamil Nadu	Nagaland Manipur Tripura	Uttarakhand Mizoram Rajasthan
93% deliveries take place in institutions	Odisha Punjab Rajasthan	Manipur Bihar Nagaland	Uttar Pradesh Meghalaya Kerala
54% newborns get 6+ HBNC visits	Assam Odisha Himachal Pradesh	Goa Tamil Nadu Kerala	Assam Uttarakhand Uttar Pradesh

**Note: However, for MAM, we did not have a long time-period from ICDS-RRS. Therefore, we analyzed 5 month trend from July to November 2020.

In terms of trends in performance, nationally, the fastest improving outcome indicator is maternal mortality ratio which (favourably) decreased by an average of 0.3 maternal deaths from 2017 to 2021. An indicator which has deteriorated is newborns with low birth weight which experienced a positive average growth rate of 0.01%. Among process related indicators, the maximum growth rate of 1.6% was experienced by 6+ HBNC visits, followed by 4+ ANC check ups at 1.2% and provision of 180+ IFA at 1%. Finally, institutional deliveries grew at a negligible average rate of 0.15%, though it is of note that institutional deliveries have been consistently high, at more than 90% across the country.

COVID-19 led to a temporary but steep decline in public health services in April 2020 after which the services resumed starting May-June 2020. By December 2020, most states recovered and matched the December 2019 levels, with the exception of Manipur. The slump in April 2020 can be attributed to actual decline in services as well as reduced data reporting on service provision.

In April 2020, services related to delivery and early childhood care appeared more resilient – with institutional deliveries only 20% below the April 2019 levels and those receiving more than 6 HBNC 24%. The most affected was full immunization of children which fell by 60% from April 2019 (figure). Across all services, some states experienced a smaller decrease in April 2020 vs April 2019.

Based on this, we identify least and most affected stated below:

Least affected states	**Andhra Pradesh**	**Uttarakhand**	**Sikkim**
Most affected states	**Uttar Pradesh**	**Bihar**	**Manipur**

National level data on institutional deliveries indicates that districts in the Aspirational Districts Programme were affected more adversely by COVID-19 than non-ADP districts, although their performance has started to converge with non-ADP districts as of 2021.

Trends in inputs and services delivered are expected to be associated with outputs and outcomes. An assessment of the relationship of some of these input-output pairs (like provision of IFA and prevalence of anemia) confirms that in a majority of states, key outcomes, although insignificantly, do improve with an increase in inputs. We recommend more robust studies to confirm these causal linkages.

1. Introduction

Nutrition – particularly during pregnancy and early childhood – is the foundation for lifelong health outcomes and cognitive development. The Prime Minister's Overarching Scheme for Holistic Nutrition (POSHAN Abhiyaan)[5] is Government of India's flagship programme to improve nutritional outcomes for children, pregnant women and lactating mothers. It is a multi-pronged strategic framework that aims to bring about convergence across a number of important schemes and interventions. Key pillars include monitoring systems and capacity building.

The COVID-19 pandemic and related lockdowns exacerbated existing challenges related to maternal and child health and nutrition by disrupting food systems, livelihoods, household incomes, and government-provided child nutrition services. To respond to the crisis of malnutrition and the amplified challenges due to the COVID-19 pandemic, decision makers need access to reliable information on the status of key health and nutrition interventions and outcomes. Accurate and timely data can inform India's national-level strategies while empowering state-level officials to identify and act in priority areas.

Tracking levels and trends becomes more important to understand the effect of COVID-19 on key nutrition outcomes and delivery of related services. There is a wealth of administrative data available for use by decision makers, yet many are skeptical of its reliability. Across India, millions of ASHAs, Anganwadi workers, hospital staff, and supervisors record information on patients treated and services delivered. The data is aggregated from registers to facility-level and district-level data reporting (eventually aggregated up to state). This entire mechanism occurs every month, producing comprehensive and richly detailed datasets on maternal and child health & nutrition indicators. National and state-level actors from across the government benefit from understanding performance of these indicators, but they often either lack the resources to sift through data to develop insights, or do not trust these data.

Typically, information on performance of indicators comes from one of two main sources: survey data and administrative data. These sources are often compared for accuracy and utility, and there are important tradeoffs to be acknowledged.[6]

- Survey data is generally considered to be more reliable, as surveys are designed to be representative of entire populations of interest and can be tailored to answer specific, emerging questions. However, surveys tend to be more expensive, infrequent, or cover smaller geographic areas, than administrative datasets on similar topics.

- Administrative data is already collected at high frequency for programmatic uses, producing data with detailed longitudinal information for states and districts across the country. However, it is limited to those who access government services and data quality issues may persist, especially as data entry happens in a fixed and decentralized manner. In case of self reported MIS, data may be inflated to produce desirable results. Limited metadata associated with

5. http://poshanabhiyaan.gov.in/#/
6. Groen, J. A. (2012). Sources of Error in Survey and Administrative Data: The Importance of Reporting Procedures. Journal of Official Statistics (JOS), 28(2).

administrative datasets can also impede potential users from leveraging the data to inform decisions. Key features of the administrative data are presented below.

	Features	Example: Antenatal check-ups
Who collects the data?	Data is mostly reported by front line workers	ANMs and ASHAs
Who is represented in the data?	People who access government services	Pregnant women on ANMs and ASHAs lists
What indicators do we normallly see?	Data on inputs and interventions	ANC registration, 4+ ANC, IFA tablet distribution
What indicators are commonly not seen?	Data on knowledge, attitudes, practices	Knowledge of ANC, consumption of IFA

Administrative data and survey data can complement each other, together providing rich nationwide insights. In the wake of the COVID-19 pandemic, the administrative datasets enable us to track trends levels and trends at a high frequency.

This report focuses on the insights that can be provided from administrative datasets on maternal and child health and nutrition, including India's **Health Management Information System (HMIS)** and the **Integrated Child Development Scheme Rapid Reporting System (ICDS RRS)**. The overall motivation is to create a regular cadence of reports in order to ensure regular monitoring of relevant indicators by NITI Aayog, subject to quality of data and availability of data.

The objectives of this report are to:

1. Build a compelling use case for regularly using programmatic and administrative data to inform Ministries' actions at periodic intervals, and

2. Provide insights to National Institution for Transforming India (NITI) Aayog, line Ministries (MoWCD, MoHFW), and the public on recent trends in maternal and child health & nutrition across India by sharing findings at the state-level over the first quarter of 2021

In the following sections of the report, we first describe the HMIS and ICDS RRS data we use and our process for assessing the quality and reliability of this data. Then, we share findings on the status of indicators in the first quarter of 2021 – this is the most recent data available for analysis at the time of writing this report. In the subsequent sections, we share results from analysis of quarterly indicator trends in the last four years (over 16 quarters), with particular attention on disruptions due to COVID-19. We also briefly focus on key input-outcome relationships over time. Finally, we share a conclusion summarising what all this means for national- and state-level actors. We include our methodology and supplementary tables and visuals in the Appendix.

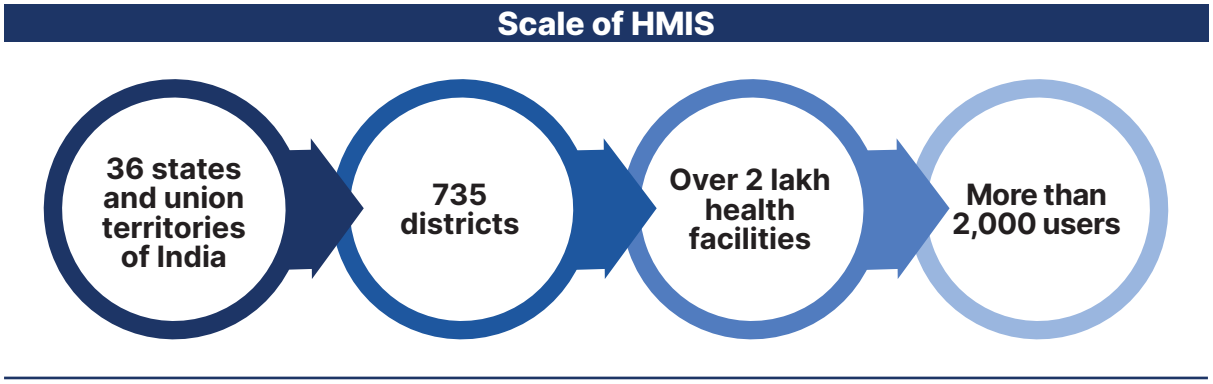
2. Data and Methods

2.1. Data sources

This report is based primarily on pan India data from HMIS, along with data on a few indicators from ICDS RRS. The main focus is on HMIS because the data from ICDS RRS was available only for a limited time period of 5 months (in 2020) as opposed to HMIS which was available for 48 months (2017-2021). Future reports should leverage the most recent data from a range of administrative systems. An assessment of the full available range of data systems has been conducted elsewhere.[7]

From HMIS data, we constructed a dataset of the 537 reported HMIS indicators with 48 months of data from April 2017 to March 2021.

District-level data was available for all states in India. We generated a shortlist of 21 nutrition-relevant indicators from the HMIS data, and further prioritized based on data quality and availability of denominators. Additional information is available in the Appendix A.



Source: HMIS website, and a recent presentation by MoHFW dated 26th August, 2021

The functionality of the HMIS has been enhanced with its latest update to HMIS 2.0. The major features of the version include availability of person specific user credentials, flexibility in mapping multiple facilities to one credential (user), along with LGD (Local Govt Directory) and NIN (National Identification Number) compliance which will enable its integration with more data sources.

From ICDS RRS, we had access to five months of data from July-November 2020 on supplementary nutrition allocation and malnutrition (Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM)).

7. Menon, P.; Avula, R; Sarswat, E; Mani, S; Jangid, M; Singh, A; Kaur, S; Dubey, A.K.; Gupta, S.; Nair, D.; Agarwal, P.; and Agrawal, N. (2020). Tracking India's progress on addressing malnutrition: What will it take? POSHAN Policy Note 34. New Delhi, India: International Food Policy Research Institute (IFPRI). https://doi.org/10.2499/p15738coll2.133750

2.1.1. 'Who' is covered in HMIS: population of interest

HMIS aims to mainly monitor the National Health Mission (NHM) and other health programmes led by the Government of India. Accordingly, the data collected on this web-based system corresponds to target beneficiaries under each of these programmes. These include:

Anganwadi Centres (AWCs)	Children from 0-6 years	Adolescent Girls	Pregnant Women	Lactating Mothers

2.2. Selection of indicators/variables

We selected indicators for analysis using the three-step approach outlined below. The three criteria for selecting finalised indicators were: priority areas for NITI Aayog, availability of data in HMIS and quality of such available data. These approaches were undertaken while ensuring that the indicators selected cover the key lifecycle stages in maternal and child health – (1) pregnancy, (2) delivery & postnatal period, and (3) early childhood. Indicators of exceptionally poor data quality, with the potential of misleading insights, were dropped from the analysis.

Parallel to these lifecycle stages, we also categorised indicators broadly into input/activity and output/outcome. This is not intended to be an objective categorisation but more a relative categorisation subjective to the data in HMIS and the context of this report. For instance, coverage of 4+ ANC check-ups could be considered an output of several other inputs, however, it is also an input/activity towards improving the output - institutional deliveries and the latter is the perspective we have maintained in the report.

Figure 2a: Selection of indicators

Relevance to NITI's decision making

- Ranked indicators based on importance to health & nutrition monitoring and priority for NITI Aayog
- Scored indicators 1-4 using two resources:
  - Intensified Strategy for Health & Nutrition (by NITI)
  - "Tracking India's Progress on Malnutrition" (by IFPRI)

Score	NITI	IFPRI
1	✔	✔
2	✔	
3		✔
4*		

*related to the topic areas of POSHAN Abhiyaan

Availability

- Checked for availability of those indicators in both HMIS and ICDS RRS.
- List available in Appendix
- Used latest available HMIS data as of June 2021

Data quality

- For the priority indicators with score 1, data quality of HMIS data was checked (list of checks covered in Data Quality section)
- Several Indicators were dropped from consideration based on the definitions and lack of estimation strategy for accurate denominators.

Final list

- A comprehensive table including the reasons specific to indicators is attached

Table 2a: Final list of selected indicators

Lifecycle Stage	Indicator Definition	Source
Output/Outcome Indicators		
1-Pregnancy	% of pregnant women (PW) with severe anemia treated against PW having severe anemia tested	HMIS
1-Pregnancy	% PW receiving who are severely anemic (Hb<7), against estimated preg	HMIS
2-Delivery	Maternal deaths per 100,000 live births	HMIS
2-Delivery	% of low-birth-weight babies (Less than 2,500 gms)	HMIS
3-Early Childhood	% children (girls, boys) under 5 who are moderately malnourished (MAM)	ICDS RRS
3-Early Childhood	Children (girls, boys) under 6 years old who regularly benefit from supplementary nutrition per lakh population, in late 2020	ICDS RRS
Input/Activity Indicators		
1-Pregnancy	% of pregnant women receiving 4+ Antenatal Care (ANC) check-ups against total ANC registrations	HMIS
1-Pregnancy	% of pregnant women given 180 Iron Folic Acid (IFA) tablets against total ANC registrations	HMIS
3-Early Childhood	% of newborns received 6 or more Home-based Newborn Care (HBNC) visits	HMIS
3-Early Childhood	% of children under 6 years old who regularly benefit from supplementary nutrition per lakh population, in late 2020	ICDS RRS
Both[8]		
2-Delivery	% of institutional deliveries out of total estimated deliveries	HMIS
2-Delivery	% of newborns breastfed within one hour of birth	HMIS
3-Early Childhood	% of children 9 to 11 months that are fully vaccinated	HMIS

A complete list of indicators with clear rationale for exclusion of dropped indicators is presented in the Appendix A Table XA.2.

2.3. Indicator calculation and aggregation

We analyse indicator performance across geographies and over time. We study a quarterly value of the indicator (for the most recent quarter available: January-March 2021), followed by a month wise analysis of trends. We observe this performance first at the national level, followed by state and district level assessment of the same.

8. Depending on the lifecycle stage, these hold relevance as both output and activity indicators

We also estimate an average growth rate over time of the indicator for each state. This growth rate is generated using a multilevel model with repeated measures (MLM-RM).

2.3.1. Monthly indicator values and quarterly aggregation

To understand the trajectory of the indicator over time, we use monthly indicator values as per HMIS/ICDS RRS. In order to understand the performance of states and districts on a quarterly basis, we need a composite estimate of the latest available quarter. For HMIS data, we simply calculate the estimate by averaging three months' indicator value (January-March 2021).

$$Qtr_S = \frac{Month_1 + Month_2 + Month_3}{3}$$

For ICDS RRS data, since we do not have data from after November 2020, we calculate the latest performance metric as the average of five months (July-November) in 2020 we have the latest ICDS RRS for.

2.3.2. State and national level aggregation of indicators

For aggregated HMIS proportions, we create state level and national-level estimates of indicator performance by taking the numerator average for non-missing districts and dividing by the denominator average for non-missing districts as highlighted in the equation below. For any indicator R and state S:

$$\bar{R}_S = \frac{(Dist_{1S}Num + Dist_{2S}Num + \ldots + Dist_{DS}Num) / D_S}{(Dist_{1S}Den + Dist_{2S}Den + \ldots + Dist_{DS}Den) / D_S}$$

Where D_S is the number of nonmissing districts in state S. We follow an analogous approach for the national average, replacing districts with states. The implication of our "averages" approach is that it takes into account cases where some districts might have missing data in only the numerators or only in the denominators.

For ICDS RRS, we do not have large scale data and therefore do not face major challenges with missing values. We create state and national level estimates of performance by simply summing the district level numerator and denominators to arrive at a state/national level proportion[9]:

$$\bar{R}_S = \frac{Dist_{1S}Num + Dist_{2S}Num + \ldots + Dist_{DS}Num}{Dist_{1S}Den + Dist_{2S}Den + \ldots + Dist_{DS}Den}$$

2.4. Data limitations

This report mainly uses HMIS data which was available for a notable time period of 48 months. However, as mentioned in Chapter 1, the HMIS dataset is prone to certain limitations in terms of

9. If a district is missing from numerator, it is also excluded from the denominator and vice-versa

its ability to provide a comprehensive picture of the health and nutrition situation in the country and it is important to keep them in mind while considering this report. These include:

- **Delay in availability of recent data:** Given the scale of the system, these data need to be assembled and processed before being uploaded on the HMIS portal. Also, in the context of the pandemic, the data systems were offline at some points. For this report, we downloaded the data in June 2021, for January-March 2021 .

- **Inclusion of all POSHAN relevant interventions is not possible:** All interventions under the POSHAN Abhiyaan are not reflected in this report. Even though we cover most key outcomes under POSHAN Abhiyaan, we are not, for example, able to cover supplementary nutrition, stunting and underweight in children due to limited availability. For underweight in children however, we examine Moderate Acute Malnutrition (MAM).[10] Overall, a number of important indicators, that for example, measure quality of services, are also not reflected in this report. Similarly, demand-side measures are not available as administrative data systems reflect the supply-side.

- **Challenges in representing the target population:** The HMIS system covers a subset of the target population as it includes only those populations who are a part of, or registered with, the public health system. For example, the coverage of antenatal check-ups are measured against registrations and not against all pregnant women.

The next chapter provides a detailed description of the quality of these administrative data.

10. There is significant correlation in underweight and MAM as also demonstrated in Appendix C

3. Data Quality

Confidence in the reliability of administrative data is critical to enable greater use of this data to guide government strategy and decision-making. Yet, many potential users of administrative data on health and nutrition are skeptical of the quality and reliability of the data, especially when comparing administrative datasets against well-regarded population-based sample surveys, such as the National Family Health Survey (NFHS).

For users to trust the quality of administrative data sources like HMIS and ICDS RRS, the data must be complete, reported in a timely manner, consistent on repeated measurement, and accurately reflect the actual level of services delivered or outcomes measured. The World Health Organization (WHO) released a data quality toolkit for health management information systems, which outlines four specific dimensions of data quality:[11]

- Completeness and timeliness
- Internal consistency
- External consistency
- External comparisons of population data

In the following subsections, we run our checks to investigate the following:

1. **Internal consistency and completeness:** This section checks the real time data quality by running various checks within HMIS or ICDS-RRS datasets. These checks allow us to look at the data quality for the most recent available quarter i.e. January-March 2021 from HMIS.
2. **External data quality:** This section builds a broader sense of data quality and identifies the potential errors that might not be picked up under internal checks by comparing HMIS with external reliable survey datasets. Under external data quality, it's possible to do a comparison of point estimates or a comparison of rankings across the two datasets.

A summary of the data quality exercises conducted for each dimension of data quality is provided in Table 3a below. Additional information on data availability and cleaning is available in Appendix A.

11. WHO, (2017). Data Quality Review, Module 1: Framework and metrics.

Table 3a: Checks conducted by IDinsight along WHO dimensions of data quality[12]

	HMIS	ICDS RRS
Internal consistency and completeness	Jan-March 2021 • Check for missing values by state and indicator • Check for outliers • Check for consistency over time - repeated values and cumulative reporting • Consistency between indicators: proportions generated greater than 100% • Check against HMIS data reported elsewhere	Jul-Nov 2020 • Check for missing values

External consistency	2017 and 2019 annual average
	• Benchmarking against NFHS-5, CNNS (2016-18), NFHS-4, and RSOC (2013-14)
	  • State level rank benchmarking
	  • District level point comparison benchmarking
		Jul-Nov 2020
		• Benchmarking against NFHS-4 and NFHS-5

Box 1. Data Quality checks run by HMIS internally

The data in the HMIS system is introduced and reviewed for quality at multiple levels. The data at the individual level is entered at the Sub-Centre (SC), aggregated at the Primary Health Care (PHC) facility level. Here, facility level data is also entered using a different form. The flow of data entry continues in a similar way through Community Health Centers (CHC), Sub-District Hospital (SDH), District Hospital (DH), and District HeadQuarters (DHQ). HMIS has a number of data quality checks built-in at all these stages of data entry to establish reliability of the admin data on a variety of the aforementioned categories declared by the WHO. These checks are disaggregated at various levels from the data-entry operator, to the block level chief medical officer (BCMO), district programme management unit (DPMU) and finally at the central statistics division at MohFW.[13]

3.1. Internal consistency and completeness

The WHO describes the need for checking completeness of data reporting and three types of internal consistency: (a) coherence between data points for the same metric over time, (b) coherence between data points for different, but related metrics, and (c) coherence between data in source documents and national databases.

We conduct these checks for the most recent available quarter data i.e. from January-March 2021. Overall, we found a low level of inconsistencies across most internal data quality checks except the check for consistency across indicators. We find that numerators consistently report numerators greater than denominators across indicators and states. Below, we summarise the results from each check to establish completeness and internal consistency.

12. We did not conduct a proper external comparison with population data (pt 4 in WHO's list) as there were no other population estimates available. However, we did adapt this to our context and assessed coverage of HMIS in a separate section.
13. This information is based on information gathered during semi-structured group discussion with select state-level officials working with HMIS data.

Dimension 1: Completeness of reporting

The WHO defines "completeness" as a measure of whether all entities which are supposed to report actually do so and "timeliness" as a measure of whether reporting occurs before a predefined deadline. In this part of our data quality exercise, we focused on completeness of the indicator data.

5% **observations were reported missing across indicators**

Best Indicators

7 indicators (out of 18) have 0% missing values

- Pregnant women receiving albendazole
- Early initiation of breastfeeding
- Pregnant women receiving 360 calcium tablets
- Pregnant women receiving 4+ ANC check-ups
- Pregnant women receiving 180+ IFA tablets
- Pregnant women registered for ANC in the first trimester
- Pregnant women receiving 2 doses of TT

Worst Indicators

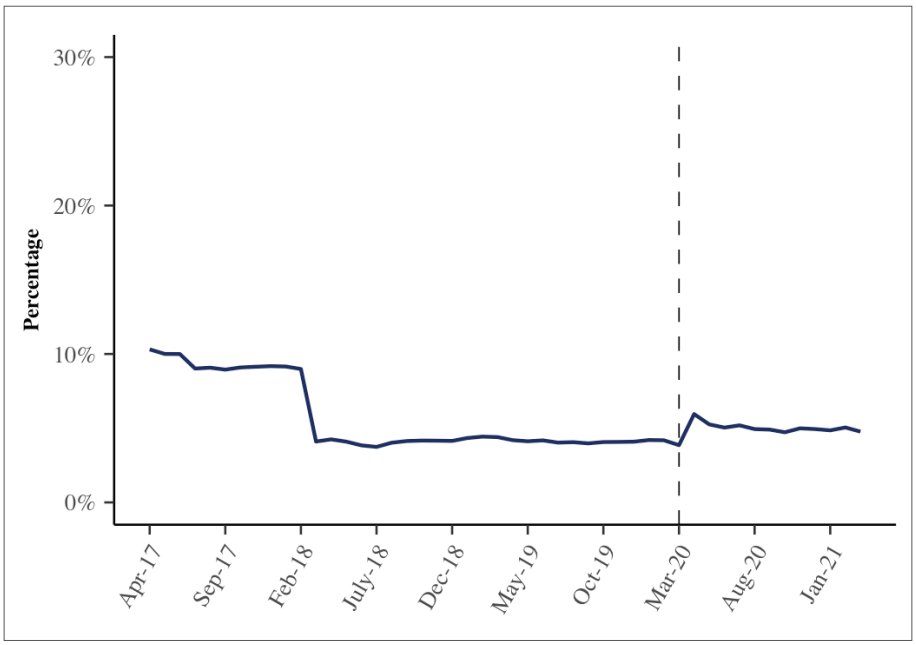
- SAM children admitted to NRC
- Home deliveries attended by SBA
- Pregnant women with severe anemia who were treated

Best performing states: Delhi, Madhya Pradesh, Uttar Pradesh, Odisha

Worst performing states: Arunachal Pradesh, Nagaland

Source: HMIS, January to March 2021

Figure 3.1a: Monthly average missings rate across indicators[14]



Source: HMIS, 2017 to 2021

Figure 3.1a shows that the monthly missing rate is low and has shown some improvement in the long-run, however, during the lockdown months rate of entries reported missing increased and has since then remained higher than the pre-pandemic levels.

14. For this analysis, we take an average of monthly missings rates of 18 indicators analysed for data quality.

Dimension 2: Outliers

For this check, we flagged data points which were greater than 3 standard deviations from the mean value for each indicator we analysed for all district-month observations. **The percentage of outliers is consistent with normally distributed data and it doesn't appear to be a systematic problem anywhere.** We also do not find a significant geographic spread in the outliers with the worst states reporting around 1.5-2% outlier values.

0.23% **observations were outliers across indicators**

Consistent with normally distributed data

- 16 indicators (out of 18) reported 0% outliers

Not consistent with normally distributed data

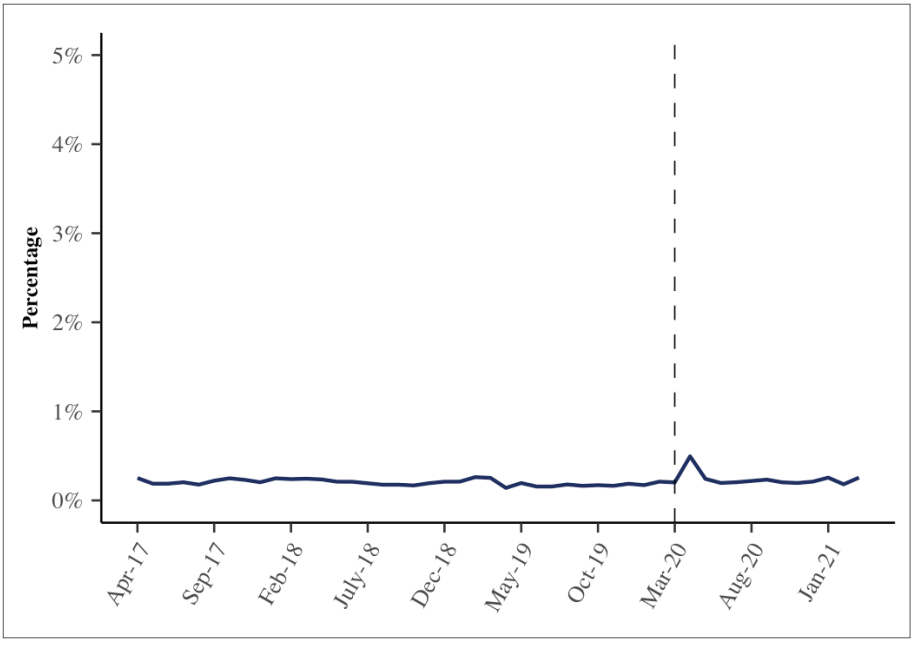
- Institutional deliveries
- Early initiation of breastfeeding

Best performing states: 16 states/UTs with 0% outliers including Punjab, Tripura, Uttarakhand

Worst performing states: Manipur, Sikkim Meghalaya

Source: HMIS, January to March 2021

Figure 3.1b: National monthly average outliers rate across indicators



Source: HMIS, 2017 to 2021

Figure 3.1b shows that the monthly outliers rate is very low and has shown no significant change in the long-run, however, during the lockdown months, the reporting of outlier values increased marginally, indicating that the data is processed before being uploaded.

Dimension 3: Consistency over time

The trends of an indicator are examined to determine whether specific reported values make logical sense in relation to other reported values. In particular, we check whether a district is reporting cumulative values over the course of the financial year instead of a month wise total. **We find that almost all districts (99% +) are report values with the correct denominators and not as cumulative totals.** The details for how we flag cumulative totals is in Appendix A.

<0.1% districts report cumulative values across indicators

Best Indicators

- 13 out of 32 numerators and denominators analyzed for data quality reported no case of cumulative reporting

Worst Indicators

- Pregnant women receiving more ANC 4+ check-ups

Best performing states: 27 states/UTs had no case of cumulative reporting

Worst performing states: Uttar Pradesh, Assam

Source: HMIS, January to March 2021

Dimension 4: Consistency between indicators

Our fourth internal consistency check focused on the logic of our selected numerators and denominators in relation to each other. Specifically, the proportions we generate by dividing numerator and denominator should be expected to be less than 100%. However, for many of the indicators that we attempted to generate, we found our generated proportions exceeded 100% with a concerning frequency.

This is the most concerning internal DQ error that we find and it could potentially arise due to various reasons. In particular, it is possible that denominators are under-reported or numerators are over-reported. For example- stillbirths are often under-reported which will lead to underestimation of denominators like total estimated pregnancies. A detailed tracing of these inconsistencies at the local facility level will shed more light on why they occur. More details on this check can be found in the Appendix A.

24% values logically inconsistent with each other

Best Indicators

- Home deliveries attended by SBA
- Pregnant women who are severely anemic (HB<7)
- New-borns with low birth weight

Worst Indicators

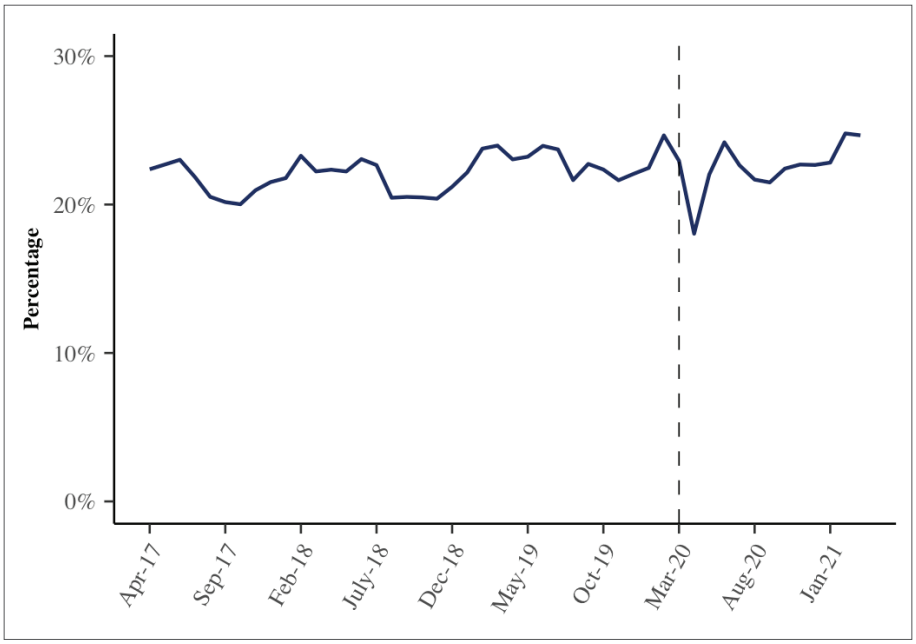
- Pregnant women registered for ANC
- Pregnant women receiving 2 doses of TT
- Maternal mortality ratio
- Pregnant women who are anemic (Hb<11)

Best performing states: Manipur, Nagaland, Goa

Worst performing states: Andhra Pradesh, Karnataka, Chhattisgarh, Madhya Pradesh

Source: HMIS, January to March 2021

Figure 3.1c: National average monthly rate of proportions > 100 across indicators



Source: HMIS, 2017 to 2021

Figure 3.1c shows that the monthly rate of proportions greater than 100% showed sharp movements over time. Most interestingly, during COVID lockdown months the incidence of this error actually decreased. This can potentially be explained for the reason that numerators saw significantly more fall than denominators, therefore, reducing overall rate of proportions >100 inconsistency.

Box 2. Potential incorrect reporting in HMIS data (on non-existent programmes)
Home Based NewBorn Care (HBNC) aims for reduction of neonatal mortality in rural areas. Started in 2011, the program is being currently implemented through ASHAs across the country except Goa and Lakshadweep.[15] The HMIS however, reports non missing and non-zero data on HBNC visits for both Lakshadweep and Goa. This points towards a quality problem in data entry, unless there have been recent policy changes that are not public yet.

3.2. External Consistency

External consistency refers to the level of agreement between two data sources measuring the same health indicator, often between an administrative dataset and a population-based sample survey for the same period.[16] External consistency is a measure of data accuracy, reflecting how faithfully the administrative dataset reflects reality.

To assess the external consistency of HMIS data, we benchmarked indicators against the NFHS.[17] We evaluated our shortlist of HMIS indicators to find overlap with NFHS-4 and NFHS-5. Table

15. https://hbnc-hbyc.nhp.gov.in/AboutUs/aboutHBNC
16. WHO (2017). Data Quality Review, Module 1: Framework and metrics.
17. We considered benchmarking HMIS estimates against other sample survey, including the Comprehensive National Nutrition Survey (CNNS) from 2016-2018 and the Rapid Survey on Children (2013-2014), but did not find any common indicators with our shortlist of HMIS indicators.

3.3a describes the indicators included in this benchmarking exercise. This is not a straightforward exercise as recall periods for similar indicators can differ across these two data sources, as do the denominators and survey sampling processes. Apart from this, it is also important to note that due to significant differences in definitions we could not compare all indicators.

It is also worth underscoring the amount of variation in data quality of HMIS across states (find a full distribution in Appendix B. As can be deduced from our results in the previous section, the poor and well performing states vary quite a bit across different checks also. Below is a list of common indicators that we compared across NFHS and HMIS.

Table 3.2a: Common indicators between HMIS and NFHS

HMIS indicator definition	NFHS indicator used for comparison	Level of comparison
Pregnant women receiving 4+ ANC check-ups, against ANC registrations	Mothers who had at least 4 ANC visits (%), for last birth in the 5 years before the survey	District and State
Pregnant women who are anemic (Hb <11.0 g/dl), against estimated pregnancies	Pregnant women aged 15-49 years who are anemic (<11.0 g/dl) (%), adjusted for altitude and smoking status	State
Institutional deliveries, against total live births	Institutional births	District and State
Home deliveries attended by a skilled birth attendant (SBA), out of total home deliveries	Home delivery conducted by skilled health personnel (out of total deliveries) (%), for births in the 5 years before the survey	State
Newborns breastfed within one hour of birth, out of total live births	Children under age 3 years breastfed within one hour of birth (%), based on the last child born in the 5 years before the survey	District and State
Newborns with birth weight under 2.5 kg, against newborns weighed	Newborns weighing under 2.5 kg, as reported by mother or recorded on written record, out of births in the last 5 years with a reported birth weight	State

We conducted two different benchmarking exercises: *comparison of HMIS proportions NFHS point estimates* ("point benchmarking") and a comparison of statewise indicator rankings ("rank benchmarking") across the two datasets. Given the legitimate differences in coverage and reference periods between NFHS and HMIS, the two approaches have their advantages and disadvantages. While comparison of point estimates is useful at smaller geographic units (district) but when aggregated at the state level, the differences in coverage make the comparison difficult. Comparison of rankings is an alternative that helps us get an indicative sense of whether geographies ranked well in surveys are also ranked well in administrative data or not. However, this exercise has limitations in that the score on a given geography may depend on how the other geographies are ranked. If some states are ranked poorly, the state that actually reported "true" value also gets ranked incorrectly.

We conduct both these checks albeit at different geographical levels; comparison of point estimates at the district level and comparison of rankings at the state level. More details about the methodology and results are discussed below. Overall it seems that the two checks reveal very different results. Only 4 out of the 10 least consistent data quality states are common across the two checks. The following infographic establishes how to interpret these results:

District Benchmarking

These states have **over 50% districts** which need attention to improve data quality.

- Arunachal Pradesh
- Assam
- Haryana
- Jammu and Kashmir
- Manipur
- Meghalaya
- Mizoram
- Nagaland
- Rajasthan
- Uttar Pradesh
- Uttarakhand

These states need attention to **all districts** to improve data quality.

- Bihar
- Chhattisgarh
- Delhi
- Jharkhand

State Benchmarking

These states need more attention on the **select districts acting as the potential source of this inconsistency.**

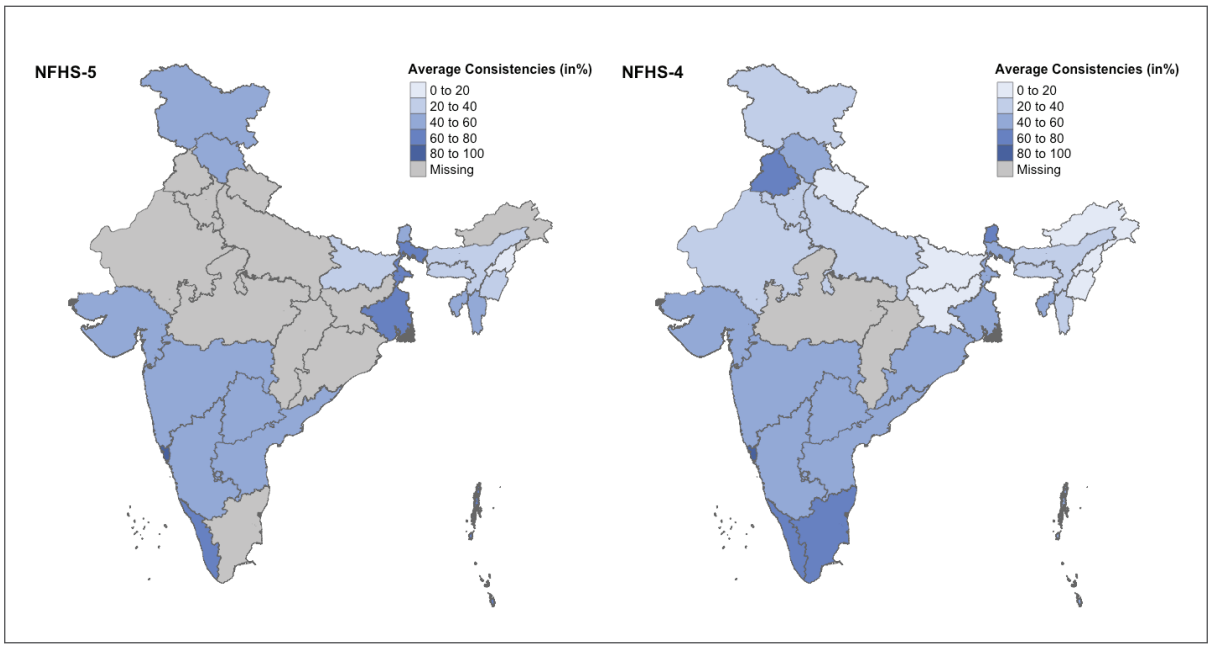
- Andhra Pradesh
- Karnataka
- Madhya Pradesh
- Maharashtra
- Puducherry
- West Bengal

3.2.1. Comparison of point estimates

We compared district level estimates from HMIS and NFHS to check if the HMIS values were comparable to the NFHS estimates. We conducted this exercise with both NFHS-4 and NFHS-5 comparing them HMIS 2017 annual average and 2019 annual average respectively. To do this, we did an equivalence test where we created margin of errors (MoE, 5% bounds) across NFHS-4 and NFHS-5 estimates and checked if HMIS value fell within the range. More details on methodology on creation of these MoE can be found in Appendix A. Finally, we calculated the proportion of districts at the state-level that were consistent. Figure 3.2a represents the results.

Figure 3.2a: Proportion of districts in HMIS consistent with NFHS

HMIS (annual average 2019) is compared with NFHS-5, and HMIS (annual average 2017) with NFHS-4 for three indicators[18]



18. The compared indicators include: (a) Early Initiation of Breastfeeding, (b) Institutional Deliveries and (c) PW receiving ANC 4+ checkups. We could only compare these indicators due to most reliable design effects and sample sizes.

3.2.2. Comparison of rankings

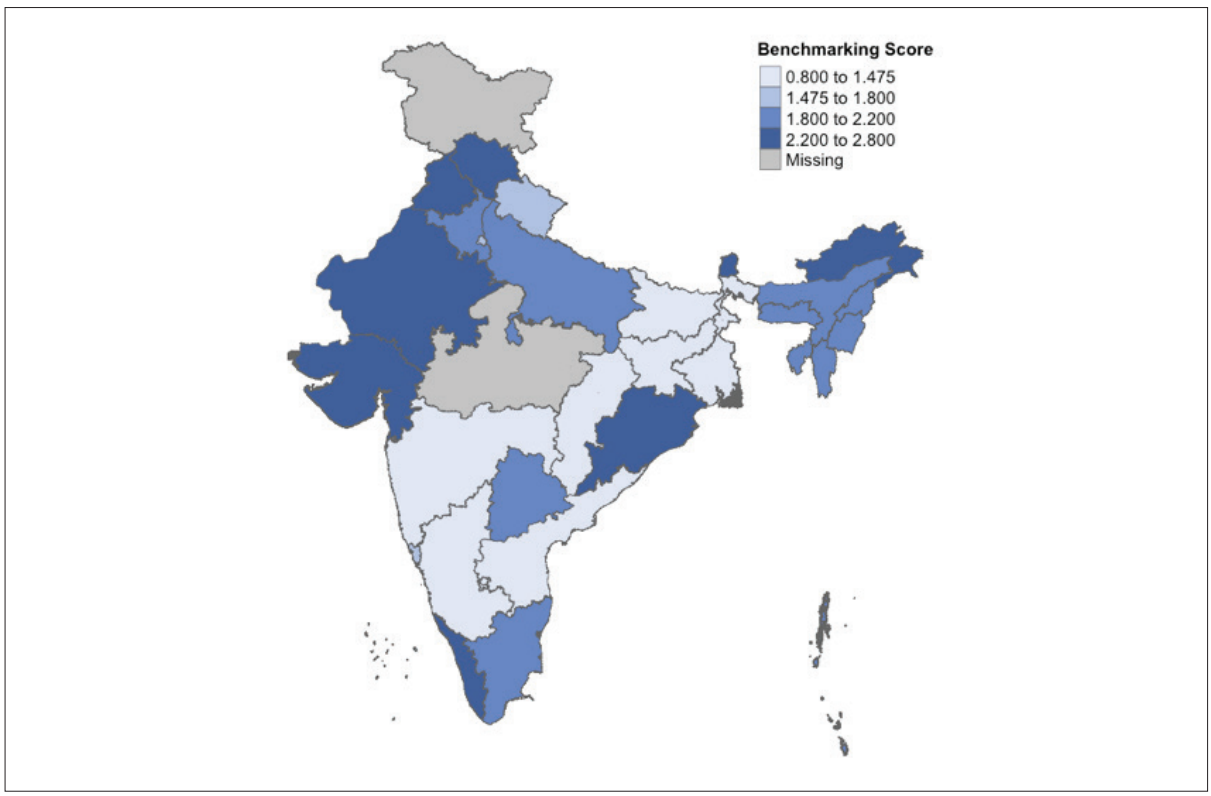
We compared the relative ranking of state performance on each indicator between HMIS and NFHS surveys. Considering the legitimate differences between HMIS and NFHS, we decided against a point-to-point comparison of values or a test of whether HMIS values fall within estimated confidence intervals around NFHS values. If HMIS and NFHS both reflect the on-the-ground reality, we would expect to see the same states perform well in comparison to other states for a given indicator. Based on this assumption, we developed an approach to compare indicator estimates across NFHS surveys and HMIS.

For this, we ranked the states based on each indicator's performance across HMIS and NFHS-5, where it was available, and NFHS-4 for the remaining states. We then devised a scoring criteria based on whether a state rank in HMIS is within (+/-) one quintile of the state rankings in NFHS and whether the HMIS estimate was within (+/-) 20 percentage points of NFHS estimate. A higher weightage was given to rankings than difference in percentage points. We then took an average of the six indicators' scores for each state and calculated the final benchmarking score. The detailed methodology is discussed in the Appendix A.

This is not a final assessment on the accuracy of HMIS in each state, but provides insights on the quality of specific indicators as reported by states (Figure 3.2b).

Figure 3.2b: Proportion of districts in HMIS inconsistent with NFHS

Relative ranks in HMIS (annual average 2019) are compared with NFHS-5, and HMIS (annual average 2017) ranks with NFHS-4. A lower benchmarking score implies poor comparability



3.2.3. NFHS vs HMIS trends comparison

We also conducted a comparative analysis of the indicator trends from NFHS with those from HMIS. We calculated the correlation coefficient between the change in a given indicator's value from NFHS-4 to NFHS-5, against the difference for the same indicator in HMIS (2019) and HMIS (2017) average values. Through this analysis, **we aim to assess whether the trends for key indicators match in NFHS and HMIS datasets.**

However, these correlations are to be read keeping in mind a number of caveats why they might not match for legitimate reasons. First, we are comparing different time periods in HMIS and NFHS, while we have HMIS data from 2017 onwards, the NFHS-4 survey is from 2015-16 and similarly while NFHS-5 is spread over 2019, the HMIS 2019 is the annual average. Other reasons why these trends may not match are difference in population covered, the difference in reference periods, and difference due to the fact that HMIS is self-reporting.

The results suggest presence of negligible to low correlation between the changes in NFHS and analogous changes in HMIS indicator values. The indicator-wise correlation coefficients and correlation plots are presented below.

Correlation between trends: (NFHS5 - NFHS4) and (HMIS 2019 - HMIS 2017)

2 TT doses:	+0.14
4+ ANC checkups:	+0.11
Early initiation of breastfeeding:	-0.02
Home deliveries by SBA:	-0.03
Anemia:	-0.05
Institutional Deliveries:	-0.32

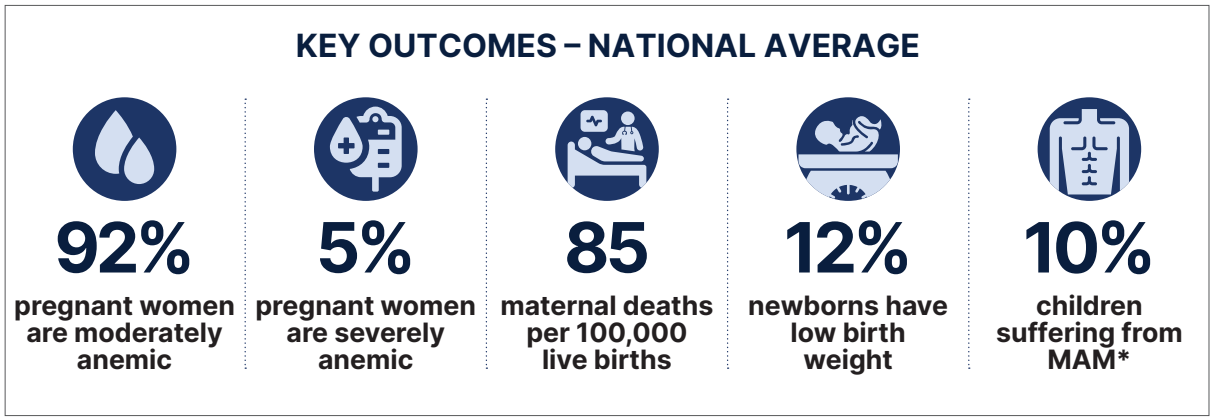
4. Findings

In this chapter, we present our findings on the current status and trends in health and nutrition outcomes based on HMIS and ICDS RRS data. Here, we answer the following questions:

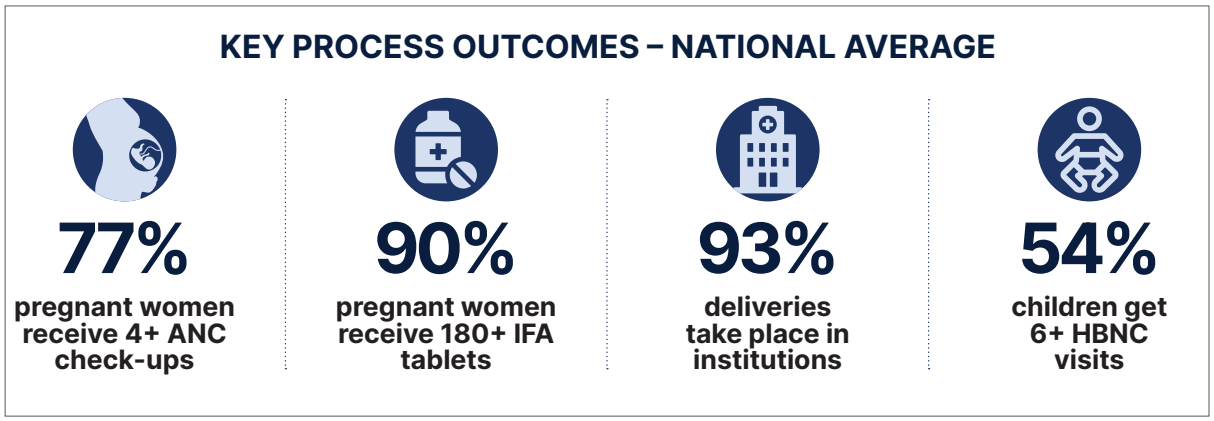
- Based on the most recent data available for analysis, what are the levels of the state and national health and nutrition indicators? What are the long-term and short-term trends in some of the best and worst performing states?

4.1. Overview: national and state level outcomes over Jan-Mar 2021

In this section, we briefly summarise the persisting levels of the key outcome and process indicators as in the latest quarter for which the data is available: January-March 2021.



Source: HMIS, January to March 2021, *Source: ICDS RRS, July to November 2020



Source: HMIS, January to March 2021

Considering the performance of health indicators across the states, Manipur and Nagaland are among top performing states in most outcome indicators but fall among the worst performing states in some process indicators like institutional deliveries and 4+ ANC checkups. One of the worst performing states in most indicators is Bihar.

Specifically for anemia prevalence, Telangana and Haryana are bottom most states but have also been rapidly improving. Odisha is among top states in process related indicators including institutional delivery and 6+ HBNC visits and Kerala is the worst performer on both child related inputs and outcome considered, that is, MAM and HBNC visits.

4.2. Status of key outcome indicators in 2021[19]

4.2.1. Low birth weight

At the national level, currently 11.75% of newborns in the HMIS have low birth weight, and this figure has not changed much in the past 4 years. There is considerable variation among states – in terms of trends in improvement over time and their current status of low birth weight prevalence.

Low birth weight prevalence is typically defined as the percentage of children born weighing less than 2,500 grams. It is an important predictor of health risks later in life: children born with a low birth weight are at higher risk of morbidity and mortality, as well as non-communicable diseases including diabetes and hypertension later in life.[20] Children born with low birth weight are also at higher risk of stunting and lower IQ.[21]

Indicator 1. Low birth weight

Definition based on available HMIS data

Numerator	Number of newborns having weight less than 2.5 kg
Denominator	Number of newborns weighed at birth

Table 4.2a: State level performance on low birth weight

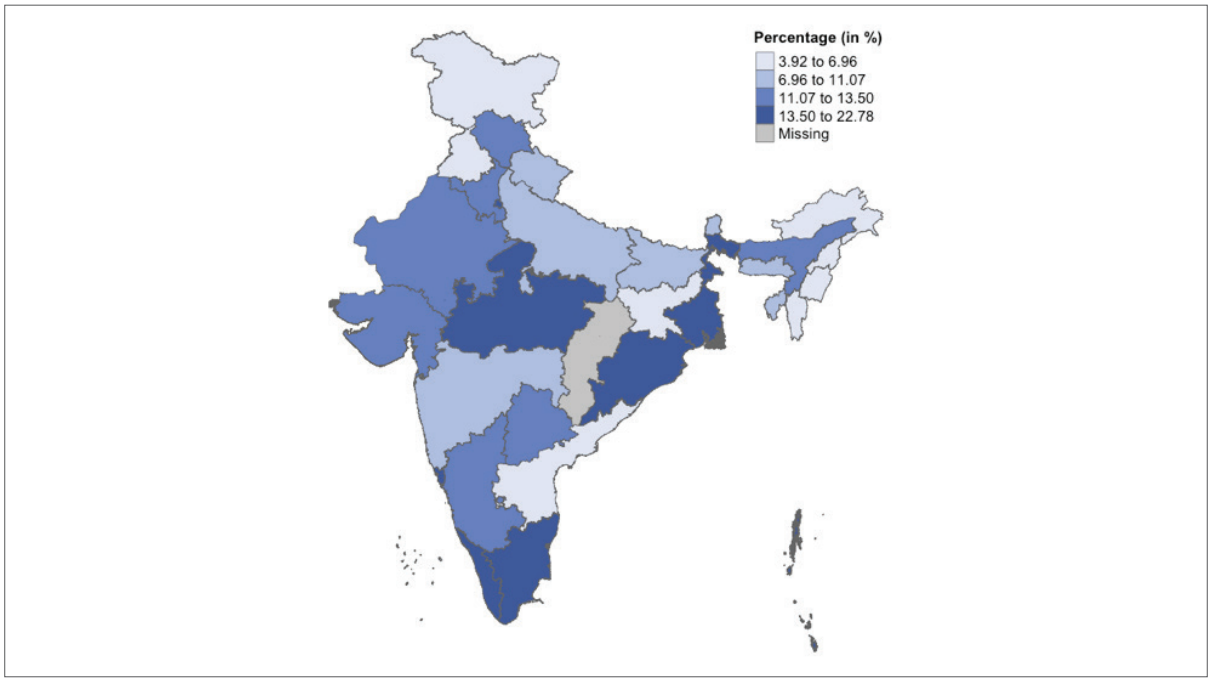
Top states (Jan-Mar 2021)	Bottom states (Jan-Mar 2021)	Rapidly improving states (based on data from 2017-2021)
Manipur	Odisha	Himachal Pradesh
Andhra Pradesh	West Bengal	
Nagaland	Delhi	

19. Full set of quarterly and monthly state estimates for 2017-2021 can be found in Appendix C

20. [W] WHO. (2014). Comprehensive implementation plan on maternal, infant and young child nutrition. World Health Organization. https://apps.who.int/iris/handle/10665/113048

21. UNICEF (2019). Low birthweight. https://data.unicef.org/topic/nutrition/low-birthweight/

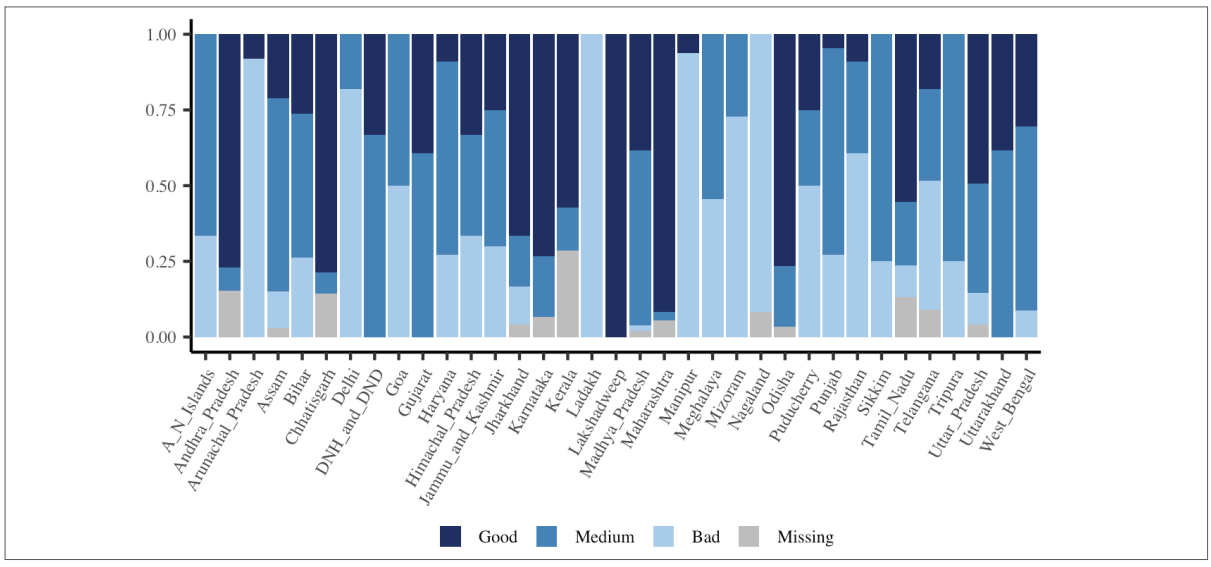
Figure 4.2a: State-wise prevalence of low birth weight babies



Source: HMIS data from January to March 2021

Figure 4.2b: District variation in performance of low birth weight babies

The height of the bars represents the proportion of districts that are good (<5%), medium (>5 & <15%), or bad (>15%) performers.



Source: HMIS data from January to March

Across India, almost 29% districts are categorised as bad performing states, 55% as medium and the rest (15%) as good performers.

4.2.2. Anemia and severe anemia

At the national level, currently 5.1% of pregnant women registered in HMIS suffer from severe anemia and 91.6% of women suffer from anemia, and this figure has shown marginal improvement in the past 4 years.

Anemia during pregnancy increases the risk of premature delivery, low birth weight, and maternal and infant mortality.[22] Severe anemia increases the risk of hemorrhage and infection for the mother.[23] Globally, anemia affects 42% of pregnant women (56 million people).[24] India has one of the highest prevalence of anemia, with 50.4% of pregnant women (NFHS-4).[25] There has been some progress in reducing anemia levels from 57.9% in 2006 to 50.4% in 2016.[26]

Indicator 2. Severe anemia during pregnancy

Definition based on available HMIS data

$$\frac{\textbf{Numerator}\quad \text{Number of PW having Hb level< 7.0 dg/l (tested cases)}}{\textbf{Denominator}\quad \text{[Live Birth – Male] + [Live Birth – Female] + [Still Birth]}}$$

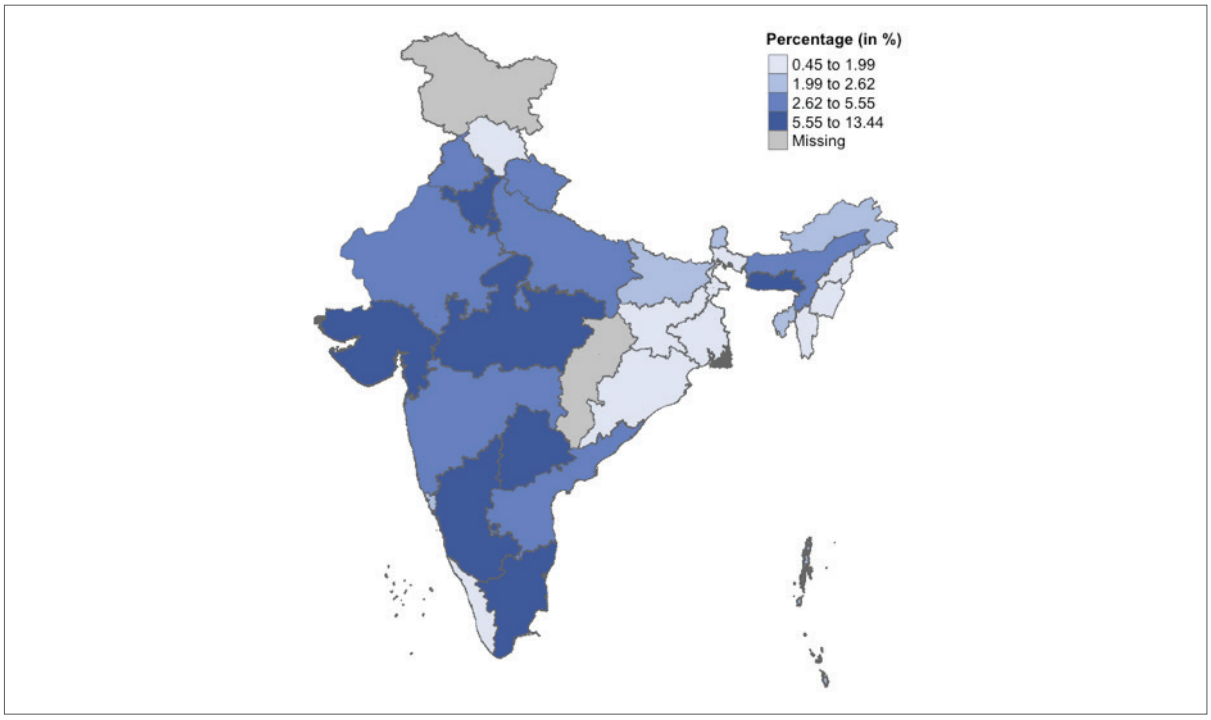
Note: Denominator is estimated pregnancies.

Table 4.2b: State level performance on severe anemia

Top states (Jan-Mar 2021)	Bottom states (Jan-Mar 2021)	Rapidly improving states (based on data from 2017-2021)
Nagaland	Tamil Nadu	Uttarakhand
Mizoram	Telangana	Telangana
Manipur	Haryana	Haryana

22. WHO. (2014). Comprehensive implementation plan on maternal, infant and young child nutrition. World Health Organization. https://apps.who.int/iris/handle/10665/113048
23. https://applications.emro.who.int/imemrf/Professional_Med_J_Q/Professional_Med_J_Q_2014_21_2_247_252.pdf
24. WHO. (2014). Comprehensive implementation plan on maternal, infant and young child nutrition. World Health Organization. https://apps.who.int/iris/handle/10665/113048
25. NFHS-4 (2015-2016). India Factsheet. http://rchiips.org/NFHS/pdf/NFHS4/India.pdf
26. https://anemiamuktbharat.info/home/target/

Figure 4.2c: State-wise prevalence of severe anemia among pregnant women

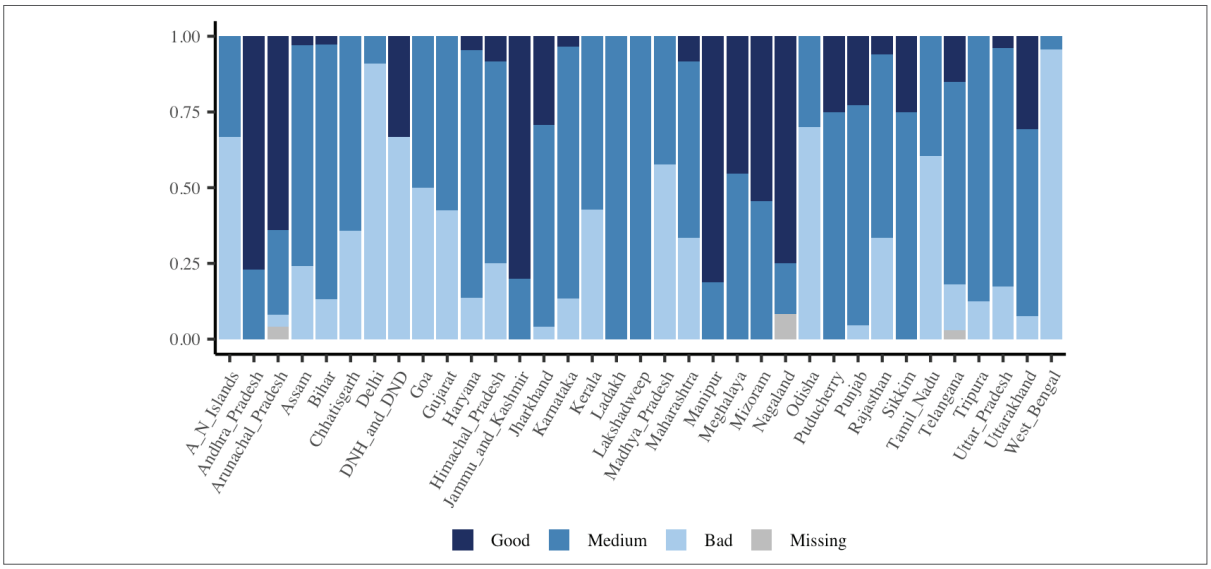


Source: HMIS data from January to March 2021

It can be noted that Manipur and Nagaland are among the best performing states even according to NFHS-4.[27] Telangana and Haryana have shown significant reduction in anemia at an average quarterly decline of 0.09% over the past four years.

Figure 4.2d: District variation in performance of severe anemia

The height of the bars represents the proportion of districts that are good (<5%), medium (>5 & <10%), or bad (>10%) performers.



Source: HMIS data from January to March 2021

27. Refer to the benchmarking exercise in section 3.3 or the state factsheets http://rchiips.org/nfhs/factsheet_NFHS-4.shtml

At a national level, almost all districts (87%) fall in the bad category, and for the majority of remaining districts, the data is missing with only 4% districts categorised as good.

4.2.3. Maternal Mortality Ratio (MMR)

As per the HMIS estimates at the national level, currently the maternal mortality ratio is 85 per 100,000 live births and this figure has shown marginal improvement in the past 4 years.

Maternal mortality is a critical outcome indicator for maternal health, measuring the risk of death per childbirth. Globally, the maternal mortality ratio (MMR) is estimated as 211 deaths per 100,000 live births. Reducing maternal mortality is an important outcome target associated with Sustainable Development Goal 3 (SDG-3) on "Good Health and Well-being." The specific target is to reduce the global MMR to less than 70 per 100,000 live births.

India remains well above the target for MMR set in the SDGs. India's MMR is estimated as 113 maternal deaths per 100,000 live births in the Sample Registration System (SRS) 2016-2018. A United Nations (UN) inter-agency report presents an alternative estimate of India's MMR as 145 (confidence interval: 117 to 177) in 2017, a notable reduction from an estimated MMR of 370 (confidence interval: 324 to 426) in 2000.[28]

Indicator 3. Maternal Mortality Ratio (MMR)

Definition based on available HMIS data

Numerator	[Number of Maternal Deaths due to Bleeding] + [Number of Maternal Deaths due to High fever] + [Number of Maternal Deaths due to Abortion] + [Number of Maternal Deaths due to Obstructed/ prolonged labour] + [Number of Maternal Deaths due to Severe hypertension/fits] + [Number of Maternal Deaths due to Other Causes (including causes not known)]	× 100,000
Denominator	Male Live Births + Female Live Births	

The national level prevalence of MMR as per the HMIS is 85 per 100,000 live births in the first quarter of 2021. However, the national level trend shows persisting seasonality, even as recently as the last quarter of 2020, MMR went over 100. MMR is hard to be calculated at geographically disaggregated level. Therefore, we don't delve deeply in state-specific insights for MMR.

28. WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. (2019). Maternal mortality: Levels and trends 2000 to 2017. https://www.who.int/reproductivehealth/publications/maternal-mortality-2000-2017/en/

4.2.4. Moderate Acute Malnutrition (based on July-November 2020, ICDS RRS[29])

As per the ICDS RRS estimates of July-November 2020, about 10% of Indian children (under 5 years) suffer from moderate acute malnutrition (MAM).

This is higher than the last recorded global average of 7.3%. Between July to November we didn't see much movement in either MAM values.[30] Interestingly, this high rate of MAM is equally dispersed across caste categories and sex categories.

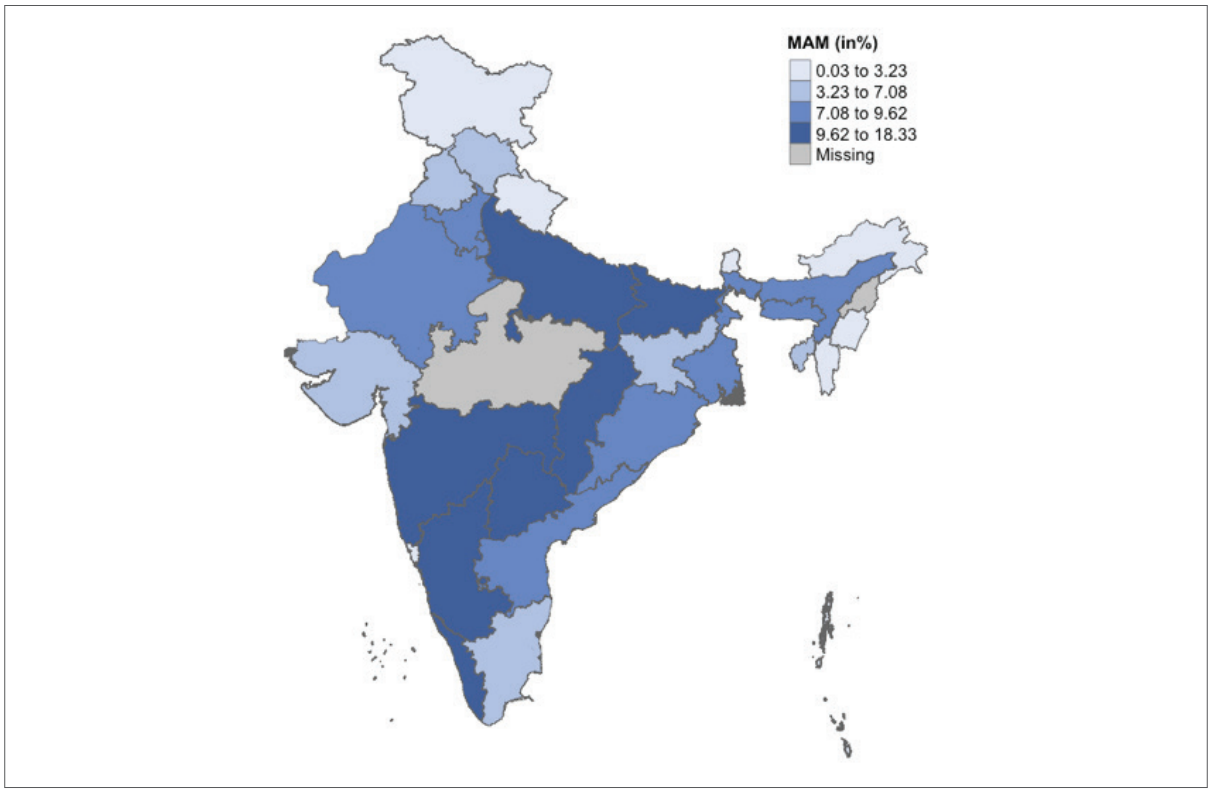
As per WHO, 45% of child deaths are associated with undernutrition. Malnutrition is detrimental to formative development of a child and therefore is a priority outcome for the POSHAN Abhiyaan.

Indicator 4. Moderate Acute Malnutrition (MAM)

Definition based on available ICDS RRS data

Numerator	Number of children 0-5 yrs suffering from MAM (weight for height between - 3 sd)
Denominator	Total number of children 0-5 yrs

Figure 4.2e: State-wise prevalence of MAM among children



Source: ICDS RRS from July to November 2020

29. We were not able to conduct full trends and disaggregation analysis like other indicators due to lack of time series data. Data on this indicator is only available for 5 months
30. We focus our insights mainly from MAM, since SAM is of poorer data quality relative to MAM

Table 4.2c MAM prevalence in states

MAM prevalence	No. of states/UTs	States/UTs
Less than 2%	8	Manipur, Arunachal Pradesh[31], Mizoram
On average >4%, but <9% in 2020	11	Andhra Pradesh, Meghalaya, Haryana, Punjab
More than 10%	7	Bihar, Kerala, Chhattisgarh

Source: ICDS RRS, July to November 2020

While Kerala reports the second highest MAM, it has reported <1% SAM. It's likely that over time children improved from severe and entered the moderate category of malnutrition in Kerala. Also possible that MAM children are getting adequate care and not escalating to SAM.

4.3. Status of key process indicators in 2021[32]

4.3.1. Antenatal care (ANC) checkups

At the national level, currently 77.23% of registered pregnant women receive at least 4 ANC checkups, and this indicator has shown substantial improvement in the past 4 years.

ANC check ups are an essential input in improving maternal health. A majority of maternal deaths can be prevented if women regularly go for ANC and deliver in an institution. Contact with the health worker during ANC checkups has emerged as an important factor for utilization of services.[33]

Indicator 5. Pregnant women receiving 4 or more ANC check ups

Definition based on available HMIS data

Numerator	Number of pregnant women receiving 4 or more check ups
Denominator	Number of pregnant women registered for ANC

Table 4.3a: State level performance on ANC checkups

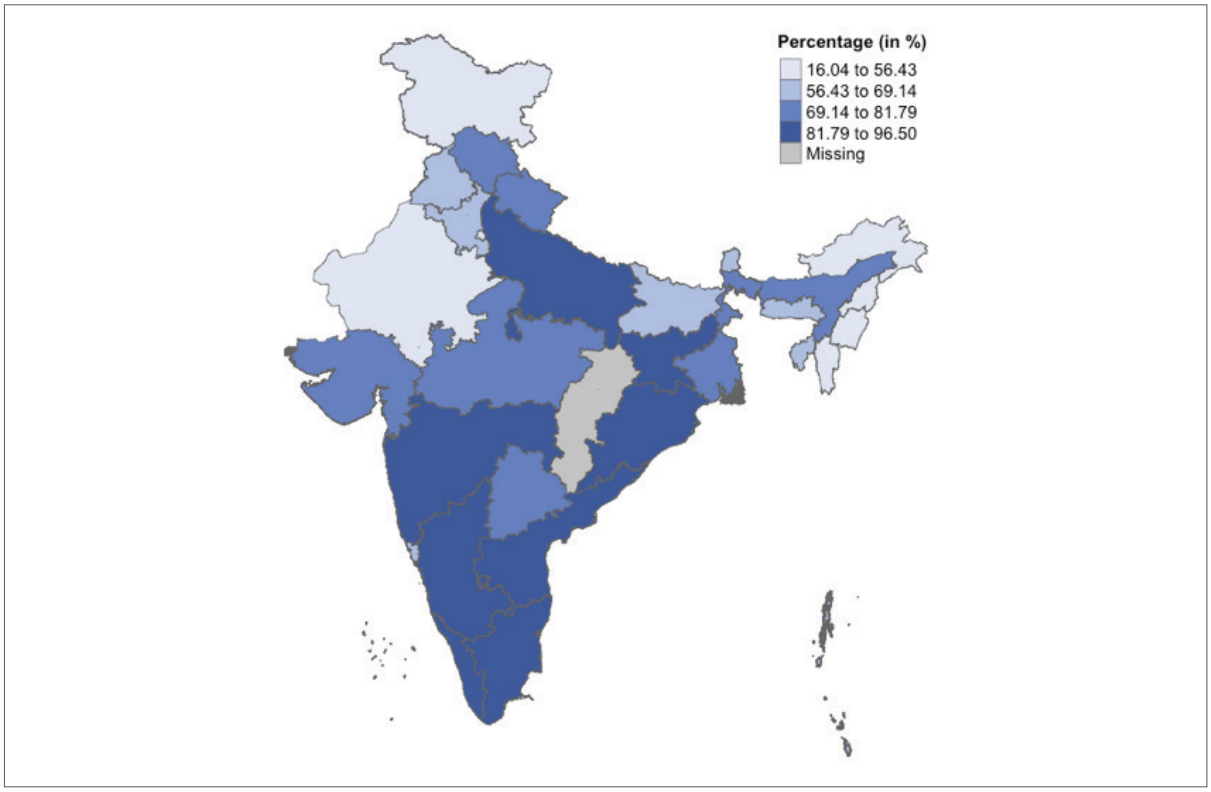
Top states (Jan-Mar 2021)	Bottom states (Jan-Mar 2021)	Rapidly improving states (based on data from 2017-2021)
Kerala	Nagaland	Rajasthan
Maharashtra	Arunachal Pradesh	Uttar Pradesh
Andhra Pradesh	Manipur	Uttarakhand

31. Arunachal Pradesh does not have reliable data as per CIDS RRS data quality checks

32. Full set of quarterly and monthly state estimates for 2017-2021 can be found in Appendix C

33. Paul, P.L., Pandey, S. Factors influencing institutional delivery and the role of accredited social health activist (ASHA): a secondary analysis of India human development survey 2012. BMC Pregnancy Childbirth 20, 445 (2020). https://doi.org/10.1186/s12884-020-03127-z

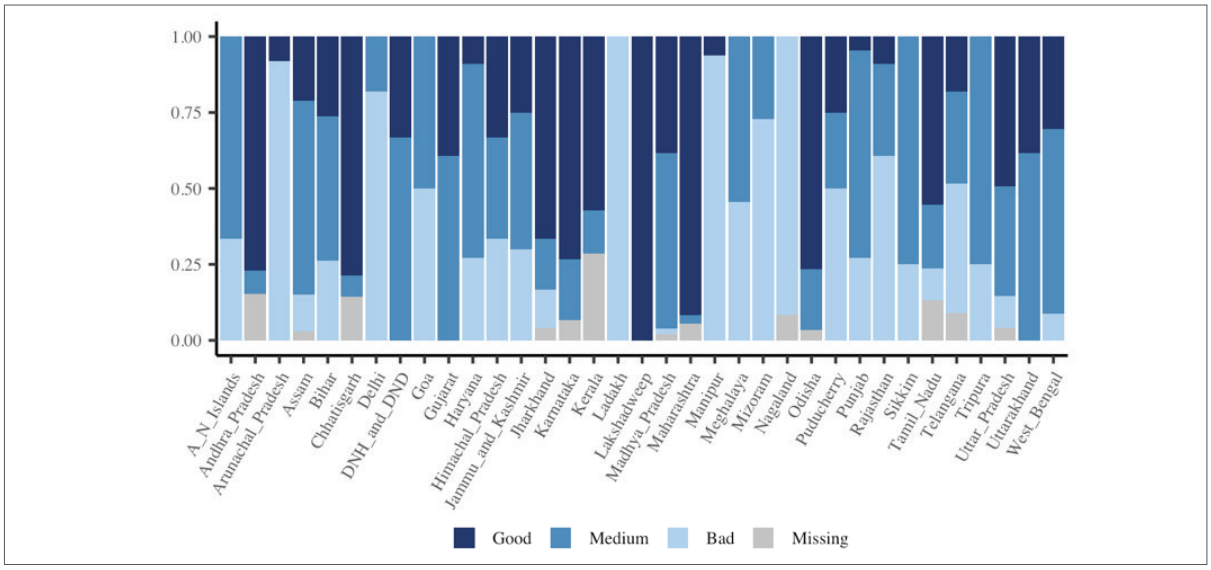
Figure 4.3a: State-wise receipt of 4+ ANC check-ups among pregnant women



Source: HMIS data from January to March 2021

Figure 4.3b: District variation in performance of 4+ ANC check-ups

The height of the bars represent proportion of districts that are good (>80%), medium (>60- & <80%), or bad (<60%)



Source: HMIS data from January to March 2021

Figure 4.3b presents the variation in the levels of 4+ ANC check ups across districts. And, on a national level, almost 40% of districts are categorised as medium, 34% as bad and the rest of 23% as good.

4.3.2. Provision of iron folic acid (IFA) tablets

At the national level, currently 90.44% of pregnant women registered in the HMIS system receive more than 180 IFA tablets, and this indicator has shown a marginal improvement in the past 4 years.

Treatment with IFA supplementation helps to prevent anemia in pregnant women. It has been established that daily iron supplementation in pregnancy, compared with no iron intake, is associated with a reduction in the risk of maternal anaemia and is thus a key input in improving maternal and child health and nutrition.[34]

Indicator 6. Provision of IFA

Definition based on available HMIS data

Numerator	Number of Pregnant Women receiving 180+ IFA tablets
Denominator	Number of pregnant women registered for ANC

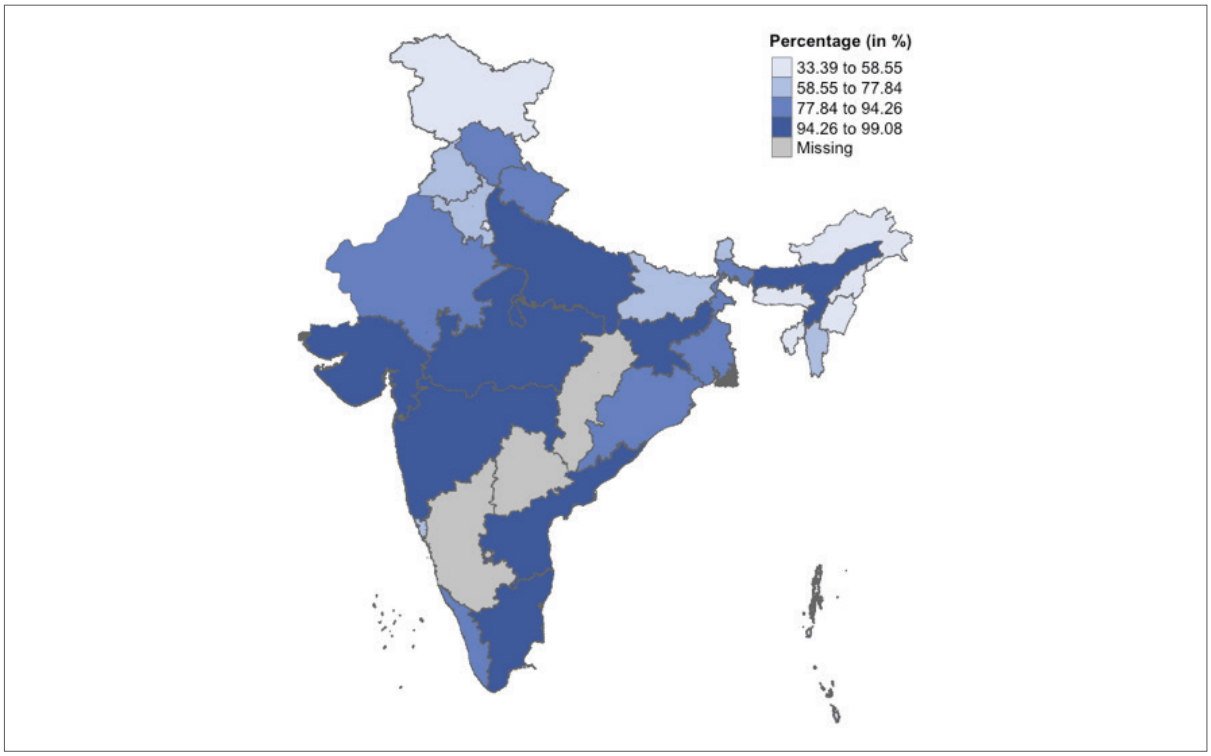
Note: Denominator is estimated pregnancies.

Table 4.3b: State level performance on provision of IFA tablets

Top states (Jan-Mar 2021)	Bottom states (Jan-Mar 2021)	Rapidly improving states (based on data from 2017-2021)
Andhra Pradesh	Nagaland	Uttarakhand
Chhattisgarh	Manipur	Mizoram
Tamil Nadu	Tripura	Rajasthan

34. Zulfiqar A Bhutta, Jai K Das, Arjumand Rizvi, Michelle F Gaffey, Neff Walker, Susan Horton, Patrick Webb, Anna Lartey, Robert E Black, Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?, The Lancet, https://doi.org/10.1016/S0140-6736(13)60996-4.

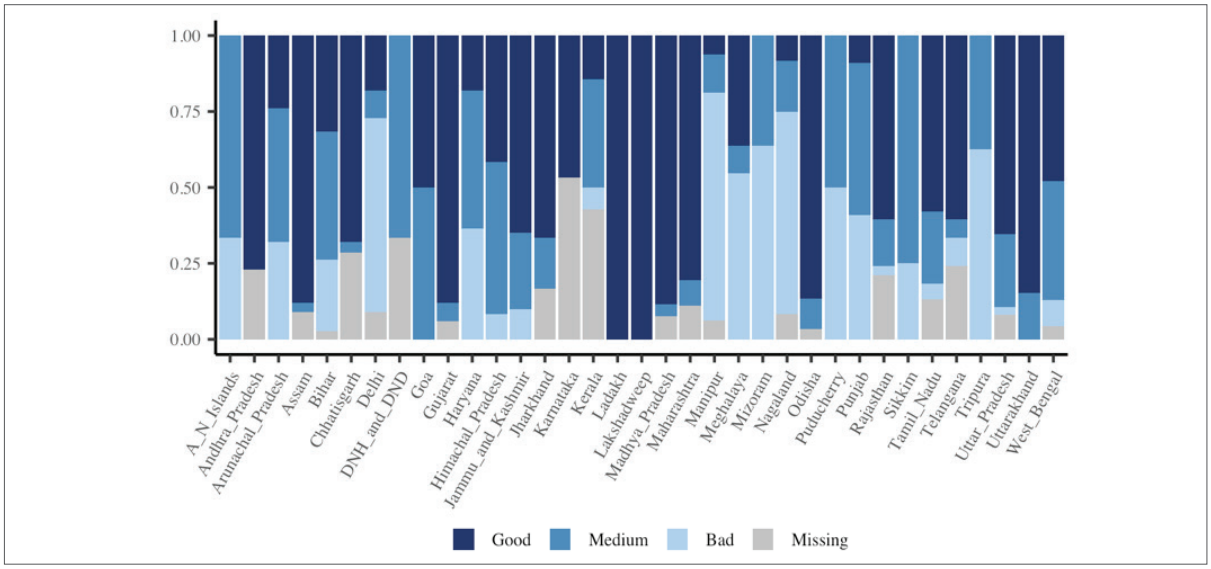
Figure 4.3c: State-wise receipt of 180+ IFA tablets among pregnant women



Source: HMIS data from January to March 2021

Figure 4.3d: District variation in performance of provision of 180+ IFA tablets

The height of the bars represent proportion of districts that are good (>80%), medium (>60- & <80%), or bad (<60%)



Source: HMIS data from January to March 2021

Figure 4.3d above presents the variation in the levels of provision of 180 IFA tablets across districts. At the national level, more than 50% of districts are classified as medium, 20% as bad, and 13% as good.

4.3.3. Institutional deliveries

At the national level, currently 93.21% of the total registered deliveries are institutional deliveries, and this indicator has shown marginal improvement in the past 4 years.

There is moderate variation among states in terms of their current status of institutional deliveries and considerable variation in their improvement over time.

Institutional delivery is an important determinant of maternal and neonatal mortality. Delivering in a health facility attended by skilled personnel reduces the risk of maternal death.[35] Institutional births have increased dramatically in India in recent years from 38.7% in 2006 to 78.9% in 2016.[36]

Indicator 7. Institutional deliveries

Definition based on available HMIS data

Numerator	Number of Institutional Deliveries conducted (Including C-Sections)
Denominator	Male Live Births + Female Live Births + Still-births

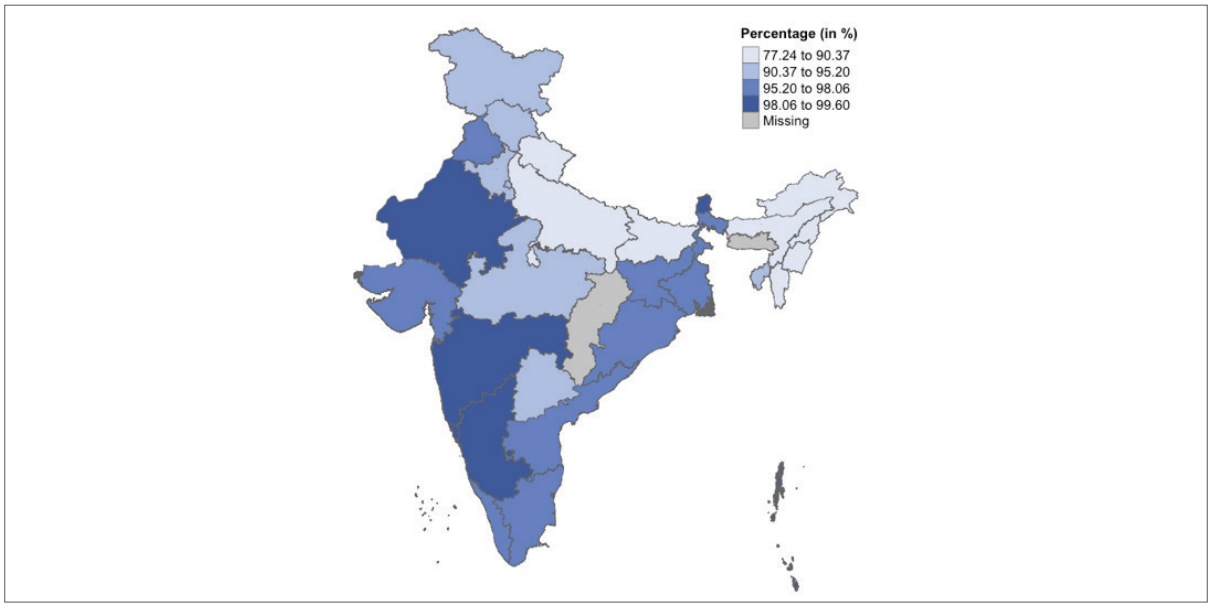
Note: Denominator is estimated pregnancies.

Table 4.3c: State level performance on institutional deliveries

Top states (Jan-Mar 2021)	Bottom states (Jan-Mar 2021)	Rapidly improving states (based on data from 2017-2021)
Odisha	Manipur	Uttar Pradesh
Punjab	Bihar	Meghalaya
Rajasthan	Nagaland	Kerala

35. Campbell, O. M., Graham, W. J., & Lancet Maternal Survival Series steering group. (2006). Strategies for reducing maternal mortality: getting on with what works. The Lancet, 368(9543), 1284-1299.
36. NFHS-4 (2015-2016). India Factsheet. http://rchiips.org/NFHS/pdf/NFHS4/India.pdf

Figure 4.3e: State-wise institutional deliveries

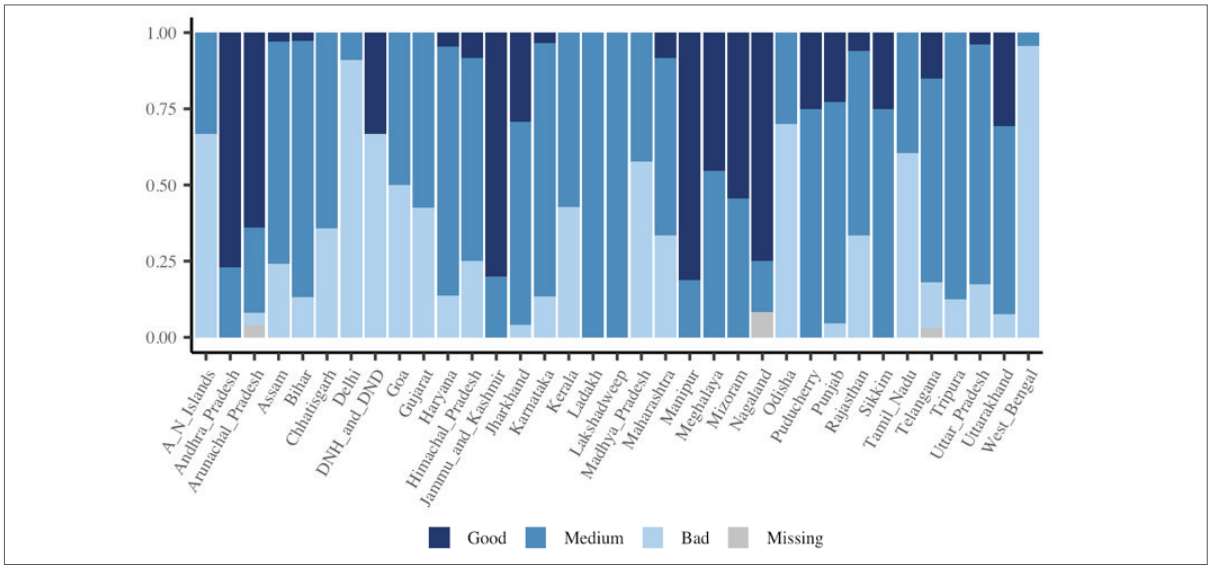


Source: HMIS data from January to March 2021

Mizoram and Nagaland have shown significant and positive improvement with an average quarterly growth rate of 0.15% and 0.12% respectively. Note that the finding that north-eastern states are among the worst on institutional deliveries is in line with the NFHS-5 and NFHS-4 numbers that finds north-eastern states, except Sikkim, to be among the worst performers on institutional deliveries.[37]

Figure 4.3f: District variation in performance of institutional deliveries

The height of the bars represent proportion of districts that are good (>90%), medium (>75 & <90%), or bad (<75%)



Source: HMIS data from January to March 2021

37. Institutional deliveries on the rise across most states, shows NFHS-5 report, Down to Earth, 29 Dec 2020.

Figure 4.3f presents the district-level variation in institutional deliveries across states between January and March 2021. Almost 3/4th of the districts fall in the good category, 17% as medium and a negligible 6% in bad.

4.3.4. Home-based newborn care (HBNC) visits

At the national level, currently 54.04% of newborns registered in the HMIS system receive more than 6 HBNC visits, and this indicator has shown a notable improvement in the past 4 years.

One of the key constituents of community-based approach to neonatal health is the HBNC, that is, care provided at homes by health workers in the antenatal, intrapartum and postnatal periods. Introduced in 2011, HBNC is centred around Accredited Social Health Activist (ASHA). An earlier study has demonstrated that HBNC by trained female village health workers significantly reduced the Neonatal Mortality Rate (NMR) by up to 62% in settings with high baseline NMRs.[38]

Indicator 8. Newborns receiving 6+ HBNC visits

Definition based on available HMIS data

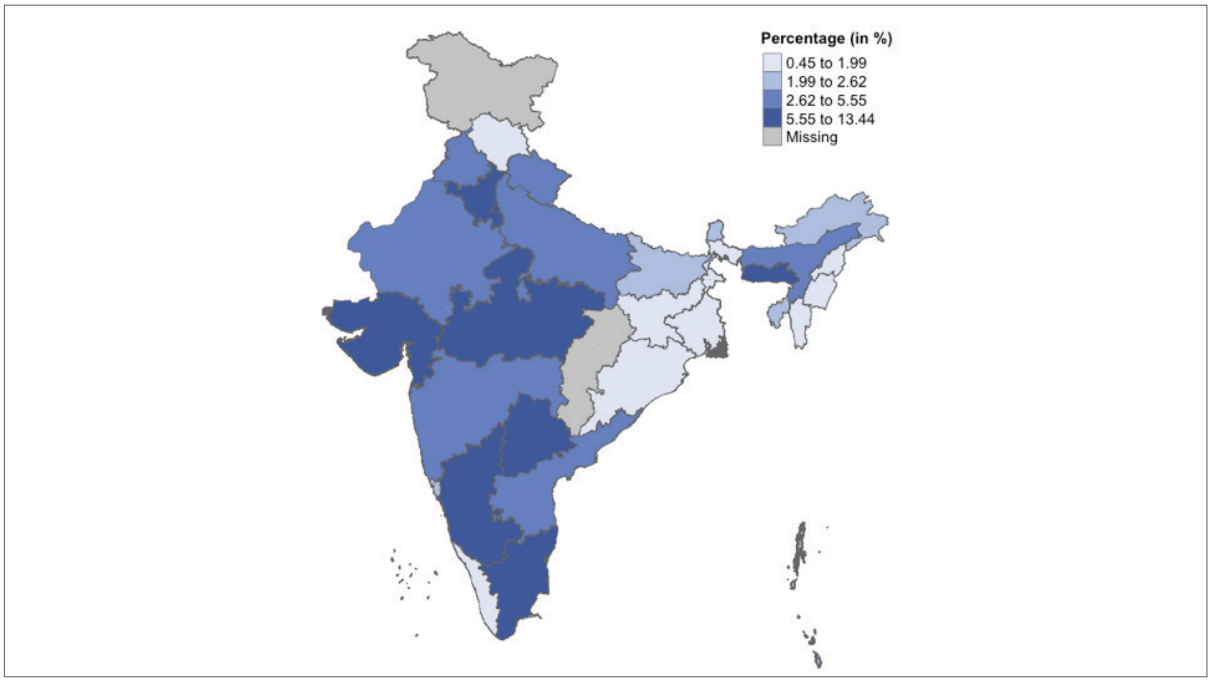
Numerator	Number of newborns who received 6 or more HBNC visits
Denominator	Male Live Births + Female Live Births

Table 4.3d: State level performance on HBNC visits

Top states (Jan-Mar 2021)	Bottom states (Jan-Mar 2021)	Rapidly improving states (based on data from 2017-2021)
Assam	Goa	Assam
Odisha	Tamil Nadu	Uttarakhand
Himachal Pradesh	Kerala	Uttar Pradesh

38. Bang AT, Bang RA, Baitule SB, et al. Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. Lancet 1999;354:1955–61.

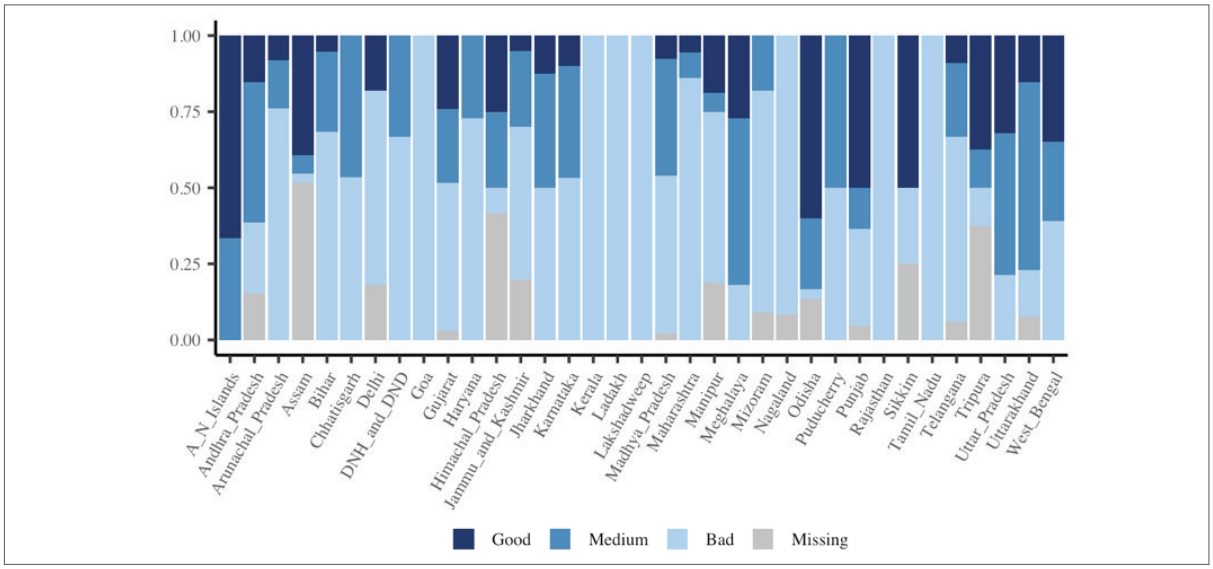
Figure 4.3g: State-wise receipt of of 6+ HBNC visits by newborns



Source: HMIS data from January to March 2021

Figure 4.3h: District variation in performance of HBNC visits

The height of the bars represent proportion of districts that are good (>80%), medium (>60 & <80%), or bad (<60%)



Source: HMIS data from January to March 2021

At a national level, more than half districts are categorised as good, 17% as medium and 1/4th as bad.

4.4. COVID-19 and health services

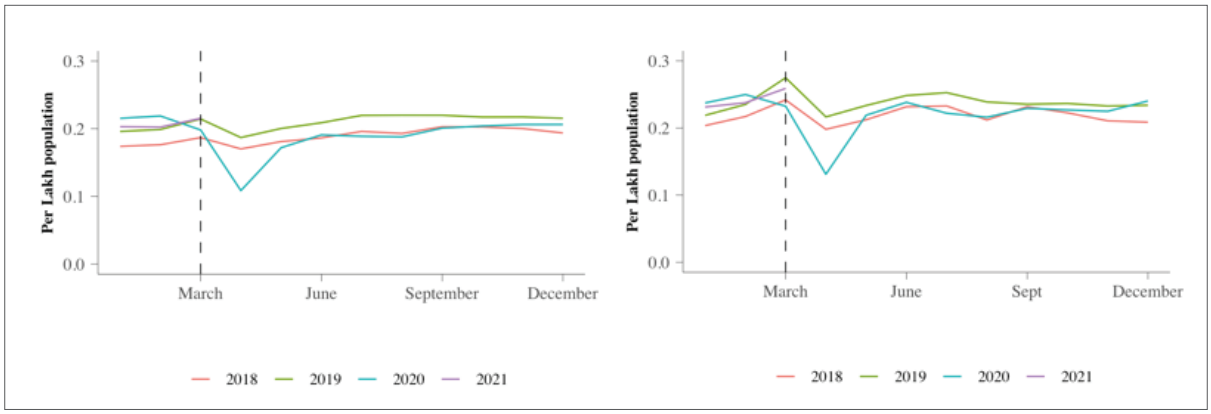
In the earlier section, we identify that the long term trends in key outcome indicators were mostly stable over the last four years. However, when the Government of India imposed the strict nationwide lockdown on 24th March 2020, the public health system faced disruptions in service delivery. Despite medical services being exempted from the lockdown, the curbs on movement, along with aggravated fear of infection, resulted in temporary but steep drop in availability of health and nutrition services across the country.[39] As the true effect on service delivery might be concealed in proportions, we use relative changes in levels over the time periods to assess the consequences of COVID.[40]

We find that despite experiencing an immediate and steep fall in April 2020, services promptly resumed in June and by December 2020, and indicators were close to the December 2019 levels (within 7%). Specifically, women receiving 180 IFA tablets and new-borns getting 6+ HBNC visits were higher than the levels in December 2019, whereas, children fully immunized and institutional deliveries lagged only slightly behind. This is in line with the difference in the mode of delivery of these services. Services like ANC check ups and provision of IFA were required to be delivered at home, whereas institutional deliveries and immunization required movement and interaction from the beneficiaries.

On comparing 2020 with yearly trend lines for 2018 and 2019, it is clear that these indicators fall every April indicating a seasonal pattern. A discussion with some state level officials working with HMIS confirmed that at the end of each financial year, the system is refreshed resulting in a brief lag in data entry.

Nonetheless, the drop in April 2020 was of much greater magnitude and can be attributed to the discontinuation of services along with the disruptions in the data entry.

Figure 4.4a: Number of pregnant women receiving 4+ANC checkups, number of pregnant women receiving 180 IFA tablets

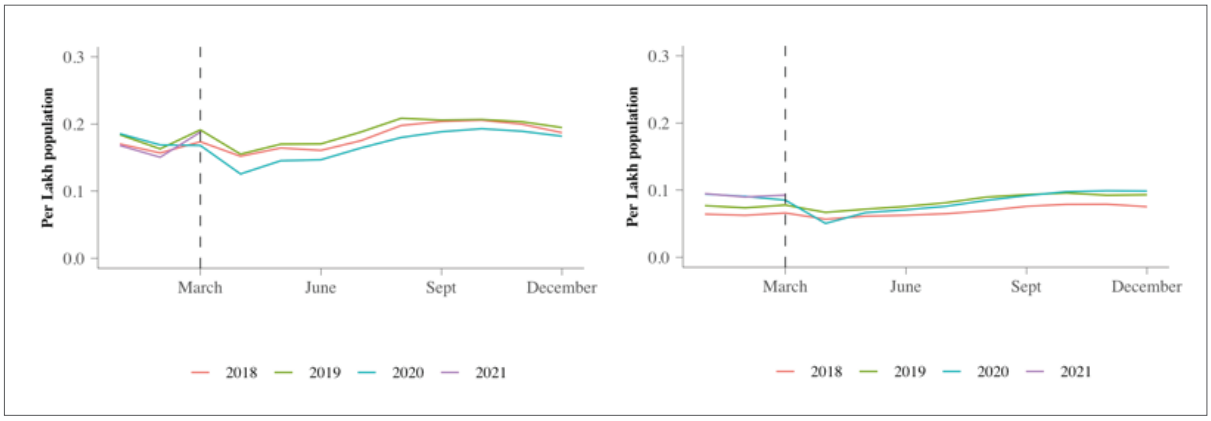


Source: HMIS

39. Goyal, M., Singh, P., Singh, K., Shekhar, S., Agrawal, N. and Misra, S. (2021), The effect of the COVID-19 pandemic on maternal health due to delay in seeking health care: Experience from a tertiary center. Int. J. Gynecol. Obstet., 152: 231-235. https://doi.org/10.1002/ijgo.13457

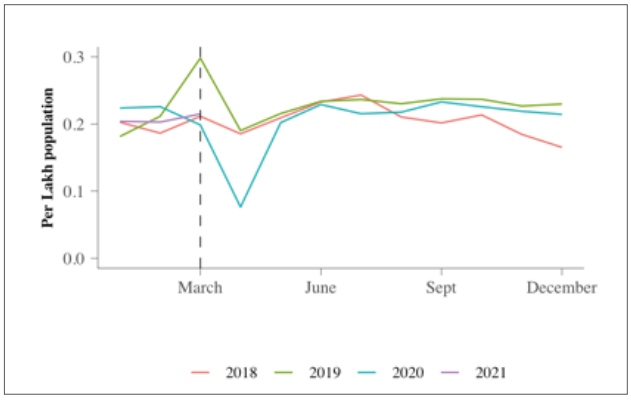
40. We found that the absolute numbers for all services did suffer a significant downturn in April 2020. But, the denominators were falling commensurately too - leading to little net change in the proportion value. For example, the percentage of institutional deliveries against total estimated deliveries increased in April 2020 from April 2019 . Whereas, when we plot total institutional deliveries and total estimated deliveries separately, the trend lines for both data points drop sharply in the month of April 2020.

Figure 4.4b: Number of institutional deliveries, number of newborns receiving 6+ HBNC visits



Source: HMIS

Figure 4.4c: Number of children fully immunized



Source: HMIS

During the brief period of halt in services, the most affected were related to immunization services. The total number of children fully immunized (age 9-11 months) fell by a staggering 60% in April of 2020 from April 2019. These were followed by pregnancy related services, under which both the number of women receiving 4 ANC check-ups and the number of women receiving 180 IFA tablets decreased by almost 40% over the period April 2019-April 2020. Services related to delivery and early childhood care appeared more resilient with institutional deliveries only 20% below the April 2019 levels and the number of newborns receiving more than 6 HBNC 24%.

4.4.1. State level effects of COVID-19

By December 2020, all the services in almost every state were equal to or more than the December 2019 levels.

Table 4.4a: State level performance post COVID-19

Time Period	Least affected states	Most affected states
Crash Period **April 2020 compared to April 2019**	Andhra Pradesh Sikkim Uttarakhand Punjab Kerala Chhattisgarh	Uttar Pradesh Bihar Jharkhand Manipur
Recovery Period **December 2020 compared to December 2019**	Andaman and Nicobar Islands Lakshadweep Andhra Pradesh Jharkhand Meghalaya Jammu and Kashmir Rajasthan	Manipur Arunachal Pradesh Assam Goa

Source: HMIS, 2017 to 2021

In conclusion, as previously discussed, the levels of service provision and outcomes do not account for unregistered populations in HMIS. Therefore, in situations like COVID-19, when recording of administrative data is challenging and coverage of target populations is incomplete, it is important to also use sample surveys to assess impact on the outputs and outcomes related to these health services.

4.5. Input output correlations

Health and nutrition outcomes are affected by a number of factors including a range of nutrition-specific and nutrition-sensitive inputs. Many of the key performance indicators included in HMIS can be broadly categorized into "process outcomes" and "final outcomes." In general, we expect that specific process variables are linked to outcomes within the context of a theory of change, and that if interventions are well-executed and theoretically sound we should observe an "input-output" relationship. Our aim is to broadly characterize the nature of these relationships by state, over time. In this section, we explore the correlation between three input-output indicator pairs.

- Input: Percentage of women registered for ANC receiving a 180 day supply of IFA tablets; Output: percentage of estimated pregnancies diagnosed with anemia
- Input: Percentage of women registered for ANC completing more than 4 ANC visits; Output: percentage of estimated pregnancies that had an institutional delivery
- Input: Percentage of estimated pregnancies that had an institutional delivery; Output: percentage of infants breastfed within one hour of birth

Definitions of all indicators as specified in Appendix A. The data, methodology and results are provided in detail in Appendix C.

We observe expected relationships between specified inputs and outputs in most states.

Table 4.5a: Results from input-output correlations

Input	Output	Result
% women receiving 180 IFA	% women with anemia	20/27 states showed negative relationship; 7 state relationships were significant
% women completing 4 ANC checkups	% institutional deliveries	20/32 states showed positive relationship; 9 state relationships were significant
% institutional deliveries	% infants breastfed within one hour of birth	24/32 states showed positive relationship; 9 state relationships were significant

Conclusion

The goal of this report is to understand the state of health and nutrition using the latest available administrative data - we examine data from January to March 2021. We examine the quality of the data generated by HMIS and ICDS-RRS along various key dimensions. We then generate insights from the data to understand levels and trends in three key outcomes: low birth weight, anemia, and maternal mortality rates. We examine key nutrition-specific process indicators related to these outputs, and report trends and associations over January-March 2021, and complement this with trend analysis over 2017-2021. Leveraging the richness of these data, we also report on state and district-level variations.

HMIS and ICDS provide a somewhat reassuring picture of the post-2020 COVID world. Delivery of key services such as antenatal care, immunization and IFA supplementation resumed close to pre-COVID 2019 levels in December 2020. A caveat of note is that the trends we report are confounded by pandemic-led disruption in HMIS data entry, as opposed to only disruption of service delivery. Moreover, we are not able to report on outcome measures such as stunting, wasting using these data.

Administrative data from HMIS is somewhat reliable and can provide the framework, and be a key driver for supportive supervision activities under POSHAN Abhiyaan and a number of other health and nutrition related initiatives. The quality of these data can also be further improved by additional data quality measures including logic checks, back-checks, audits, and capacity building.

Overall, fostering a culture of data use can incentivize improvements in data quality, and more importantly, should help in collective problem solving and targeting resources effectively. HMIS and other administrative data are critical to provide feedback loops and for monitoring if public services are reaching registered beneficiaries. When assessing the overall scheme, these data systems should be complemented with survey data or social audits, particularly to provide a consumer perspective.

Finally, we suggest some potential actions to ensure usefulness and reliability of HMIS data in programme monitoring, and to support further improvements in key inputs and outcomes.

Table 5a. Summary of suggested actions by actor

Stakeholder/s	Suggested actions or priority areas
NITI Aayog	Foster a culture of evidence and data-driven programming Strengthen feedback loops to improve data quality and data use • Generate insights using the data on a regular basis • Monitor HMIS data on a regular basis • Create a feedback loop with state/district HMIS officials - provide them with data quality information Identify opportunities to improve inputs and outcomes across India • Engage with states to better understand and socialize patterns that emerge from quarterly reports • Investigate more deeply case-studies of positive deviance or resilience that emerge from quarterly monitoring. Relay back lessons learned from these states/districts (as an opportunity for cross-learning and gaining traction on data use)
Ministry of Health & Family Welfare and Ministry of Women & Child Development	Foster a culture of evidence and data-driven programming • Ensure standardised reporting formats at all facilities • Ensure indicator definitions are standardized and easier to compute (with appropriate numerators and denominators) • Support quickly operationalizable database (e.g. with unique IDs, variable names, etc) – currently data is available in disjointed form and requires manual downloading of files one by one for each geography Identify barriers and opportunities to improve inputs and outcomes • Develop mechanisms such that high data quality data is rewarded • Poor performance on indicators should trigger supportive actions during monthly meetings conducted by supervisors at various levels • Invest in both physical and human capacity to generate and utilize high quality data
State-level ICDS officials and State-level HFW officials	Use administrative data during regular supervision meetings to inform programmatic actions • Conduct regular systematised data quality checks before finalising the data • Assess and regularly monitor performance on indicators using administrative data. These reviews should also trigger corrective steps to support improvements

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Appendix

Appendix A - Methods

Data Access

HMIS data was downloaded from the publicly available data portals, accessible via: HMIS website for 2017 to 2020 data[41] and NRHM website for 2020 to 2021 data.[42] ICDS RRS data was provided directly to IDinsight via contacts at NITI Aayog. We were provided access to monthly data at the state-level for each state in India for a period of five months: July-November 2020.

Additional data sources referenced in this report included the fourth and fifth NFHS (NFHS-4 and NFHS-5),[43] the Comprehensive National Nutrition Survey (CNNS), the Rapid Survey on Children (RSOC), DDL's HMIS and IDinsight's Poshan survey round-2 data.

The use of administrative data is often constrained by ease of access and availability. HMIS data has been made publicly available only in the form of state-monthly standard reports and getting the dataset in a usable format is a cumbersome task. However, recent efforts by organisations such as Development Data Lab (DDL) have made this data accessible to the larger public.[44]

Data Cleaning

The data was downloaded monthly state-wise in excel format and we used StataSE/15 to combine these excel files into a single master data including estimates across districts from all states monthly estimates on all given indicators. The master dataset comprises 547 variables and 32,940 district-monthly level observations. We discuss below the challenges we faced while undertaking the cleaning process and the mitigation measures we took as a result:

- The district spellings across months and years did not match with each other. This led to absence of clear district concordance over time. As part of the cleaning we had to manually check for the district spellings that did not merge.
  - In the process, we generated unique-IDs for all districts.

- Some state and district boundaries had changed over time. For example - Jammu & Kashmir and Ladakh were separated as UTs in October 2019.
  - We considered them separate geographical units retrospectively before October 2019 in order to obtain each UT specific long term time trends.

41. https://hmis.nhp.gov.in/
42. https://nrhm-mis.nic.in/hmisreports/frmstandard_reports.aspx
43. At the time of analysis, NFHS-5 data was only available for 22 states/union territories.
44. https://www.devdatalab.org/covid

- Another step of cleaning involved getting, "analysis-ready" dataset with intuitive variable naming that can be used for generating insights.

The final step after generating the master dataset was to create proportion indicators to be able to compare and analyse performance of different geographic and temporal units of data. To create proportions, we needed reliable denominators and this was one of the biggest challenges we faced as discussed below.

Estimating denominators

HMIS makes data available as raw counts or numbers of the indicator at hand. For our analysis, we required proportions, so that we understand coverage and inclusion rates and compare across states. In some cases, we could use numerators and denominators found within HMIS data to produce proportions for each district or state during each month of the time series available. In some cases, a denominator was not readily available in HMIS data. For example, we aimed to include a proportion indicator of IFA supplementation during childhood. The numerator was available from the HMIS variable: *"9.9 Number of children (6-59 months) provided 8-10 doses (1ml) of IFA syrup (Biweekly),"* but the denominator required estimation of the total number of children in the 6-59 month age group in each district in India on a monthly basis across the four years of data analysed. We considered several estimation strategies as discussed in Table X.A1.

However, we decided to omit this indicator from analysis as we did not feel sufficient confidence in the denominator estimation process to draw nuanced insights from this indicator.

To successfully track performance on indicators, Ministries should consider ways to collect, process, and make public information on important denominators like this one. Below we present a list of such denominator estimations strategies that we undertook:

Table X.A1: Denominator Estimation Strategies

S. no.	Denominator	Strategies	Final Decision
1.	Estimated Pregnancies	• Using state-level annual HMIS figure on estimated pregnancies and use that to slice across districts and across months (for seasonality) • Generate an estimate using a combination of previous year record of deliveries, stillbirths • An estimation using the total population of women of child-bearing age and fertility rate. • Using total deliveries in each month from HMIS as a proxy for estimated pregnancies • We did not account for abortions due to lack of high qualitty data on this within HMIS. Based on high level assessment of this data, abortions account for 1% or less of the total pregnancies on average and should not affect the overall estimate	We used total deliveries (live births + stillbirths) in each month as a proxy for estimated pregnanciesIS
2.	Children 9-11 months	• Assuming uniform distribution of population, and therefore dividing the total Census population by a factor to estimate children aged between 9-11 months • Use uniform distribution of population and therefore dividing the population estimates in ICDS RRS for 0-3 years with a certain factor • Using live births from within HMIS data for 9-11 months ago subtracting stillbirths and deaths till the first 4 weeks of birth	We used live births from within HMIS data for 9-11 months ago subtracting stillbirths and deaths till the first 4 weeks of birth
3.	Children 6-59 months	• Assuming uniform distribution of population, and therefore dividing the total Census population by a factor to estimate children aged between 6-59 months • Using NFHS-4 unit-level data, to calculate proportion of 6-59 months children and multiply that factor from the total Census population • Using live births from within HMIS data for 6-59 months ago	Omitted from analysis
4.	Number of AWC/UPHCs	• Use number of AWC's from the ICDS RRS for the months that we have the data for (July-November 2020)	Omitted from analysis

Indicator Selection

In the following table, we give an exhaustive list of all indicators that we considered for analysis along with the reason for removal of those indicators from the analysis.

Table X.A2: Indicators selection

Lifecycle Stage	Indicator Definition	Source	Indicator in Report	If not, reason for removal
Outcome Indicators				
1 - Pregnancy	% of PW w/severe anemia treated against PW having severe anemia tested	HMIS	Yes	
1 - Pregnancy	% PW who are severely anemic (Hb <7), against PW tested 4 times	HMIS	No	Used a different definition with a diff denominator since tested 4 times could be stringent
2 - Delivery	Maternal deaths per 100k live births	HMIS	Yes	
1 - Pregnancy	% PW receiving who are anemic (Hb <11), against estimated preg	HMIS	No	Prop>100 issue over 35%, but discussed briefly in current levels
1 - Pregnancy	% PW receiving who are severely anemic (Hb <7), against estimated preg	HMIS	Yes	
1 - Pregnancy	% PW who are anemic (Hb <11), against PW tested 4 times	HMIS	No	Used a different definition with a diff denominator since tested 4 times could be stringent
2 - Delivery	% of low-birth-weight babies (Less than 2,500 gms)	HMIS	Yes	
2 - Delivery	% of home deliveries attended by an SBA out of total home deliveries	HMIS	No	This indicator is less directly tied to nutritional outcomes
3 - Early Childhood	% children (girls, boys) under 5 who are moderately malnourished (MAM)	ICDS RRS	Yes	
3 - Early Childhood	% children (girls, boys) under 5 who are severely malnourished (SAM)	ICDS RRS	No	Data quality is poor
3 - Early Childhood	Children (girls, boys) under 6 years old who regularly benefit from supplementary nutrition per lakh population, in late 2020	ICDS RRS	Yes	
3 - Early Childhood	% of SAM children admitted to NRC	HMIS	No	Data quality is poor; a high proportion of greater than 100% and lack of metadata or clarity in the HMIS data on how "# of SAM children" is measured.

Lifecycle Stage	Indicator Definition	Source	Indicator in Report	If not, reason for removal
Input Indicators				
1 - Pregnancy	% of pregnant women receiving 4+ ANC check-ups against total ANC registrations	HMIS	Yes	
1 - Pregnancy	% of ANC registered within 1st trimester against total ANC registrations	HMIS	No	Identified as slightly less useful than the 4+ANC indicator because the latter was comparable in the benchmarking exercise
1 - Pregnancy	% of pregnant women given 180 IFA tablets to total ANC registrations	HMIS	Yes	
1 - Pregnancy	% of PW registered for ANC against estimated pregnancies using total live births	HMIS	No	Data quality is poor
1 - Pregnancy	% PW receiving 2 doses TT injections, against ANC registrations	HMIS	No	Data quality is poor
1 - Pregnancy	% PW receiving 360 calcium tablets, against ANC registrations	HMIS	No	Was decided to be less relevant than some other priority indicators
1 - Pregnancy	% PW receiving 1 dose of albendazole after 1st trimester, against ANC registration	HMIS	No	Was decided to be less relevant than some other priority indicators
3 - Early Childhood	Children under 6 years old who regularly benefit from supplementary nutrition per lakh population, in late 2020	ICDS RRS	Yes	
3 - Early Childhood	% of newborns received 6 or more HBNC visits	HMIS	Yes	
3 - Early Childhood	% of children 6-59 months who receive 8-10 doses of IFA	HMIS	No	Denominator estimation is complicated; not confident in the results
Both[45]				
2 - Delivery	% of institutional deliveries out of total estimated deliveries	HMIS	Yes	
2 - Delivery	% of newborns breastfed within one hour of birth	HMIS	Yes	
3 - Early Childhood	% of children 9-11 months that are fully vaccinated	HMIS	Yes	did not use denom, estimation was an issue, used numerator

45. Both input and activity indicators depending on the lifecycle stage

Growth Rate Calculation

We have also discussed long state-level trends in Section 4 for the indicators of interest for the 48 month period from April 2017 to April 2021. As the basis of this analysis, we generated linear growth rates for each indicator to understand if, on average, the indicator has improved, worsened or stagnated over time.

The data is nested in a spatial hierarchy with repeated measures at regular intervals, we use MLM-RM to generate these growth rates. A multilevel model with repeated measures is a statistical model for analyzing hierarchical data over time. In this case, HMIS data is available for the nested hierarchy of districts within states. This data is also available as a time series, with the administrative data updated monthly at the district level. A multilevel model with repeated measures allows for estimates of changes over time between different units of analysis (e.g. between states, districts) and differences within the same unit over time.[46] In the Indian context, multilevel models have been used frequently for analysing data on maternal and child health, particularly on healthcare service utilization.[47,48] Using MLM on HMIS data we are able to obtain a linear monthly growth trend for all districts and states. These trends are then represented throughout the report as a quarterly growth rate by multiplying by three.

MLM-RM offers distinct advantages for comparative trend analysis. First, MLMs leverage correlations in a hierarchical (nested) data structure to calculate more accurate and precise parameter estimates than would be attainable if such nesting were ignored.[49] Second, MLMs with repeated measures allows the analyst to simultaneously estimate a separate regression line for each unit-level in the data. Combined, these two features imply that for each indicator of interest we are able to fit robust monthly growth rates at the state level.

Since we do not have more than five months of data from ICDS RRS, we are not able to create MLM-RM based growth rates with sufficient rigour from it.

Internal Data Quality

Completeness

To calculate the levels of completeness of the data, we calculated the **number of data points missing** for a given indicator and state.

Outliers

For this check, we flagged data points which were **greater than 3 standard deviations** away from the mean value for a given indicator.

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46. Steele, Fiona (2008) Multilevel models for longitudinal data. Journal of the Royal Statistical Society: series A (statistics in society)
47. Sridharan S, Dey A, Seth A, Chandurkar D, Singh K, Hay K, Gibson R. Towards an understanding of the multilevel factors associated with maternal health care utilization in Uttar Pradesh, India
48. Singh PK, Kumar C, Kumar Rai, Singh L, Factors associated with maternal healthcare services utilization in nine high focus states in India: a multilevel analysis based on 14 385 communities in 292 districts.
49. MLMs achieve this by assigning relatively greater weights to units within a hierarchy that are more precisely estimated. For example, the growth rate estimate for a district with relatively few data points and/or higher variance will be adjusted by its more precisely estimated neighbors (i.e. other districts in the same state), and likewise for state growth rates, which would be drawn to the pan-India average in case they are imprecisely estimated.

Consistency over time

We examine the trends of an indicator to determine whether specific reported values make logical sense in relation to other reported values.

Districts report some indicators as a cumulative value over the course of the financial year (a running total), while other indicators are properly captured as the new values for that month only. In some cases, we see that districts report a running total of indicators where only fresh totals are appropriate. This makes comparability across geographies difficult. If there is a data quality problem related to cumulative totals, we would expect:

- The data to be monotonically increasing with over time and the average size of this increase (slope) is larger than some threshold
- The value drops suddenly after the totals are refreshed at the beginning of the financial year

Therefore, we check whether in a district the value has been increasing for 6 consecutive months and it drops by over 80% in a given month with roughly annual intervals. If a district meets both the aforementioned criteria, then it is flagged as a case cumulative totals.

Consistency between indicators

Our second internal consistency check focused on the logic of our selected numerators and denominators in relation to each other. In many cases, we were able to generate proportion indicators using one or more HMIS variables as the denominator. These denominators were theoretically valid; for example, using estimated pregnancies as a denominator for anemia prevalence during pregnancy. If the reported data accurately reflects the true denominator value and numerator value, the consequent proportion should never be greater than 100%.

Comparison of point estimates

We compared district level estimates from HMIS and NFHS to check if the HMIS values were comparable enough to the NFHS estimates. We conducted this exercise with both NFHS-4 as compared with HMIS 2017 annual average and NFHS-5 as compared with 2019 annual average. To do this, we created margin of errors across NFHS-4 and NFHS-5 estimates and checked if HMIS value fell within the range. We used the following formula to calculate the MoEs for the NFHS-5 and NFHS-4 indicators:

$$MoE = 1.96 * sqrt\,(DE * (prop * (1 - prop))/N)$$

Here, *prop* is the indicator estimate reported in the NFHS-5 and NFHS-4 datasets. is the Design Effect for each indicator. is the sample size for the indicator. We assumed the binomial approximation to the normal distribution for indicators measured as proportions. Since, the design effects for NFHS-5 indicators have not been published yet we used the design effects included in the NFHS-4 survey documentation for similar indicators. This is permissible because the sampling strategies applied for both NFHS-4 and NFHS-5 as well as the sampling frame used for both the surveys are the same.

We used the sample sizes reported in the NFHS-5 factsheets to calculate the MoE. For all indicators, we have used the total female population as the sample size. However, the true sample size for these indicators may not include all women. In absence of clear information on the sample sizes for sub-populations, we continue to use full female sample sizes. The implication for this is that, due to large sample size our margin of errors would be more conservative.

Finally, we calculated the upper and lower bounds of the estimates for each indicator.
Upper bound = Indicator estimate (prop) + MoE

Lower bound = Indicator estimate (prop) - MoE

Comparison of rankings

We compared a relative ranking of state performance on each indicator between HMIS and NFHS surveys. Considering these legitimate differences between HMIS and NFHS, we decided against a point-to-point comparison of values or a test of whether HMIS values fall within estimated confidence intervals around NFHS values. If HMIS and NFHS both reflect the on-the-ground reality, we would expect to see the same states perform well in comparison to other states for a given indicator. For example, the states with relatively high levels of institutional delivery reported in NFHS-5 should also have relatively high levels of institutional delivery reported in HMIS.

Based on this assumption, we developed an approach to compare indicator estimates across NFHS surveys and HMIS. This is not a final assessment on the accuracy of HMIS in each state, but provides insights on the quality of specific indicators as reported by states.

- Where possible, we compare HMIS against NFHS-5, as it is the most recent population-based sample survey available. However, as of August 2021, NFHS-5 data is only available for 22 states/Union Territories (UTs). We use NFHS-4 estimates for the states/UTs for which NFHS-5 data has not yet been released.

- As HMIS provides a monthly time series of estimates, we had to select a value to compare against NFHS-4 and against NFHS-5. We opted to create a yearly average HMIS at the state-level for each indicator.[50] To compare against NFHS-5 (2019-2020), we generated average values for 2019 for each state. To compare against NFHS-4 (2015-2016), we generated average values from April 2017 to March 2018.[51,52]

- For each indicator and data source, we ranked and assigned states to quintiles. For example, Kerala had the highest reported levels of institutional delivery in NFHS-4, so it was assigned to the top quintile for that indicator and data source.

- We assigned states a benchmarking score for each indicator we could benchmark. The scores are meant as an aid in distinguishing between states for which HMIS reporting

50. We chose a yearly average, rather than quarterly, to mitigate some of the seasonality patterns we observed in HMIS data.
51. This was the earliest year of data that we had cleaned and available for comparison.
52. Since NFHS-4 was conducted primarily in 2016, it is still comparable with HMIS values of 2017-18 - the criteria we use is fairly lenient and a state has to really have displayed extreme performance change to surpass our data quality thresholds

appears plausible and those for which the values seem implausible. Benchmarking scores were based on the following criteria:

- A score of **3** was assigned if the value reported in HMIS was within the same quintile or within the quintile above or below the quintile assigned to the NFHS value,[53] and the HMIS value fell within ± 20 percentage points of the NFHS value.[54]
- A score of **2** was assigned if the value reported in HMIS was within the same quintile or within the quintile above or below the quintile assigned to the NFHS value.
- A score of **1** was assigned if the HMIS value fell with ± 20 percentage points of the NFHS value
- A score of **0** was assigned if none of the above conditions were met

- A single benchmarking score was generated for each state by averaging the benchmarking scores for the six comparison indicators used. Refer to Table X.B3 - X.B5 in Appendix B for the benchmarking scores for each indicator and states.

Input output correlations - data and basic specification

The dataset for this analysis is the monthly HMIS time series from April, 2017 to April, 2021, a period of 48 months. The unit of analysis is the 36 states and union territories. Therefore, each row of the dataset represents a state-month. The data are cleaned and all indicators are calculated as described in section 2 and Appendix A.

Sometimes a state was missing data for one or both of the indicators in a given input/output pair, and in those cases we dropped the state from analysis; details are given below in the pairwise discussion of each input/output relationship.

53. We decided to adopt a more flexible criteria on assessing quintile matches across datasets, as several states with poor data quality could effectively "bump" states down to another quintile.
54. The +/- 20 pp rule serves as a redundancy check, helping to distinguish between cases where the indicator estimate passes the quintile rule but has a vastly different point estimate, or fails the quintile test but is within a plausible range.

Box 3. Technical details of key input-output analysis

To assess the strength of the input-output relationships listed above, we regress the output in state s at time t on the corresponding input in state s at time t, with an added control for time period

$$Output_{st} = \alpha + \beta_1 Input_{st} + \beta_2 time + \varepsilon \qquad (1)$$

We estimate the model by ordinary least squares (OLS) individually for every state included in the analysis of a given indicator pair.

Note that this is a parsimonious regression specification: we have included minimal explanatory variables in these exploratory regressions. It is likely that, in the case of some states and some indicators, omitted regressors other than the input of interest and time could also affect the output variable, and that estimation of the β_1 parameter is biased. This is especially true of the other inputs listed above that are not included in the specification for a particular output. For instance, we might hypothesize that completing 4+ ANC appointments also affects anemia rates, and not just IFA provision. However, these two explanatory variables are often highly correlated and including both in the same OLS regression results in incorrect and unpredictable parameter estimates.[55] For this reason, we prefer to omit additional explanatory variables related to ANC.

In addition to omitted causal parameters, we are concerned with relevant variables that change over time but are not directly measurable, such as common shocks, policy changes, and changes in knowledge, attitudes and practices of pregnant women and frontline health workers. To control for these we introduce a simple control for a linear time trend.[56] Overall model performance as measured by R^2 ranges from a poor fit to reasonably well-fitted models, varying by state and by indicator. For the analysis of IFA supply and anemia, R^2 ranges from 0.01 to 0.53 with an average of 0.23. For the comparison of 4+ ANC and institutional delivery, the range was 0.02 to 0.76.

Appendix B - Data Quality

The World Health Organization (WHO) released a data quality toolkit for health management information systems, which outlines four specific dimensions of data quality:[57]

- Completeness and timeliness
- Internal consistency
- External consistency
- External comparisons of population data

Below we present the outputs for all the checks we conduct to establish the extent of reliability on the Health Management Information Systems (HMIS).

55. Technically this condition is known as multicollinearity. Technical checks, including pairwise correlation coefficients and variance inflation factors, confirm that the input variables mentioned above are frequently collinear at the state level. We have omitted the results of these tests (they are voluminous) but they can be provided upon request.
56. Visual inspection of statewise time series plots and exploratory regressions suggests that linear time trends are adequate. Including a quadratic term or other higher order polynomial rarely if ever improved the model.
57. WHO, (2017). Data Quality Review, Module 1: Framework and metrics.

Completeness and internal data quality by indicator

Table X.B1: Completeness of data by indicator

Based on monthly HMIS data reported between April 2017 and March 2021

Indicator name	% of observations with proportion > 100%	% of observations missing	% of outlier observations	Average DQ score	Data Reliability
PW registered for ANC	94%	1%	0%	31%	Least Reliable
SAM children admitted to NRC	43%	47%	0%	30%	Least Reliable
PW receiving 2 doses TT injections	85%	0%	0%	28%	Least Reliable
Maternal Mortality Rate	56%	4%	0%	20%	Least Reliable
PW receiving who are anemic (Hb <11)	47%	1%	0%	16%	Least Reliable
PW given 180 IFA tablets	24%	0%	0%	8%	Somewhat Reliable
Home deliveries attended by an SBA	0%	18%	0%	6%	Somewhat Reliable
Newborns received 6 or more HBNC visits	12%	2%	0%	5%	Somewhat Reliable
PW receiving 360 calcium tablets	16%	0%	0%	5%	Somewhat Reliable
PW with severe anemia treated against tested	8%	9%	0%	5%	Somewhat Reliable
PW receiving 4+ ANC check-ups	11%	0%	0%	4%	Somewhat Reliable
Children 9 to 11 months that are fully immunized	3%	7%	0%	3%	Least Reliable**
Institutional deliveries	6%	1%	1%	3%	Most Reliable
Newborns breastfed within 1 hour of birth	3%	0%	2%	2%	Most Reliable
PW receiving 1 dose of albendazole after 1st trimester	2%	0%	0%	1%	Most Reliable
Low-birth-weight babies	0%	1%	0%	0%	Most Reliable
PW registered for ANC in the first trimester of pregnancy	1%	0%	0%	0%	Most Reliable
PW receiving who are severely anemic (Hb <7)	0%	1%	0%	0%	Most Reliable

**Despite being reliable as per internal data quality checks, this indicator is categorised least reliable because of unavailability of precise estimates for denominator

Completeness and internal data quality by state

Table X.B2: Completeness and internal data quality by state

Based on monthly HMIS data reported between January and March 2021, the average incidence is across 14 shortlisted indicators

State	Completeness	Internal Data Quality		
	Incidence of Missing values	Incidence of Proportion >100	Incidence of outliers	Incidence of cumulative totals**
Andaman & Nicobar Islands	8%	25%	0%	0%
Andhra Pradesh	4%	35%	0%	0%
Arunachal Pradesh	17%	13%	1%	0%
Assam	4%	23%	0%	1%
Bihar	4%	17%	0%	0%
Chhattisgarh	3%	31%	0%	0%
DNH & DND	0%	19%	0%	0%
Delhi	8%	22%	0%	0%
Goa	4%	6%	0%	0%
Gujarat	3%	27%	0%	0%
Haryana	3%	24%	0%	0%
Himachal Pradesh	7%	24%	0%	0%
Jammu & Kashmir	9%	24%	0%	0%
Jharkhand	3%	24%	0%	0%
Karnataka	2%	35%	0%	0%
Kerala	5%	23%	0%	0%
Ladakh	6%	22%	0%	0%
Lakshadweep	9%	19%	0%	0%
Madhya Pradesh	1%	31%	0%	0%
Maharashtra	3%	27%	0%	0%
Manipur	12%	11%	2%	0%
Meghalaya	3%	16%	1%	0%
Mizoram	11%	19%	0%	0%
Nagaland	17%	10%	1%	0%
Odisha	2%	24%	0%	0%
Puducherry	11%	16%	1%	1%
Punjab	4%	22%	0%	0%
Rajasthan	5%	23%	0%	0%
Sikkim	11%	20%	1%	0%
Tamil Nadu	7%	29%	1%	0%

State	Completeness	Internal Data Quality		
	Incidence of Missing values	Incidence of Proportion >100	Incidence of outliers	Incidence of cumulative totals**
Telangana	11%	29%	1%	0%
Tripura	5%	18%	0%	0%
Uttar Pradesh	2%	24%	0%	1%
Uttarakhand	6%	21%	0%	0%
West Bengal	3%	22%	0%	1%

** Cumulative totals check can be calculated only on the full dataset and hence is not focussed only on the last quarter.

External Consistency

Table X.B3. HMIS 2017 vs. NFHS-4 Quintile Benchmark

Indicator	% states in the same quintile across datasets	% states in the same quintile (+/- 1) across datasets
Percent institutional deliveries	59%	88%
Percent of newborns with birth weight under 2.5kg	40%	74%
Percent of pregnant women who received 4+ ANC check-ups	31%	69%
Percent of home deliveries attended by an SBA	32%	68%
Percent of newborns breastfed within 1 hour of birth	26%	63%
Percent of pregnant women who are anemic	36%	57%
Percent of pregnant women who received 2+ TT doses	18%	36%

Table X.B4. HMIS 2019 vs. NFHS-5 Quintile Benchmark

Indicator	% states in the same quintile across datasets	% states in the same quintile (+/- 1) across datasets
Percent institutional deliveries	47%	79%
Percent of pregnant women who received 4+ ANC check-ups	25%	70%
Percent of pregnant women who are anemic	25%	63%
Percent of pregnant women who received 2+ TT doses	14%	57%
Percent of newborns breastfed within 1 hour of birth	20%	55%
Percent of home deliveries attended by an SBA	20%	35%
Percent of newborns with birth weight under 2.5kg	*	*

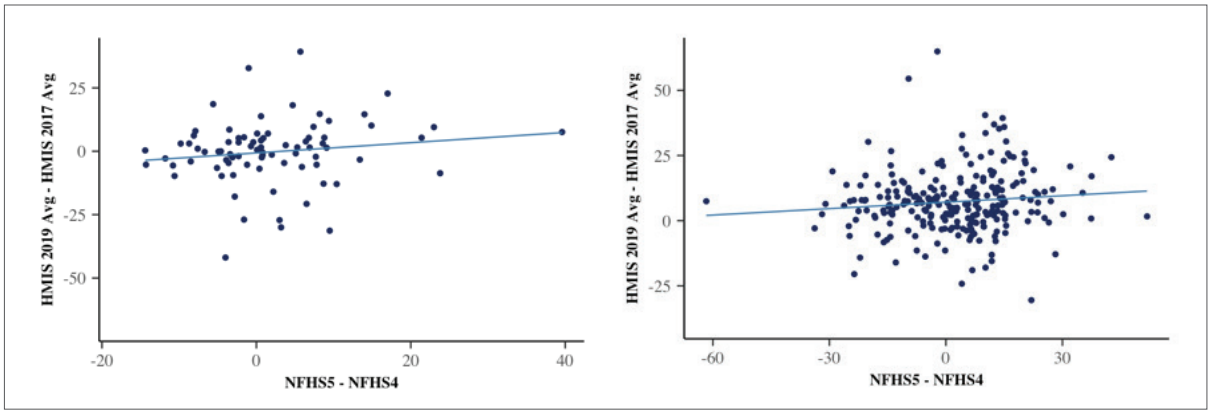
Table X.B5: State-wise benchmarking scores for HMIS vs. NFHS

No.	State / Union Territory	NFHS round	Average benchmarking score	Number of districts
1	Andaman & Nicobar Islands	5	1.8	3
2	Andhra Pradesh	5	1.2	13
3	Arunachal Pradesh	4	2.2	20
4	Assam	5	1.8	27
5	Bihar	5	1.4	38
6	Chandigarh	4	2.8	1
7	Chhattisgarh	4	1.0	27
8	Dadra & Nagar Haveli	4	2.5	1
9	Daman & Diu	4	2.2	2
10	Delhi	4	1.5	11
11	Goa	5	1.6	2
12	Gujarat	5	2.2	33
13	Haryana	4	1.8	22
14	Himachal Pradesh	5	2.2	12
15	Jammu & Kashmir	5	2.3	22
16	Jharkhand	4	1.0	24
17	Karnataka	5	0.8	30
18	Kerala	5	2.2	14
19	Ladakh	4		
20	Lakshadweep	5	1.6	1
21	Madhya Pradesh	4		51
22	Maharashtra	5	1.0	35
23	Manipur	5	2.0	9
24	Meghalaya	5	1.8	11
25	Mizoram	5	1.8	9
26	Nagaland	5	2.0	11
27	Odisha	4	2.2	30
28	Puducherry	4	1.0	4
29	Punjab	4	2.2	22
30	Rajasthan	4	2.2	33
31	Sikkim	5	2.2	4
32	Tamil Nadu	4	2.0	32
33	Telangana	5	2.0	31
34	Tripura	5	2.0	8
35	Uttar Pradesh	4	2.0	75
36	Uttarakhand	4	1.7	13
37	West Bengal	5	1.2	23

Note: States with a score below 1.5 are highlighted in grey. These states fall below the benchmarking score threshold we have set or have no data quality information available. These states are highlighted separately in the remainder of the report and omitted from discussion of results, as the values reported in HMIS by these states are potentially unreliable.

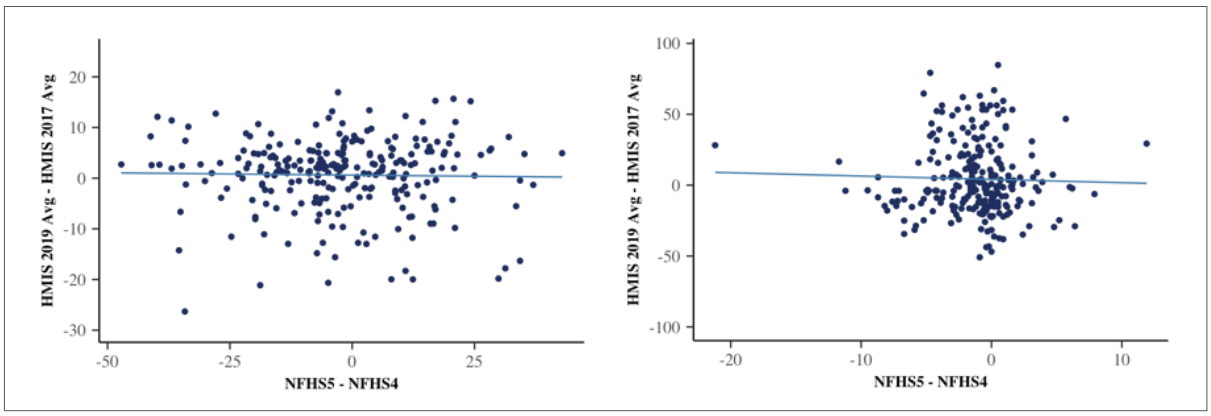
NFHS vs HMIS trends correlation

Figure X.B1: Correlation plots for 2 TT doses and 4+ ANC check ups



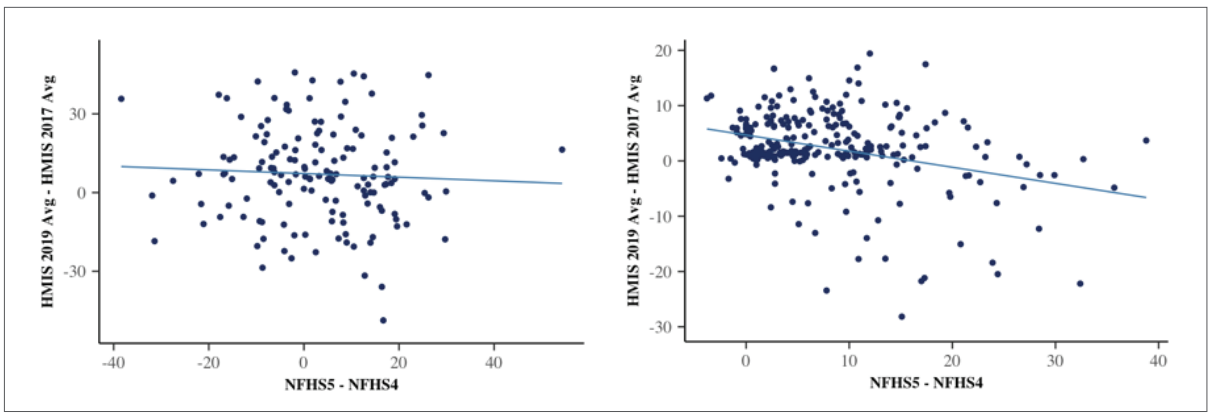
Source: XX

Figure X.B2: Correlation plots for early initiation of breastfeeding and home deliveries by SBA



Source: XX

Figure X.B3: Correlation plots for anemia and institutional deliveries



Source: XX

Appendix C - Findings

Status of key outcome indicators

Table X.C1 includes state-wise estimates for key outcome indicators in the first quarter of 2021. Table X.C2 presents the average estimates for MAM and SNP from ICDS RRS – for the 5 month period.

Notes: 1. State-level averages are calculated taking the sum of numerators in all districts in a month divided by the sum of denominators in all districts in a given month. However, the extent of data quality mitigation (dropping rows with greater than 100 proportion and missing values) might differ across numerator and denominators while calculating state proportions. 2. States highlighted in grey were omitted from the analysis post the benchmarking exercise discussed in section 3.3.

Table X.C1. HMIS state-wise quarter average performance of key outcomes

January to March 2021

State	% of low birth-weight babies (Less than 2,500 gms)	% PW who are severely anemic (Hb <7)
Andaman & Nicobar Islands	18.09%	2.58%
Andhra Pradesh	4.28%	3.35%
Arunachal Pradesh	5.82%	2.50%
Assam	13.43%	3.33%
Bihar	10.07%	2.46%
Chhattisgarh	11.61%	2.91%
Delhi	28.22%	3.60%
DNH & DND	22.78%	5.81%
Goa	14.95%	2.00%
Gujarat	12.95%	5.87%
Haryana	12.00%	6.80%
Himachal Pradesh	13.46%	0.86%
Jammu & Kashmir	5.12%	
Jharkhand	6.07%	1.98%
Karnataka	11.31%	5.90%
Kerala	13.63%	1.59%
Ladakh	9.09%	2.51%
Lakshadweep	7.79%	2.30%
Madhya Pradesh	15.36%	6.35%
Maharashtra	10.25%	4.53%
Manipur	3.92%	0.45%

State	% of low birth-weight babies (Less than 2,500 gms)	% PW who are severely anemic (Hb <7)
Meghalaya	7.04%	6.05%
Mizoram	5.11%	1.14%
Nagaland	4.89%	1.10%
Odisha	18.54%	1.66%
Puducherry	12.08%	5.08%
Punjab	6.73%	2.70%
Rajasthan	13.03%	3.90%
Sikkim	7.26%	2.22%
Tamil Nadu	16.65%	13.44%
Telangana	11.50%	8.83%
Tripura	10.83%	2.10%
Uttar Pradesh	9.69%	5.29%
Uttarakhand	8.36%	2.62%
West Bengal	21.79%	1.55%
India (National Average)	11.75%	5.09%

Table X.C2. HMIS state-wise quarter average performance of key process outcomes

January to March 2021

State	% of PW receiving 4+ ANC check-ups against total ANC registrations	% of pregnant women given 180 IFA tablets to total ANC registrations	% of institutional deliveries out of total estimated deliveries	Newborns who received 6+ HBNC visits
Andaman & Nicobar Islands	60.20%	56.66%	98.53%	81.33%
Andhra Pradesh	93.34%	99.08%	97.89%	81.56%
Arunachal Pradesh	26.35%	53.37%	89.22%	20.73%
Assam	79.67%	95.13%	89.28%	99.95%
Bihar	68.89%	76.97%	80.98%	51.95%
Chhattisgarh	92.90%	98.37%	97.75%	54.85%
Delhi	78.60%	93.13%	97.58%	65.03%
DNH & DND	39.56%	56.63%	92.92%	51.27%
Goa	60.01%	74.29%	98.98%	0.06%
Gujarat	77.35%	95.12%	97.15%	66.06%
Haryana	60.24%	71.61%	94.71%	43.41%
Himachal Pradesh	69.38%	78.80%	91.03%	88.85%
Jammu & Kashmir	46.42%	54.32%	92.15%	46.17%
Jharkhand	82.93%	96.60%	96.31%	55.77%

State	% of PW receiving 4+ ANC check-ups against total ANC registrations	% of pregnant women given 180 IFA tablets to total ANC registrations	% of institutional deliveries out of total estimated deliveries	Newborns who received 6+ HBNC visits
Karnataka	87.00%		99.37%	51.88%
Kerala	96.50%	88.89%	97.42%	6.59%
Ladakh	47.47%	96.33%	98.14%	19.92%
Lakshadweep	81.00%	85.70%	98.98%	47.19%
Madhya Pradesh	81.77%	97.16%	94.77%	56.06%
Maharashtra	93.95%	96.98%	99.01%	20.58%
Manipur	40.35%	44.97%	77.77%	53.88%
Meghalaya	56.43%	58.42%		69.47%
Mizoram	56.08%	61.28%	83.77%	32.46%
Nagaland	16.04%	33.39%	77.24%	26.20%
Odisha	85.86%	91.66%	97.57%	91.87%
Puducherry	56.30%	63.89%	99.60%	24.58%
Punjab	64.54%	58.96%	98.01%	63.89%
Rajasthan	56.42%	89.36%	98.11%	18.04%
Sikkim	63.79%	64.89%	98.99%	74.53%
Tamil Nadu	90.50%	97.38%	95.20%	4.13%
Telangana	77.04%		92.79%	41.05%
Tripura	62.86%	51.23%	93.10%	83.86%
Uttar Pradesh	81.85%	95.45%	89.72%	69.52%
Uttarakhand	78.75%	89.89%	87.29%	71.80%
West Bengal	73.50%	78.72%	97.64%	60.76%
India (National Average)	77.23%	90.44%	93.21%	54.04%

Table X.C3. ICDS RRS State-wise Average Performance of SNP and MAM

July to November 2020

State	MAM (in%)	MAM High/ Low	SNP children beneficiaries (per lakh population)	SNP Beneficiaries High/Low
Andaman & Nicobar Islands	1.87%	Low	3,357	High
Andhra Pradesh	7.08%	Low	2,819	Low
Arunachal Pradesh	0.09%	Low	2,636	Low
Assam	9.55%	High	3,315	High
Bihar	18.33%	High	2,370	Low
Chandigarh	9.95%	High	2,622	Low
Chhattisgarh	13.76%	High	6,999	High

State	MAM (in%)	MAM High/ Low	SNP children beneficiaries (per lakh population)	SNP Beneficiaries High/Low
DNH & DND	13.64%	High	1,744	Low
Delhi	8.49%	High	2,424	Low
Goa	3.16%	Low	2,840	Low
Gujarat	6.82%	Low	4,369	High
Haryana	7.68%	High	2,736	Low
Himachal Pradesh	4.39%	Low	4,510	High
Jammu & Kashmir	1.35%	Low	1,222	Low
Jharkhand	6.11%	Low	3,995	High
Karnataka	11.50%	High	2,924	High
Kerala	16.68%	High	2,801	Low
Ladakh	0.12%	Low	3,777	High
Lakshadweep				
Madhya Pradesh				
Maharashtra	9.68%	High	1,813	Low
Manipur	0.03%	Low	3,129	High
Meghalaya	7.66%	High	13,278	High
Mizoram	1.08%	Low	8,287	High
Nagaland				
Odisha	8.36%	High	6,510	High
Puducherry	3.30%	Low	1,704	Low
Punjab	6.65%	Low	2,210	Low
Rajasthan	9.39%	High	2,164	Low
Sikkim	0.04%	Low	2,720	Low
Tamil Nadu	4.70%	Low	3,625	High
Telangana	11.01%	High	2,632	Low
Tripura	3.94%	Low	3,694	High
Uttar Pradesh	11.13%	High	3,554	High
Uttarakhand	1.21%	Low	3,673	High
West Bengal	8.37%	High	2,356	Low

Note: Above median values in MAM and SNP are classified as “High” and below median values in both are classified as “Low”

Table X.C4. State-wise number of districts categorised by performance for low birth weight babies

January to March 2021

State	% of low-birth-weight babies (Less than 2,500 gms)				
	Missing	#Good (Less than 5%)	# Medium (5 to 15%)	# Bad (More than 15%)	Majority are...
A & N Islands	0	0	1	2	Bad
Andhra Pradesh	0	10	3	0	Good
Arunachal Pradesh	1	16	7	1	Good
Assam	0	1	24	8	Medium
Bihar	0	1	32	5	Medium
Chhattisgarh	0	0	18	10	Medium
Delhi	0	0	1	10	Bad
DNH & DND	0	1	0	2	Bad
Goa	0	0	1	1	Medium
Gujarat	0	0	19	14	Medium
Haryana	0	1	18	3	Medium
Himachal Pradesh	0	1	8	3	Medium
Jammu & Kashmir	0	16	4	0	Good
Jharkhand	0	7	16	1	Medium
Karnataka	0	1	25	4	Medium
Kerala	0	0	8	6	Medium
Ladakh	0	0	2	0	Medium
Lakshadweep	0	0	1	0	Medium
Madhya Pradesh	0	0	22	30	Bad
Maharashtra	0	3	21	12	Medium
Manipur	0	13	3	0	Good
Meghalaya	0	5	6	0	Medium
Mizoram	0	6	5	0	Good
Nagaland	1	9	2	0	Good
Odisha	0	0	9	21	Bad
Puducherry	0	1	3	0	Medium
Punjab	0	5	16	1	Medium
Rajasthan	0	2	20	11	Medium
Sikkim	0	1	3	0	Medium
Tamil Nadu	0	0	15	23	Bad
Telangana	1	5	22	5	Medium
Tripura	0	0	7	1	Medium
Uttar Pradesh	0	3	59	13	Medium
Uttarakhand	0	4	8	1	Medium
West Bengal	0	0	1	22	Bad

Table X.C5. State-wise number of districts categorised by performance for pregnant women who are severely anemic

January to March 2021

State	% PW who are severely anemic (Hb <7), against estimated pregnancies				
	NA	#Good (Less than 5%)	# Medium (5 to 15%)	# Bad (More than 15%)	Majority are...
A & N Islands	0	1	0	2	Bad
Andhra Pradesh	0	0	0	13	Bad
Arunachal Pradesh	13	5	1	6	NA
Assam	1	3	1	28	Bad
Bihar	1	3	3	31	Bad
Chhattisgarh	0	0	0	28	Bad
Delhi	1	0	0	10	Bad
DNH & DND	0	1	0	2	Bad
Goa	0	0	0	2	Bad
Gujarat	0	0	0	33	Bad
Haryana	2	0	0	20	Bad
Himachal Pradesh	2	1	0	9	Bad
Jammu & Kashmir	0	1	1	18	Bad
Jharkhand	0	0	0	24	Bad
Karnataka	0	0	0	30	Bad
Kerala	0	0	0	14	Bad
Ladakh	1	0	0	1	NA
Lakshadweep	0	0	0	1	Bad
Madhya Pradesh	0	3	1	48	Bad
Maharashtra	0	0	0	36	Bad
Manipur	12	0	0	4	NA
Meghalaya	1	1	0	9	Bad
Mizoram	2	4	0	5	Bad
Nagaland	6	3	0	3	NA
Odisha	0	1	0	29	Bad
Puducherry	2	0	0	2	NA
Punjab	0	2	0	20	Bad
Rajasthan	0	0	0	33	Bad
Sikkim	1	1	0	2	Bad
Tamil Nadu	0	0	2	36	Bad
Telangana	0	2	1	30	Bad
Tripura	1	0	0	7	Bad
Uttar Pradesh	0	1	3	71	Bad
Uttarakhand	1	1	0	11	Bad
West Bengal	1	1	1	20	Bad

Table X.C6. State-wise number of districts categorised by performance for 4+ ANC checkups

January to March 2021

State	NA	#Good (More than 80%)	# Medium (60 to 80%)	# Bad (Less than 60%)	Majority are...
A & N Islands	0	1	0	2	Bad
Andhra Pradesh	2	0	10	1	Medium
Arunachal Pradesh	0	23	2	0	Good
Assam	1	4	7	21	Bad
Bihar	0	10	10	18	Bad
Chhattisgarh	4	0	22	2	Medium
Delhi	0	0	1	2	Bad
DNH & DND	0	9	0	2	Good
Goa	0	1	0	1	Good
Gujarat	0	0	13	20	Bad
Haryana	0	6	2	14	Bad
Himachal Pradesh	0	4	4	4	Good
Jammu & Kashmir	0	6	5	9	Bad
Jharkhand	1	3	16	4	Medium
Karnataka	2	0	22	6	Medium
Kerala	4	0	8	2	Medium
Ladakh	0	2	0	0	Good
Lakshadweep	0	0	1	0	Medium
Madhya Pradesh	1	1	20	30	Bad
Maharashtra	2	0	33	1	Medium
Manipur	0	15	1	0	Good
Meghalaya	0	5	0	6	Bad
Mizoram	0	8	0	3	Good
Nagaland	1	11	0	0	Good
Odisha	1	0	23	6	Medium
Puducherry	0	2	1	1	Good
Punjab	0	6	1	15	Bad
Rajasthan	0	20	3	10	Good
Sikkim	0	1	0	3	Bad
Tamil Nadu	5	4	21	8	Medium
Telangana	3	14	6	10	Good
Tripura	0	2	0	6	Bad
Uttar Pradesh	3	8	37	27	Medium
Uttarakhand	0	0	5	8	Bad
West Bengal	0	2	7	1	Medium

Table X.C7. State-wise number of districts categorised by performance for 180+ IFA provision

January to March 2021

State	NA	#Good (More than 80%)	# Medium (60 to 80%)	# Bad (Less than 60%)	Majority are...
Andaman & Nicobar Islands	0	1	0	2	Bad
Andhra Pradesh	3	0	10	0	Medium
Arunachal Pradesh	0	8	6	11	Bad
Assam	3	0	29	1	Medium
Bihar	1	9	12	16	Bad
Chhattisgarh	8	0	19	1	Medium
Delhi	1	0	0	2	Bad
DNH & DND	1	7	2	1	Good
Goa	0	0	1	1	Medium
Gujarat	2	0	29	2	Medium
Haryana	0	8	4	10	Bad
Himachal Pradesh	0	1	5	6	Bad
Jammu & Kashmir	0	2	13	5	Medium
Jharkhand	4	0	16	4	Medium
Karnataka	16	0	14	0	NA
Kerala	6	1	2	5	NA
Ladakh	0	0	2	0	Medium
Lakshadweep	0	0	1	0	Medium
Madhya Pradesh	4	0	46	2	Medium
Maharashtra	4	0	29	3	Medium
Manipur	1	12	1	2	Good
Meghalaya	0	6	4	1	Good
Mizoram	0	7	0	4	Good
Nagaland	1	8	1	2	Good
Odisha	1	0	26	3	Medium
Puducherry	0	2	0	2	Good
Punjab	0	9	2	11	Bad
Rajasthan	7	1	20	5	Medium
Sikkim	0	1	0	3	Bad
Tamil Nadu	5	2	22	9	Medium
Telangana	8	3	20	2	Medium
Tripura	0	5	0	3	Good
Uttar Pradesh	6	2	49	18	Medium
Uttarakhand	0	0	11	2	Medium
West Bengal	1	2	11	9	Medium

Table X.C8. State-wise number of districts categorised by performance for institutional deliveries

January to March 2021

State	NA	#Good (More than 90%)	# Medium (75 to 90%)	# Bad (Less than 75%)	Majority are...
Andaman & Nicobar Islands	0	3	0	0	Good
Andhra Pradesh	0	13	0	0	Good
Arunachal Pradesh	1	13	8	3	Good
Assam	1	21	8	3	Good
Bihar	2	6	23	7	Medium
Chhattisgarh	0	25	2	1	Good
Delhi	0	8	2	1	Good
DNH & DND	0	3	0	0	Good
Goa	0	2	0	0	Good
Gujarat	0	32	1	0	Good
Haryana	0	20	2	0	Good
Himachal Pradesh	0	8	3	1	Good
Jammu & Kashmir	0	13	6	1	Good
Jharkhand	0	20	4	0	Good
Karnataka	3	25	2	0	Good
Kerala	0	13	1	0	Good
Ladakh	0	2	0	0	Good
Lakshadweep	0	1	0	0	Good
Madhya Pradesh	0	43	9	0	Good
Maharashtra	0	35	1	0	Good
Manipur	4	2	3	7	Bad
Meghalaya	5	0	1	5	NA
Mizoram	1	6	2	2	Good
Nagaland	1	2	3	6	Bad
Odisha	1	26	3	0	Good
Puducherry	0	4	0	0	Good
Punjab	0	22	0	0	Good
Rajasthan	0	33	0	0	Good
Sikkim	1	3	0	0	Good
Tamil Nadu	0	32	5	1	Good
Telangana	0	26	7	0	Good
Tripura	0	5	3	0	Good
Uttar Pradesh	0	46	23	6	Good
Uttarakhand	0	4	8	1	Medium
West Bengal	1	22	0	0	Good

Table X.C9. State-wise number of districts categorised by performance for 6+ HBNC visits

January to March 2021

State	NA	#Good (More than 80%)	# Medium (60 to 80%)	# Bad (Less than 60%)	Majority are...
Andaman & Nicobar Islands	0	0	2	1	Medium
Andhra Pradesh	2	3	2	6	Bad
Arunachal Pradesh	0	19	2	4	Good
Assam	17	1	13	2	NA
Bihar	0	26	2	10	Good
Chhattisgarh	0	15	0	13	Good
Delhi	0	2	0	1	Good
DNH & DND	2	7	2	0	Good
Goa	0	2	0	0	Good
Gujarat	1	16	8	8	Good
Haryana	0	16	0	6	Good
Himachal Pradesh	5	1	3	3	NA
Jammu & Kashmir	4	10	1	5	Good
Jharkhand	0	12	3	9	Good
Karnataka	0	16	3	11	Good
Kerala	0	14	0	0	Good
Ladakh	0	2	0	0	Good
Lakshadweep	0	1	0	0	Good
Madhya Pradesh	1	27	4	20	Good
Maharashtra	0	31	2	3	Good
Manipur	3	9	3	1	Good
Meghalaya	0	2	3	6	Bad
Mizoram	1	8	0	2	Good
Nagaland	1	11	0	0	Good
Odisha	4	1	18	7	Medium
Puducherry	0	2	0	2	Good
Punjab	1	7	11	3	Medium
Rajasthan	0	33	0	0	Good
Sikkim	1	1	2	0	Medium
Tamil Nadu	0	38	0	0	Good
Telangana	2	20	3	8	Good
Tripura	3	1	3	1	NA
Uttar Pradesh	0	16	24	35	Bad
Uttarakhand	1	2	2	8	Bad
West Bengal	0	9	8	6	Good

Trends of key outcome indicators

Tables X.C6-X.C8 include state-wise estimates for MLM growth rate for key outcome indicators between 2017 and 2021. These include: low birth weight babies, institutional deliveries, MMR, and severe anemia among pregnant women. These are followed by Table X.C9-X.C11 which present the number of districts for which the respective indicator grew, fell or was stagnant between 2017 to 2021.

Table X.C10. HMIS state-wise MLM growth rate between 2017 and 2021

Low birth weight babies

State	% of low-birth-weight babies (Less than 2500 gms)			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
A & N Islands	-0.02%	0.01%	0.03%	0.02%
Andhra Pradesh	-0.04%	-0.01%	0.01%	-0.04%
Arunachal Pradesh	-0.04%	-0.02%	0.01%	-0.05%
Assam	-0.04%	-0.02%	0.01%	-0.05%
Bihar	0.01%	0.03%	0.06%	0.10%
Chandigarh	0.01%	0.03%	0.06%	0.10%
Chhattisgarh	0.02%	0.04%	0.06%	0.12%
Delhi	0.01%	0.04%	0.06%	0.11%
DNH & DND	0.01%	0.03%	0.05%	0.09%
Goa	-0.01%	0.02%	0.04%	0.05%
Gujarat	-0.01%	0.02%	0.04%	0.05%
Haryana	0.00%	0.04%	0.07%	0.11%
Himachal Pradesh	-0.05%	-0.03%	0.00%	-0.08%
Jammu & Kashmir	-0.03%	-0.01%	0.01%	-0.03%
Jharkhand	-0.03%	-0.01%	0.02%	-0.02%
Karnataka	0.00%	0.03%	0.05%	0.08%
Kerala	0.00%	0.02%	0.04%	0.06%
Ladakh	-0.03%	-0.01%	0.01%	-0.03%
Lakshadweep	-0.02%	0.01%	0.03%	0.02%
Madhya Pradesh	0.01%	0.03%	0.05%	0.08%
Maharashtra	-0.02%	0.01%	0.03%	0.02%
Manipur	-0.04%	-0.02%	0.01%	-0.05%
Meghalaya	-0.02%	0.00%	0.03%	0.01%
Mizoram	-0.02%	0.01%	0.03%	0.02%
Nagaland	-0.02%	0.00%	0.02%	0.00%
Odisha	0.00%	0.02%	0.04%	0.06%

State	% of low-birth-weight babies (Less than 2500 gms)			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
Puducherry	-0.01%	0.01%	0.03%	0.03%
Punjab	-0.03%	-0.01%	0.02%	-0.02%
Rajasthan	-0.02%	0.00%	0.02%	0.01%
Sikkim	-0.02%	0.00%	0.02%	0.00%
Tamil Nadu	-0.02%	0.00%	0.02%	0.00%
Telangana	0.02%	0.04%	0.06%	0.12%
Tripura	-0.03%	-0.01%	0.01%	-0.02%
Uttar Pradesh	-0.02%	0.01%	0.03%	0.02%
Uttarakhand	-0.03%	-0.01%	0.02%	-0.02%
West Bengal	0.04%	0.07%	0.10%	0.22%

Table X.C11. HMIS state-wise MLM growth rate between 2017 and 2021

Pregnant women who are severely anemic (Hb <7)

State	% PW receiving who are severely anemic (Hb <7), against estimated pre			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
Andaman & Nicobar Islands	-0.08%	-0.06%	-0.04%	-0.17%
Andhra Pradesh	-0.04%	-0.02%	0.00%	-0.05%
Arunachal Pradesh	-0.05%	-0.03%	-0.01%	-0.10%
Assam	-0.03%	-0.01%	0.01%	-0.03%
Bihar	-0.03%	-0.01%	0.01%	-0.03%
Chandigarh	-0.04%	-0.02%	0.00%	-0.05%
Chhattisgarh	-0.07%	-0.05%	-0.03%	-0.16%
Delhi	-0.07%	-0.05%	-0.03%	-0.15%
DNH & DND	-0.04%	-0.02%	0.00%	-0.06%
Goa	-0.03%	-0.01%	0.01%	-0.04%
Gujarat	-0.03%	-0.01%	0.01%	-0.04%
Haryana	-0.06%	-0.03%	0.00%	-0.10%
Himachal Pradesh	-0.02%	0.00%	0.02%	-0.01%
Jammu & Kashmir	-0.03%	-0.01%	0.01%	-0.03%
Jharkhand	-0.03%	-0.01%	0.01%	-0.03%
Karnataka	-0.07%	-0.05%	-0.03%	-0.16%
Kerala	-0.02%	0.00%	0.02%	0.00%
Ladakh	-0.03%	-0.02%	0.00%	-0.05%
Lakshadweep	-0.06%	-0.04%	-0.02%	-0.12%

State	% PW receiving who are severely anemic (Hb <7), against estimated pre			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
Madhya Pradesh	-0.10%	-0.08%	-0.06%	-0.24%
Maharashtra	-0.02%	0.00%	0.02%	0.01%
Manipur	-0.02%	0.00%	0.02%	-0.01%
Meghalaya	-0.03%	-0.01%	0.01%	-0.03%
Mizoram	-0.04%	-0.02%	0.00%	-0.06%
Nagaland	-0.03%	-0.01%	0.01%	-0.03%
Odisha	-0.04%	-0.02%	0.00%	-0.06%
Puducherry	-0.05%	-0.03%	-0.01%	-0.10%
Punjab	-0.05%	-0.03%	-0.01%	-0.08%
Rajasthan	-0.04%	-0.02%	0.00%	-0.07%
Sikkim	-0.02%	0.00%	0.02%	-0.01%
Tamil Nadu	-0.03%	-0.01%	0.01%	-0.03%
Telangana	-0.05%	-0.03%	-0.02%	-0.10%
Tripura	-0.04%	-0.02%	0.00%	-0.05%
Uttar Pradesh	-0.02%	0.00%	0.01%	-0.01%
Uttarakhand	-0.06%	-0.04%	-0.02%	-0.11%
West Bengal	-0.02%	0.01%	0.03%	0.02%

Table X.C12. HMIS state-wise MLM growth rate between 2017 and 2021

Provision of 4+ ANC check-ups

State	% of pregnant women receiving 4+ ANC check-ups against total ANC registrations			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
A & N Islands	-0.41%	0.00%	-0.21%	0.00%
Andhra Pradesh	-0.16%	0.26%	0.05%	0.78%
Arunachal Pradesh	0.00%	0.42%	0.21%	1.26%
Assam	-0.14%	0.28%	0.07%	0.83%
Bihar	0.19%	0.63%	0.41%	1.88%
Chandigarh	0.10%	0.52%	0.31%	1.55%
Chhattisgarh	-0.09%	0.37%	0.14%	1.10%
Delhi	-0.27%	0.14%	-0.07%	0.43%
DNH & DND	0.05%	0.48%	0.27%	1.43%
Goa	-0.05%	0.36%	0.15%	1.08%

State	% of pregnant women receiving 4+ ANC check-ups against total ANC registrations			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
Gujarat	0.01%	0.44%	0.22%	1.31%
Haryana	-0.11%	0.20%	0.05%	0.61%
Himachal Pradesh	-0.03%	0.38%	0.17%	1.15%
Jammu & Kashmir	-0.03%	0.38%	0.17%	1.14%
Jharkhand	-0.16%	0.22%	0.03%	0.66%
Karnataka	-0.22%	0.20%	-0.01%	0.60%
Kerala	0.20%	0.59%	0.39%	1.77%
Ladakh	-0.23%	0.19%	-0.02%	0.57%
Lakshadweep	-0.19%	0.23%	0.02%	0.68%
Madhya Pradesh	0.01%	0.41%	0.21%	1.24%
Maharashtra	-0.02%	0.39%	0.18%	1.17%
Manipur	-0.24%	0.17%	-0.03%	0.51%
Meghalaya	0.22%	0.62%	0.42%	1.85%
Mizoram	0.32%	0.73%	0.52%	2.20%
Nagaland	-0.03%	0.40%	0.18%	1.19%
Odisha	-0.02%	0.40%	0.19%	1.19%
Puducherry	-0.20%	0.22%	0.01%	0.67%
Punjab	-0.16%	0.26%	0.05%	0.77%
Rajasthan	0.90%	1.32%	1.11%	3.95%
Sikkim	-0.19%	0.23%	0.02%	0.68%
Tamil Nadu	-0.37%	0.04%	-0.17%	0.12%
Telangana	-0.22%	0.19%	-0.02%	0.58%
Tripura	0.14%	0.57%	0.35%	1.72%
Uttar Pradesh	0.67%	1.10%	0.88%	3.30%
Uttarakhand	0.49%	0.93%	0.71%	2.78%
West Bengal	-0.17%	0.08%	-0.04%	0.24%

Table X.C13. HMIS state-wise MLM growth rate between 2017 and 2021

Provision of 180+IFA tablets

State	% of pregnant women receiving 180+ IFA tablets against ANC registrations			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
A & N Islands	0.18%	0.38%	0.58%	1.15%
Andhra Pradesh	0.01%	0.22%	0.42%	0.65%
Arunachal Pradesh	0.36%	0.56%	0.76%	1.68%
Assam	0.04%	0.27%	0.48%	0.80%
Bihar	0.47%	0.67%	0.89%	2.02%
Chandigarh	0.07%	0.27%	0.47%	0.81%
Chhattisgarh	-0.16%	0.04%	0.25%	0.13%
Delhi	0.03%	0.23%	0.43%	0.69%
DNH & DND	0.10%	0.31%	0.52%	0.92%
Goa	0.18%	0.38%	0.58%	1.15%
Gujarat	-0.16%	0.05%	0.27%	0.16%
Haryana	-0.14%	0.04%	0.21%	0.11%
Himachal Pradesh	0.00%	0.19%	0.37%	0.57%
Jammu & Kashmir	-0.02%	0.17%	0.37%	0.52%
Jharkhand	0.30%	0.48%	0.66%	1.44%
Karnataka	0.17%	0.39%	0.62%	1.18%
Kerala	0.44%	0.64%	0.83%	1.91%
Ladakh	0.09%	0.31%	0.54%	0.93%
Lakshadweep	0.02%	0.22%	0.40%	0.65%
Madhya Pradesh	-0.04%	0.15%	0.34%	0.45%
Maharashtra	0.02%	0.22%	0.42%	0.67%
Manipur	-0.14%	0.05%	0.24%	0.15%
Meghalaya	0.35%	0.54%	0.72%	1.62%
Mizoram	0.72%	0.92%	1.13%	2.77%
Nagaland	0.63%	0.82%	1.01%	2.47%
Odisha	0.10%	0.29%	0.49%	0.88%
Puducherry	0.03%	0.23%	0.43%	0.68%
Punjab	-0.06%	0.13%	0.33%	0.40%
Rajasthan	0.66%	0.85%	1.05%	2.56%
Sikkim	0.04%	0.25%	0.45%	0.74%
Tamil Nadu	-0.29%	0.12%	0.52%	0.35%
Telangana	0.09%	0.28%	0.48%	0.85%
Tripura	-0.18%	0.01%	0.21%	0.04%
Uttar Pradesh	0.00%	0.21%	0.41%	0.63%
Uttarakhand	0.90%	1.10%	1.31%	3.31%
West Bengal	-0.15%	-0.01%	0.14%	

Table X.C14. HMIS state-wise MLM growth rate between 2017 and 2021

Institutional deliveries

State	% of institutional deliveries out of total estimated deliveries			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
A & N Islands	0.07%	0.11%	0.15%	0.34%
Andhra Pradesh	0.00%	0.04%	0.08%	0.13%
Arunachal Pradesh	0.01%	0.05%	0.09%	0.16%
Assam	0.02%	0.06%	0.10%	0.19%
Bihar	0.12%	0.17%	0.21%	0.50%
Chandigarh	-0.01%	0.03%	0.07%	0.09%
Chhattisgarh	-0.06%	-0.02%	0.02%	-0.05%
Delhi	-0.02%	0.02%	0.06%	0.07%
DNH & DND	-0.04%	0.00%	0.04%	0.00%
Goa	-0.02%	0.02%	0.06%	0.06%
Gujarat	0.05%	0.09%	0.13%	0.26%
Haryana	-0.01%	0.05%	0.10%	0.14%
Himachal Pradesh	0.02%	0.06%	0.09%	0.17%
Jammu & Kashmir	-0.01%	0.03%	0.07%	0.09%
Jharkhand	-0.03%	0.02%	0.06%	0.06%
Karnataka	-0.04%	0.00%	0.04%	0.01%
Kerala	0.05%	0.09%	0.13%	0.27%
Ladakh	0.01%	0.05%	0.09%	0.15%
Lakshadweep	-0.02%	0.03%	0.07%	0.08%
Madhya Pradesh	-0.07%	-0.04%	0.01%	-0.11%
Maharashtra	-0.08%	-0.04%	0.00%	-0.11%
Manipur	-0.03%	0.01%	0.05%	0.03%
Meghalaya	0.13%	0.17%	0.21%	0.50%
Mizoram	0.01%	0.05%	0.09%	0.15%
Nagaland	0.00%	0.04%	0.08%	0.13%
Odisha	0.03%	0.07%	0.11%	0.20%
Puducherry	-0.03%	0.01%	0.05%	0.04%
Punjab	0.00%	0.04%	0.08%	0.12%
Rajasthan	0.03%	0.07%	0.10%	0.20%
Sikkim	-0.01%	0.03%	0.07%	0.08%
Tamil Nadu	-0.10%	-0.06%	-0.02%	-0.18%
Telangana	-0.01%	0.03%	0.07%	0.09%
Tripura	-0.01%	0.03%	0.07%	0.10%
Uttar Pradesh	0.18%	0.22%	0.26%	0.67%
Uttarakhand	0.00%	0.04%	0.08%	0.11%
West Bengal	0.00%	0.05%	0.10%	0.15%

Table X.C15. HMIS state-wise MLM growth rate between 2017 and 2021

6+ HBNC visits

State	% of newborns receiving 6+ HBNC visits			
	Monthly Growth Rate - Lower bound	Monthly Growth Rate	Monthly Growth Rate - Upper bound	Quarterly Growth Rate (3* Monthly)
A & N Islands	0.53%	0.74%	0.96%	2.23%
Andhra Pradesh	0.61%	0.86%	1.12%	2.57%
Arunachal Pradesh	0.01%	0.22%	0.44%	0.67%
Assam	0.80%	1.01%	1.23%	3.04%
Bihar	0.41%	0.63%	0.85%	1.88%
Chandigarh	0.30%	0.51%	0.72%	1.53%
Chhattisgarh	-0.28%	-0.06%	0.16%	-0.18%
Delhi	0.29%	0.51%	0.74%	1.54%
DNH & DND	0.09%	0.30%	0.53%	0.91%
Goa	-0.08%	0.14%	0.36%	0.41%
Gujarat	0.47%	0.67%	0.89%	2.02%
Haryana	0.52%	0.77%	1.02%	2.32%
Himachal Pradesh	0.57%	0.76%	0.95%	2.29%
Jammu & Kashmir	0.13%	0.32%	0.51%	0.96%
Jharkhand	0.34%	0.53%	0.72%	1.58%
Karnataka	0.51%	0.71%	0.90%	2.12%
Kerala	-0.13%	0.06%	0.25%	0.17%
Ladakh	0.35%	0.54%	0.74%	1.62%
Lakshadweep	0.27%	0.46%	0.66%	1.39%
Madhya Pradesh	0.47%	0.66%	0.85%	1.98%
Maharashtra	-0.10%	0.09%	0.28%	0.27%
Manipur	0.47%	0.66%	0.85%	1.97%
Meghalaya	0.41%	0.69%	0.96%	2.06%
Mizoram	0.44%	0.65%	0.86%	1.95%
Nagaland	0.27%	0.46%	0.66%	1.39%
Odisha	0.16%	0.36%	0.56%	1.08%
Puducherry	0.43%	0.62%	0.82%	1.87%
Punjab	0.43%	0.64%	0.83%	1.91%
Rajasthan	0.05%	0.25%	0.45%	0.76%
Sikkim	0.16%	0.36%	0.55%	1.07%
Tamil Nadu	-0.12%	0.07%	0.27%	0.21%
Telangana	0.55%	0.75%	0.94%	2.24%
Tripura	0.69%	0.88%	1.08%	2.65%
Uttar Pradesh	0.70%	0.90%	1.09%	2.69%
Uttarakhand	0.79%	0.99%	1.18%	2.96%
West Bengal	0.19%	0.40%	0.60%	1.20%

Effects of COVID-19 on Service Delivery

The tables below describe the percentage changes in levels of service delivery for all states and at the national level. Table X.C12 presents the change experienced in April 2020 over April 2019 to capture the effect on service delivery. Whereas Table X.C13 presents the difference from December 2019 to December 2020 to capture differences after assumed recovery.

Note: States highlighted in grey have been identified to have poor data quality and thus omitted from analysis and findings.

Table X.C16: Percentage change in service levels in April 2020 from April 2019

State	% change in total women receiving 4+ ANC checkups	% change in total women receiving 180 IFA tablets	% change in total institutional deliveries	% change in total newborns receiving 6+ HBNC visits	% change in total children (9-11m) fully immunized
A & N Islands	59%	-47%	-13%	12%	25%
Andhra Pradesh	-15%	-17%	34%	-9%	35%
Arunachal Pradesh	39%	37%	29%	27%	37%
Assam	36%	24%	25%	16%	31%
Bihar	88%	90%	32%	55%	
Chandigarh					
Chhattisgarh	2%	-4%	9%	15%	-9%
Delhi	58%	65%	26%	-10%	70%
DNH & DND	11%	38%	20%	67%	85%
Goa	18%	23%	9%		43%
Gujarat	21%	12%	18%	25%	49%
Haryana	29%	23%	3%	4%	43%
Himachal Pradesh	8%	11%	0%	5%	15%
Jammu & Kashmir	38%	-10%	-5%	4%	42%
Jharkhand	72%	61%	25%	28%	
Karnataka	22%	11%	12%	-26%	58%
Kerala	4%	-14%	7%	25%	5%
Ladakh					
Lakshadweep	19%	8%	-6%	31%	-76%
Madhya Pradesh	34%	32%	14%	18%	53%
Maharashtra	6%	6%	10%	10%	20%
Manipur	76%	65%	52%	56%	75%
Meghalaya	33%	19%	13%	-3%	30%
Mizoram	29%	-48%	36%	-25%	31%
Nagaland	58%	26%	34%	-3%	57%
Odisha	2%	3%	9%	4%	14%

State	% change in total women receiving 4+ ANC checkups	% change in total women receiving 180 IFA tablets	% change in total institutional deliveries	% change in total newborns receiving 6+ HBNC visits	% change in total children (9-11m) fully immunized
Puducherry	42%	45%	43%	-27%	-5%
Punjab	6%	-3%	5%	-17%	7%
Rajasthan	34%	8%	9%	17%	86%
Sikkim	8%	0%	-9%	-15%	-12%
Tamil Nadu	11%	17%	24%	27%	24%
Telangana	31%	11%	22%	-20%	13%
Tripura	10%	56%	0%	6%	51%
Uttar Pradesh	91%	93%	24%	48%	98%
Uttarakhand	1%	-18%	5%	-20%	14%
West Bengal	40%	24%	10%	33%	
India	42%	40%	19%	25%	60%

Source: HMIS

Table X.C17: Percentage change in services in December 2020 from December 2019

State	Total women receiving 4+ ANC checkups	Total women receiving 180 IFA tablets	Total institutional deliveries	Total newborns receiving 6+ HBNC visits	Total children (9-11m) fully immunized
A & N Islands	-23%	-163%	-11%	-195%	-33%
Andhra Pradesh	-35%	-32%	-5%	-64%	-2%
Arunachal Pradesh	31%	31%	28%	7%	27%
Assam	28%	22%	21%	16%	16%
Bihar	8%	16%	14%	11%	1%
Chandigarh					
Chhattisgarh	10%	8%	4%	5%	8%
Delhi	21%	15%	33%	37%	8%
DNH & DND	21%	15%	33%	37%	8%
Goa	29%	20%	22%	92%	4%
Gujarat	-7%	-1%	4%	-3%	-1%
Haryana	6%	-15%	3%	-34%	4%
Himachal Pradesh	0%	-7%	-2%	-11%	-10%
Jammu & Kashmir	15%	-62%	-2%	-6%	-13%
Jharkhand	-10%	-32%	-1%	-20%	6%
Karnataka	4%	-20%	-1%	-36%	-9%
Kerala	3%	19%	6%	10%	-6%
Ladakh					

State	Total women receiving 4+ ANC checkups	Total women receiving 180 IFA tablets	Total institutional deliveries	Total newborns receiving 6+ HBNC visits	Total children (9-11m) fully immunized
Lakshadweep	-18%	-2%	-5%	20%	-17%
Madhya Pradesh	-4%	-1%	-1%	-55%	5%
Maharashtra	0%	-2%	-1%	-18%	1%
Manipur	70%	74%	64%	53%	45%
Meghalaya	-9%	-27%	5%	-45%	-3%
Mizoram	13%	-9%	30%	-14%	23%
Nagaland	24%	-38%	21%	-28%	4%
Odisha	-4%	-4%	0%	-2%	1%
Puducherry	-140%	-2%	33%	-16%	-9%
Punjab	4%	-24%	6%	2%	-11%
Rajasthan	-9%	-11%	-6%	-7%	-3%
Sikkim	7%	-15%	-39%	-35%	8%
Tamil Nadu	-4%	-38%	16%	-311%	19%
Telangana	15%	10%	19%	-19%	11%
Tripura	6%	-25%	6%	-20%	-19%
Uttar Pradesh	2%	4%	0%	-9%	7%
Uttarakhand	19%	-16%	-2%	-34%	3%
West Bengal	5%	3%	7%	-4%	15%
India	4%	-3%	7%	-6%	7%

Source: HMIS

COVID-19 and Health Outcomes

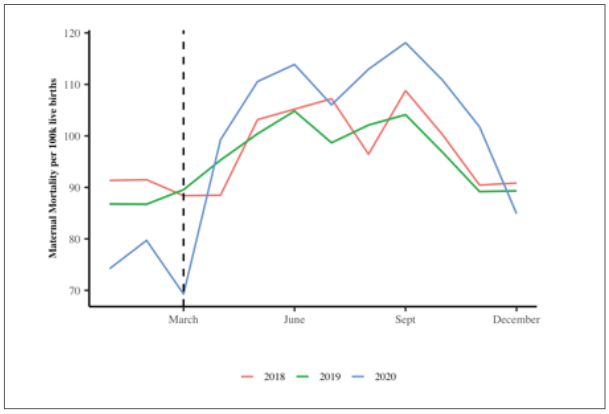
The disruptions to primary health services have immense potential to hinder health and nutrition outcomes among the most vulnerable groups, especially women, and children[58]. In this section, we study the yearly patterns of the key outcome indicators on maternal and child health in light of the shock faced by the related input activities in 2020.

Maternal Mortality Rate

Figure X.C1 shows that although there is a temporary increase in the MMR from April till September every year, the magnitude of this increase is visibly more in April of 2020. One of the primary factors leading to this alarming event could be the onset of the COVID-19 lockdown and the subsequent drop in ANC along with access to facilities for deliveries and postnatal care, though it is less likely for reduction in ANC services to be affecting MMR this promptly. It is also worth noting that even after September, though the rate began to plummet steadily, it continued to be higher than that of the previous years, till December.

58. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7955960/#R9, https://obgyn.onlinelibrary.wiley.com/doi/10.1002/ijgo.13457

Figure X.C1: Yearly Trend of Maternal Mortality Rate



On considering state-specific patterns, Kerala was one of the few states which were relatively stable and did not witness much increase in the indicator. Contrarily, some states with more adverse effects appear to be Uttar Pradesh, Rajasthan, and Odisha. All these states experienced a steep hike in MMR before dropping in November. Overall, we observe that even though most services began resuming in June – MMR rose till September and even November in some states.

Severe Anemia among Pregnant Women, Low Birth Weight Babies

As discussed in section 4.4, right after March 2020, the provision of these services suffered a major decline. However, long term outcomes such as prevalence of anemia and percent of low-birth-weight babies which are related directly to these services, cannot be expected to react immediately. The yearly trendlines for both these outcomes (Figure X.C5 and X.C6) show steep changes in two different directions right after the lockdown bump. This refutes our expectation of a lag in the long-term outcomes being affected by a drop in services with a lag which also leads us to questioning the accuracy of data reported in this period.

Figure X.C2
Severely Anemic Pregnant Women

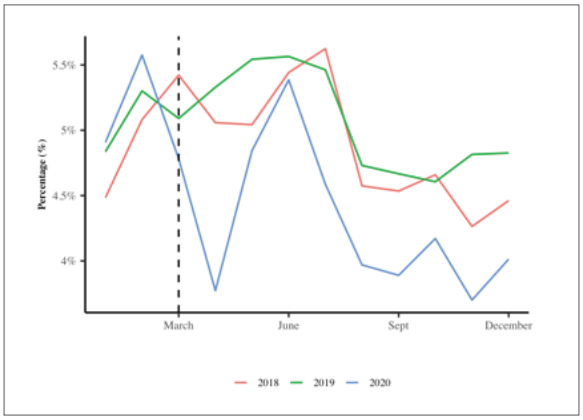
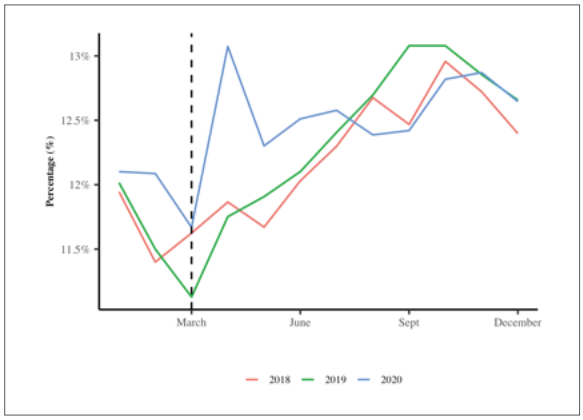


Figure X.C3
Low birth weight Babies



Overall, most services underwent an unprecedented shock which coincided more with the lockdown than the actual COVID caseload. However, the disruptions identified are not only related to the service provision but also to data reporting as seen in trends of total estimated deliveries. This also gives rise to the possibility that some portion of the (substantial) drop reported in services during April 2020 could be attributed to under reporting of data.

Input-Output Correlations

Note that the following results represent only correlations and must be interpreted with caution.

Table X.C18: Regression results for provision of IFA and prevalence of anemia

State	Coefficient	Standard Error	Observations	R-squared	Upper limit of CI	Lower limit of CI
Andhra Pradesh	-0.71896	0.447241	20	0.197039	0.157633	-1.59555
Arunachal Pradesh	0.067951	0.197159	48	0.019308	0.454383	-0.31848
Assam	-0.38288	0.356878	20	0.250307	0.316598	-1.08236
Bihar	0.369403	0.265239	48	0.137692	0.889272	-0.15047
Chandigarh	-0.3046	0.16967	22	0.151336	0.02795	-0.63716
DNH and DND	-0.10473	0.185076	24	0.042802	0.258017	-0.46748
Goa	-0.18249	0.116428	47	0.241282	0.045704	-0.41069
Gujarat	-1.35567	0.696003	38	0.116174	0.0085	-2.71983
Haryana	-0.59772	0.165279	23	0.398114	-0.27377	-0.92167
Jharkhand	-0.02128	0.183249	41	0.311034	0.337892	-0.38044
Kerala	0.063341	0.059539	24	0.538843	0.180038	-0.05336
Manipur	-0.05552	0.078608	48	0.429825	0.098557	-0.20959
Meghalaya	-0.22452	0.20419	32	0.048558	0.175691	-0.62473
Mizoram	-0.25374	0.166054	44	0.145329	0.07172	-0.57921
Nagaland	0.060295	0.371436	48	0.009996	0.788309	-0.66772
Odisha	-0.65954	0.120141	46	0.439282	-0.42406	-0.89502
Puducherry	-0.00128	0.141087	44	0.318176	0.275247	-0.27782
Punjab	-0.34404	0.106507	22	0.378725	-0.13529	-0.5528
Rajasthan	-0.23726	0.144817	26	0.172494	0.046585	-0.5211
Sikkim	-0.23997	0.114157	44	0.143386	-0.01623	-0.46372
Tripura	0.036384	0.137005	48	0.002473	0.304913	-0.23215
Uttar Pradesh	0.260906	0.226277	37	0.038774	0.704409	-0.1826
Uttarakhand	-0.00339	0.08744	31	0.37759	0.167989	-0.17477
West Bengal	-0.63214	0.160012	44	0.436453	-0.31851	-0.94576

Source: HMIS

Table X.C19: Regression results for 4+ ANC check ups and institutional delivery

State	Coefficient	Standard Error	Observations	R-squared	Upper limit of CI	Lower limit of CI
A & N Islands	-0.11426	0.04752	45	0.481182	-0.02112	-0.2074
Arunachal Pradesh	-0.0329	0.026474	48	0.088611	0.018984	-0.08479
Assam	0.004636	0.013819	37	0.293436	0.031722	-0.02245
Bihar	0.135479	0.063866	47	0.374908	0.260656	0.010301
Chhattisgarh	0.039441	0.025198	43	0.442149	0.088829	-0.00995
Delhi	0.053851	0.022022	47	0.295299	0.097014	0.010687
Goa	-0.00085	0.005039	48	0.119016	0.009031	-0.01072
Gujarat	0.08545	0.032905	45	0.390511	0.149943	0.020957
Haryana	0.010814	0.008707	47	0.453948	0.027879	-0.00625
Himachal Pradesh	0.03619	0.010346	44	0.470561	0.056469	0.015911
Jammu & Kashmir	0.044998	0.011312	48	0.320018	0.06717	0.022826
Jharkhand	-0.02106	0.018944	47	0.27382	0.016066	-0.05819
Maharashtra	-0.00073	0.010031	48	0.341003	0.018929	-0.02039
Manipur	0.143128	0.027834	48	0.38115	0.197683	0.088574
Mizoram	0.073228	0.028788	48	0.315982	0.129652	0.016804
Nagaland	0.270758	0.075254	48	0.34851	0.418255	0.123261
Odisha	0.01612	0.013631	47	0.763339	0.042837	-0.0106
Puducherry	0.005426	0.003777	47	0.248337	0.012829	-0.00198
Punjab	0.004877	0.005566	40	0.731057	0.015786	-0.00603
Rajasthan	-0.0042	0.005571	48	0.25897	0.006716	-0.01512
Sikkim	-0.0414	0.02197	43	0.089924	0.001666	-0.08446
Tamil Nadu	-0.04568	0.049	46	0.27938	0.050361	-0.14172
Telangana	0.143228	0.029439	39	0.46357	0.200928	0.085528
Tripura	-0.00138	0.021935	48	0.026884	0.041615	-0.04437
Uttar Pradesh	0.004123	0.040853	48	0.738942	0.084195	-0.07595
Uttarakhand	-0.06831	0.030004	47	0.314562	-0.00951	-0.12712
West Bengal	-0.00542	0.007795	41	0.702422	0.009861	-0.02069

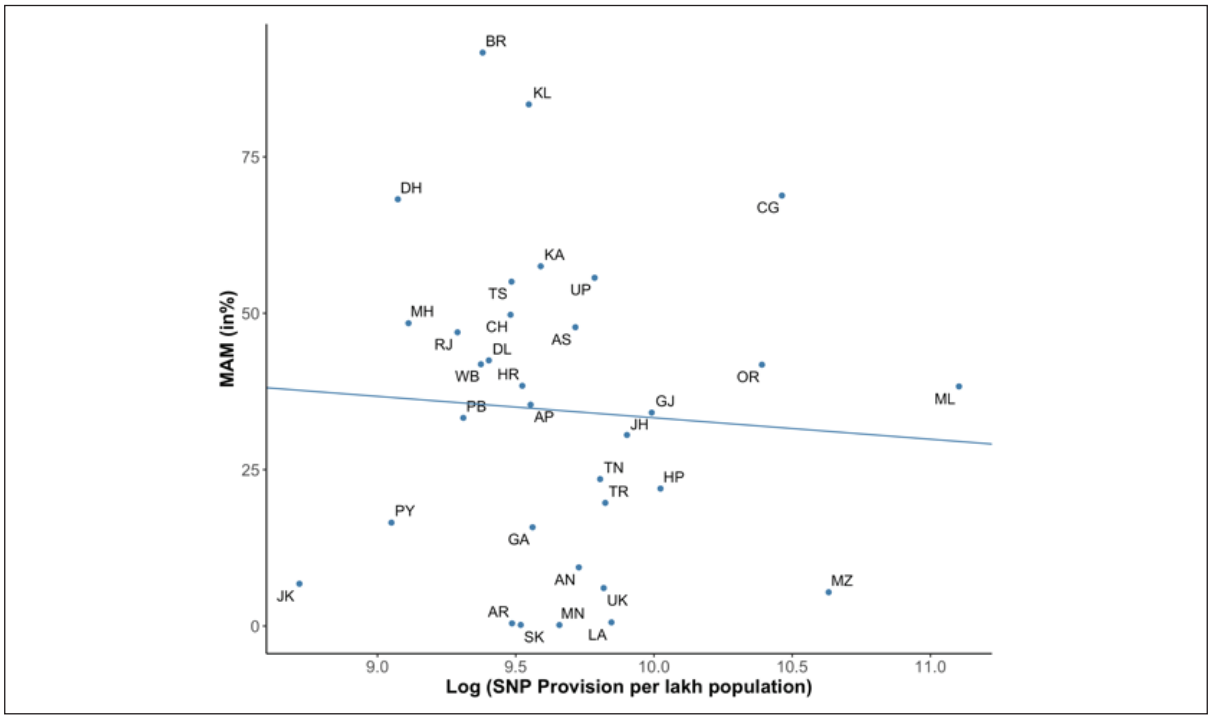
Source: HMIS

Table X.C20: Regression results for institutional delivery and early initiation of breastfeeding

State	Coefficient	Standard Error	Observations	R-squared	Upper limit of CI	Lower limit of CI
A & N Islands	-0.60739	0.307797	45	0.186948	-0.00411	-1.21067
Andhra Pradesh	0.647342	0.463735	47	0.069074	1.556262	-0.26158
Arunachal Pradesh	0.30845	0.572064	48	0.151542	1.429695	-0.8128
Assam	0.054352	0.114266	48	0.075591	0.278313	-0.16961
Bihar	-0.09728	0.055345	47	0.39864	0.011197	-0.20575
Chhattisgarh	0.074155	0.152932	48	0.428007	0.373902	-0.22559
Delhi	1.018978	0.470133	47	0.154799	1.940438	0.097519
DNH & DND	1.126082	0.844546	47	0.385397	2.781392	-0.52923
Goa	1.112542	1.759413	48	0.014088	4.560993	-2.33591
Gujarat	0.423947	0.170631	45	0.501312	0.758383	0.08951
Haryana	1.439515	0.404734	48	0.22617	2.232794	0.646236
Himachal Pradesh	1.47308	0.318241	48	0.515573	2.096832	0.849328
Jammu & Kashmir	-0.07228	0.24119	48	0.424808	0.400449	-0.54501
Jharkhand	0.027107	0.315324	47	0.406091	0.645142	-0.59093
Karnataka	0.389749	0.422851	47	0.098133	1.218536	-0.43904
Kerala	0.950109	0.132029	46	0.661007	1.208886	0.691332
Lakshadweep	-0.99411	0.750125	43	0.603439	0.47614	-2.46435
Maharashtra	0.913506	0.726737	48	0.235121	2.33791	-0.5109
Manipur	-0.25947	0.2534	48	0.152384	0.23719	-0.75614
Mizoram	0.174277	0.292684	48	0.11367	0.747938	-0.39938
Nagaland	0.030529	0.217857	48	0.088453	0.457529	-0.39647
Odisha	0.0076	0.262971	48	0.077938	0.523025	-0.50782
Puducherry	2.10462	2.721553	47	0.413995	7.438863	-3.22962
Punjab	0.592954	0.472454	48	0.12862	1.518963	-0.33306
Rajasthan	1.156948	0.537911	48	0.475853	2.211253	0.102642
Sikkim	1.154704	0.598793	40	0.338712	2.328339	-0.01893
Tamiln Nadu	1.370304	0.382271	48	0.725062	2.119556	0.621053
Telangana	0.57526	0.210662	47	0.442524	0.988156	0.162363
Tripura	-0.3058	0.494323	48	0.141003	0.663073	-1.27467
Uttar Pradesh	-0.31133	0.143959	48	0.320644	-0.02917	-0.59349
Uttarakhand	1.244887	0.326807	48	0.302186	1.885427	0.604346
West Bengal	-1.19021	0.410128	47	0.227351	-0.38636	-1.99406

Source: HMIS

Figure X.C4: Regression results for SNP and MAM (state names abbreviated)



Source: ICDS RRS

Our analysis detects no statistically significant relationship between the prevalence of MAM and the level of supplementary nutrition during the 5-month period of July-November 2020. However, it is important to note the following caveats for this correlation analysis

- We do not have enough data to establish statistical significance. The real relationship may/may not be significant
- We are not capturing intra-state variation and over-time variation

Table X.C21: Regression results for % MAM v/s % underweight (for children 0-5 yrs)

Underweight	
MAM	0.669*** (11.17)
Constant	8.248*** (4.98)
State FE	Yes

Source: NFHS-5, N=310

Correlation between children under-5 wasted and children under-5 underweight is 0.715

We find a **statistically significant relationship between MAM and underweight by conducting a state fixed effects (FE) regression of underweight on MAM in the NFHS-5 data.**

Therefore, since we don't have access to underweight data, we use MAM as a proxy to draw insights in from ICDS data.

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