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SYNTHESIS REPORT OF HEALTH INFORMATION SYSTEMS IN INDIA

May 2014

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The Health Finance and Governance Project

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ACRONYMS

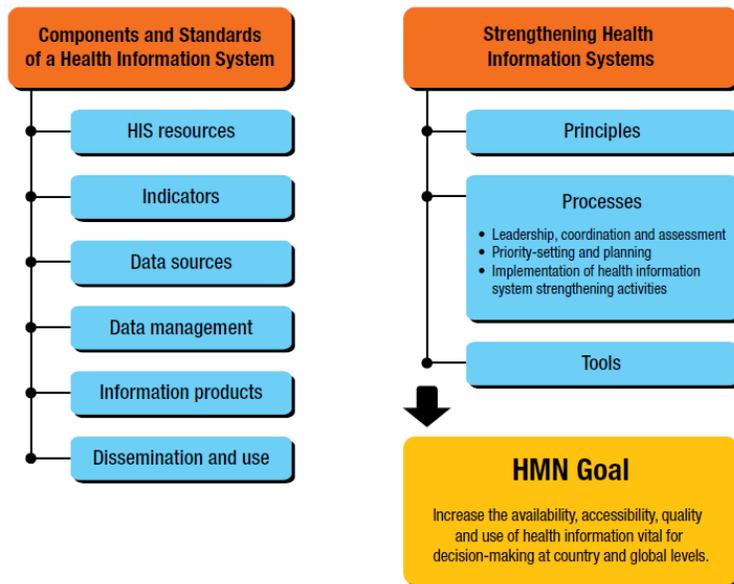
AHS	Annual Health Survey
ANC	Antenatal Care
ANM	Auxiliary Nurse Midwives
ANMTC	ANM Training Center
ASHA	Accredited Social Health Activists
ATM	Anemia Tracking System
AYUSH	Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy
CES	Coverage Evaluation Survey
CHC	Community Health Centre
CRM	Common Review Mission
CRS	Civil Reporting System
DFID	UK Department for International Development
DHIS	District Health Information System
DQA	Data Quality Audit
DH	District Hospital
DLHS	District-Level Household and Facility Survey
GDP	Gross Domestic Product
GOI	Government of India
HFG	Health Finance and Governance project
HIS	Health Information System
HMIS	Health Management Information System
HMN	Health Metrics Network
ICDS	Integrated Childhood Development Services
IDSP	Integrated Disease Surveillance Program
IEC	Information, Education and Communication
IFA	Iron Folic Acid tablet
IIPS	International Institute for Population Sciences
IMR	Infant Mortality Ratio
JSY	Janani Suraksha Yojana
M&E	Monitoring and Evaluation
MCH	Maternal and Child Health
MCTS	Mother and Child Tracking System
MDGs	Millennium Development Goals

MIDRS	Maternal and Infant Death Registration System
MMR	Maternal Mortality Ratio
MoHFW	Ministry of Health and Family Welfare
NACO	National AIDS Control Organization
NARI	National AIDS Research Institute
NFHS	National Family Health Survey
NHM	National Health Mission
NHSRC	National Health Systems Resource Centre
NRHM	National Rural Health Mission (<i>now known as National Health Mission</i>)
NVBDPC	National Vector Borne Disease Control Program
PHC	Primary Health Centre
PIPs	Program Implementation Plans
PRCs	Population Research Centres
RCH	Reproductive and Child Health
RDQA	Routine Data Quality Assessment
RMNCH+A	Reproductive, Maternal, Newborn, Child and Adolescent Health
RNCTP	Revised National Tuberculosis Control Program
RRC-NE	Regional Resource Centre for North East
SC	Sub-Centres
SDH	Sub-District Hospitals
SHSRC	State Health Systems Resource Center
SIHFW	State Institute of Health and Family Welfare
SNCU	Special Newborn Care Unit
SPMU	State Program Management Unit
SPIP	State Program Implementation Plan
SRS	Sample Registration System
TFR	Total Fertility Rate
U5MR	Under-five Mortality Ratio
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
UTs	Union Territories
VHSNC	Village Health, Sanitation and Nutrition Committee
WHO	World Health Organization

EXECUTIVE SUMMARY

A highly functioning national health information system (HIS) facilitates transparent and evidence-based decision making that ultimately leads to improvements in the health status of a country's population.¹ Rather than reflecting a single structure through which routine health statistics in a country are reported, most country health information systems are made up of multiple sub-systems that may or may not be well-coordinated, potentially collect some of the same information, and typically place the largest burden for reporting on those at the lowest levels of the health system, the primary health care facility staff. All of these characteristics present risks to the ability of the health system to function efficiently and effectively. The Health Metrics Network (HMN) Framework, published in 2008 and presented in Figure 1 below, provides a useful lens for viewing the efforts of the Republic of India to improve the production and availability of health information at all levels of its health system, from health facility to district, state, national and international levels, and to use that information to improve health outcomes.

Figure 1: The Health Metrics Network Framework



The objectives of this report are to use the HMN Framework to examine, organize and summarize some of the publicly available written information on the Indian HIS and to serve as a resource tool for stakeholders throughout the Indian health system pursuing efforts to strengthen the HIS (as shown on the right-hand side of Figure 1). This report is intended to highlight the progress that has been made to date and to discuss some of the gaps in the Indian HIS using the HMN Framework, which can then form the basis of discussions on HIS strengthening priorities.

¹ Health Metrics Network, HMN Framework. WHO, Geneva 2008.



Based on the research efforts of the Health Finance and Governance project (HFG), the key findings from publicly available sources on the performance of the Indian HIS are as follows:

HIS Resources

A review of the resources allocated to HIS in India suggests a more effective allocation could be made.

- India ranks near the bottom of world country rankings for total expenditure on health as a percentage of gross domestic product (GDP) at 4.1 percent² but it does provide significant resources for key health programs, such as the National Rural Health Mission (NRHM³) operating under the Ministry of Health and Family Welfare (MoHFW). NRHM was originally expected to receive “an additionality of 30 percent over existing Annual Budgetary Outlays, every year, to fulfill the mandate of the National Common Minimum Programme to raise the outlays of public health from 0.9 percent of GDP to 2-3 percent of GDP.”⁴ Spending on HIS is not explicitly called out in the national health budget but recent announcements from the Government of India (GoI) indicate a 24 percent budget increase in FY 2014-2015 for NRHM even as the overall health budget was reduced.⁵ Since NRHM is responsible for maintaining and improving the national Health Management Information System (HMIS) as the required reporting system for their programs, increases in the NRHM budget may indicate additional funding for HIS overall.

Indicators

India tracks a set of health indicators that tie to monitoring of key health programs and targeted health outcomes.

- In 2006, the NRHM began a process of reviewing, rationalizing and consolidating the routine reporting formats. The review indicated that there were over 3,000 data elements required across various maternal, child and reproductive health programs managed under the MoHFW being collected. After the review and refocusing the indicators and reports they were able to reduce the required number of data elements to 76 data elements being reported by Sub-centers into the national HMIS, 127 data elements by Primary Health Centers, and 134 for Community Health Centers, Sub-district Hospitals and District Hospitals.⁶
- With the advent of the Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) initiative in 2013 to target key interventions on reducing the Maternal Mortality Ratio (MMR) and Infant Mortality Ratio (IMR), a core set of 16 indicators was agreed upon in order to track progress of states on the initiative. The national HMIS was designated as the generator of these indicators on a quarterly basis and were to be compiled into a dashboard. State NRHM programs are expected to be evaluated based on their performance against these indicators relative to national averages. Separately, a scorecard with 19 outcome and coverage indicators was also instituted under the RMNCH+A initiative. The scorecard draws on nine distinct survey sources and is to be updated as survey data are updated. The HMIS-based dashboard will likely be the more referenced monitoring tool given the frequency of data availability versus data for the scorecard.

² Global Health Observatory Data Repository, 2012, WHO, <http://apps.who.int/gho/data/node.main.75?lang=en>

³ The National Rural Health Mission (NRHM) and the National Urban Health Mission were merged with into a single structure in 2013 now known as the National Health Mission (NHM). For consistency the term NRHM is used throughout this report, but also reflects the current responsibilities for the national HMIS portal and other key health programs in India under the NHM.

⁴ National Rural Mission, 2005-2012 Mission Document, 2005.

⁵ India's National Health Mission receives 24.3% funding boost in budget, <http://www.ihs.com/products/global-insight/industry-economic-report.aspx?id=1065976611>; Accessed 5/20/2014.

⁶ Service Providers' Manual: Understanding Health Management Information Systems, Volume I, National Rural Health Mission, M&E Division MOHFW and HMIS Division NHSRC, January 2011.

Data Sources

India has a plethora of data sources, both routine, institution-based sources and non-routine, population-based sources for information on health programs across the country.

- India makes extensive use of non-routine data sources including the census, national and regional surveys, and vital statistics reporting systems. The census in India has been conducted since 1881 and is managed by the Ministry of Home Affairs, Office of the Registrar General and Census Commissioner. The 2011 census data are the most recent and are fully available for review and analysis on the ministry website. The 2001 census data are also available. Similarly, the Office of the Registrar General manages the routine reporting through the Civil Reporting System (CRS) and the Sample Registration System (SRS), the latter of which has been intermittently providing direct estimates of key fertility and mortality indicators since 1969.⁷
- There are three major surveys that have been conducted on a regular basis in India that provide extensive data on NRHM-related indicators: Annual Health Survey (AHS), District Level Household and Facility Survey (DLHS) and National Family Health Survey (NFHS). The AHS, which is also implemented by the Office of the Registrar General and covers nine of NRHM's 18 special-focus states which account for a majority of India's population, has been an important source of IMR, MMR and total fertility rate indicators since 2005. It is, however, reported as being discontinued after the last round in 2013. The DLHS is implemented by the International Institute for Population Sciences (IIPS) and is designed to provide health care and utilization indicators at the district level for the enhancement of the activities under NRHM. The NFHS, which is the Indian implementation of the globally endorsed Demographic and Health Survey methodology, is considered the most comprehensive of all Indian surveys and is billed as the largest health survey in the world. NFHS has been done three times in India, beginning in 1992-1993, with the upcoming fourth round for 2014-2015 expected to cover 29 states and more than 562,000 households across the country. All told, these survey sources appear to provide reliable information in support of important monitoring efforts by NRHM.
- The GoI routinely carries out research studies in partnership with India's many academic and social sciences institutions. In one notable example, the Registrar General of India is working with more than 20 institutions on the Million Death Study which began monitoring nearly 14 million people across 2.4 million nationally representative households in 1998 for any deaths that may occur in these households through 2014. The deaths will be assigned a probable cause, as determined by a verbal autopsy methodology. This study is intended to supplement gaps in the data provided by the CRS. Overall, there appear to be extensive technical research resources supporting India's efforts to understand and improve its health systems.
- Due to variations in sampling and data definitions across some sources, results on key health outcome indicators can vary significantly. For example, the DLHS records immunization rates for children based on those age 12 – 23 months. By contrast, the national HMIS definition reflects results for children age 9 - 11 months. Not surprisingly, the resulting summary for the indicator 'full immunization of children' shows significant variation between the data sets. The use of different data sources for the indicators makes their comparisons unusable.

⁷ <http://censusindia.gov.in/>

Data Management

NRHM has made large strides in moving from a predominantly paper based reporting system across most public health facilities in 2005 to both a facility based electronic reporting system (in the case of the national HMIS) and a patient-level electronic reporting system (in the case of the Mother and Child Tracking System) by mid-2013.

- The development of the national HMIS web portal from 2008 onward has prompted the rollout of computer and internet access down to the Sub-Center level in most districts across India, in order to facilitate direct electronic data entry by health facilities. Additionally, each health facility operated by NRHM is meant to be staffed by a trained Information Assistant (or Data Entry Operators) whose responsibility is to consolidate and report health statistics on a monthly basis. All health facilities across the country are now mandated to directly enter data in the national HMIS web portal under NRHM guidelines. According to findings from a telephone survey by HFG India staff of the USAID-priority states and territories of Haryana, Uttarakhand, Himachal Pradesh, Punjab, Jharkhand and Delhi, this is happening in all cases.
- The national HMIS and the Maternal and Child Health Tracking System (MCTS) represent the two most comprehensive routine electronic health data reporting systems in use under NRHM, the former aggregating data by health facility and the latter maintaining disaggregated data by women and children. Separately, a number of state NRHM offices have developed or implemented their own routine electronic reporting systems aside from MCTS and the national HMIS. In addition, there are numerous sub-national, disease or program specific databases, such as the Maternal and Infant Death Reporting System and the case based TB reporting system, NIKSHAY (<http://nikshay.gov.in/>). Individual states have also established routine reporting systems for their state-specific efforts, such as the Anemia Tracking Module, Referral Transport and Online Drug Inventory System developed in the State of Haryana.⁸
- Expanding internet connectivity across the country and training Information Assistants to capture data have both increased the completeness and timeliness of data reporting. However, while intermittent, small studies on data quality have been done across the reporting system in India, no systematic reviews of timeliness, accuracy and validity are routinely conducted.
- NRHM has developed a comprehensive set of written data reporting manuals, each geared toward a different target audience within the reporting system. The set of four manuals are geared toward the needs of: Service Providers (e.g., Auxiliary Nurse Midwives who capture initial data); Health Program Managers at block, district and state level; HMIS Managers responsible for using the national HMIS portal; and HMIS Resource Persons who are involved with technical aspects of maintaining or modifying systems or rolling out HMIS training. These tools, in principle, lay the groundwork for a well-functioning HMIS, with written indicator definitions, reporting guidelines, practical exercises for engaging with the data and training guidelines. These manuals, however, are not widely available below the district level and the manuals are only written in English, rather than Hindi or other locally relevant languages.
- While the national HMIS and most of the state-level electronic reporting systems in India have built-in data validation rules and ranges to promote accurate reporting of data, NRHM has not implemented a systematic process of validating data to ensure the quality of the data being reported. There are cases where systematic surveys have been used to triangulate the accuracy of data captured at the facility with reports from households documented as served by the facility, but not

⁸ NRHM Data Flow: Generation, Flow and Constraints of Various Data Sources in NRHM Haryana, May 2014, NRHM Haryana, unpublished.

to systematically evaluate the quality of data flowing through the national HMIS. Concerns over data quality are one of the barriers to expanded data usage for planning purposes within NRHM programs.

- The absence of a nationally defined HIS architecture, which would guide how information systems are built and how information is captured within those systems, inhibits the ability of those systems to share data.
- India has not implemented a system for uniquely identifying its health facilities (such as a Master Facility List) across the country. With more than 175,000 health facilities across the country, the absence of unique identifiers for health facilities increases the probability that duplications can occur within the system and limits the ability of NRHM to connect information about the same health facility across different information systems (e.g., between HMIS and MCTS or DHIS). The absence of a unique identifier for individual patients also makes it difficult to document whether patients are receiving the same or complementary services (e.g., 1st, 2nd or 3rd antenatal visit) at multiple health facilities and whether indicators for coverage for these services is being accurately reflected.

Dissemination and Use

There is modest evidence to show that data generated by NRHM programs is being used at state levels, but very little evidence that it is actively used at district and health facility levels.

- There are dozens of web portals with databases for health programs in India that are publicly available and contain the most recently updated health information from programs. Most of these web portals are managed by the MoHFW, the Office of the Registrar General and the Office of Business Health Intelligence. Given the widespread access of much of the Indian population to the internet, this essentially ensures that health information is publicly and freely available. While some web portals contain data that is more than five years old as the most recently available information, (e.g., National Health Accounts data at the National Planning Commission website) there do not seem to be restrictions on access to most health data. The Indian Right to Information Act of 2005, which mandates a timely response by Gol to citizen requests for government information, provides the policy framework to promote access to health information.
- Health information seems to be widely accessed and used in India for program planning purposes at the state level as well. A review of 35 state and union territories' most recently submitted Program Implementation Plans (PIP) revealed that their plans cited an average of seven different sources for health data to support their plans. The most commonly cited source, found in 31 of the 35 (or 89 percent) PIPs, was the 2012-2013 national HMIS data, followed by the 2011-2012 national HMIS data, which was cited in 30 of the 35 (86 percent) PIPs submitted. The least commonly cited source, showing up in only one PIP was the DLHS-II, which contains data for 2002-2004. This demonstrates that state programs understand the value of leveraging the most recently available health data for their PIPs.

Recommendations

The HMN Framework makes a strong case for the need to have a centrally coordinated and championed national HIS strengthening effort. Much of the work for strengthening HIS supporting the NRHM has been led by individual states across India. In a number of cases states have implemented a separate reporting system for data capture within their states. Decentralization of program management was one of the key objectives of implementing the NRHM in 2005. With respect to HIS development and strengthening in India, decentralization without a clear set of electronic system architecture standards to follow has led to non-uniform systems development and a multitude of systems that do share data electronically.

India has tremendous potential to improve the reliability and efficiency of its data reporting and the use of information by addressing some key components:

- One approach to standardizing electronic health data standards is to constitute a national level, multi-stakeholder, multi-sectoral group responsible for and empowered to develop a strategic plan for strengthening India's national HIS.
- Define and distribute a set of electronic HIS data standards that system developers must follow to ensure data consistency across systems. This consistency will improve opportunities to exchange data electronically between systems and eventually to streamline the number of HIS sub-systems in place to eliminate duplication and reduce reporting burdens.
- Conduct a comprehensive comparison of data being captured in the national HMIS and the MCTS system to identify overlaps and unnecessary elements. The MCTS system is a patient-level reporting system which can likely feed key data into the HMIS without having to be separately captured in both. For example, MCTS is intended to ensure that pregnant women are receiving antenatal care. The number of antenatal care visits is also a key reporting requirement within the national HMIS.
- Develop and implement a system for uniquely identifying health facilities and patients that will be utilized uniformly and consistently across existing and future databases.
- Coordinate technical support on HIS for the states through a single centrally managed agency. There are numerous technical resources for HIS development, health system strengthening and health systems research across India. There is not, however, effective coordination of these resources across the country and in each state.
- Institutionalize data quality reviews at the district level in order to routinely review the validity of data being reported within districts and improve trust in the data being reported. The data quality reviews should incorporate both review and feedback mechanisms to ensure that an effective dialogue is established between facility level staff and district level staff on access to services, disease patterns and trends, the quality of care being provided and health outcomes.
- Institute routine training and develop (or revise) state-specific capacity building strategies to augment knowledge and skills related to data collection and data analysis for district and health facility level staff. Analysis of program indicators and data sources should become a core skillset for health facility staff and should be routinely updated and upgraded.

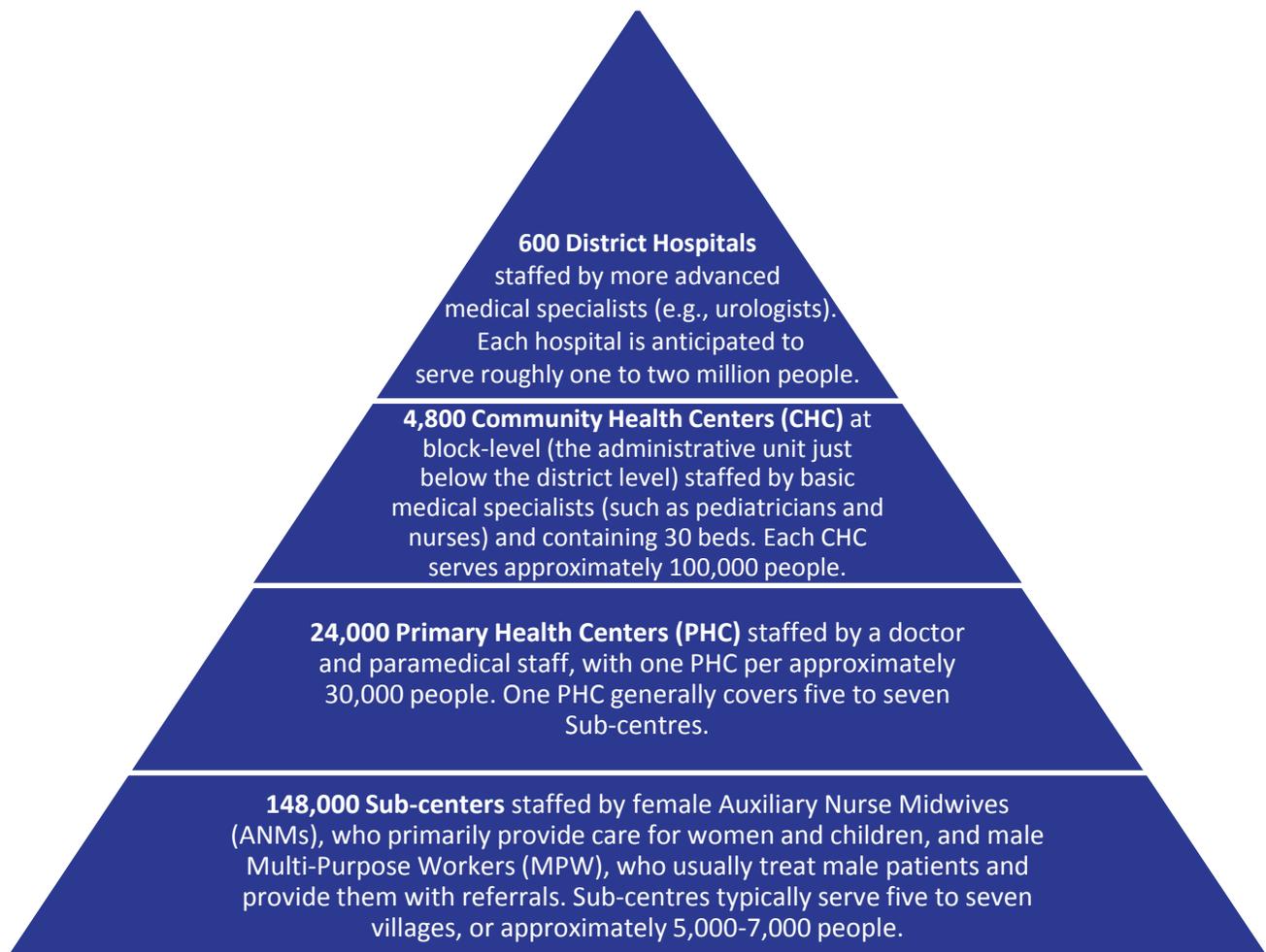
The findings and recommendations from this report are based on a review of publicly available articles, research and data from a wide range of sources. These recommendations are intended to serve as a reference point for dialogue on strengthening the tools available to the GoI in monitoring, evaluating and improving health information and the health outcomes that the NRHM programs are intended to impact.



I. BACKGROUND

The World Health Organization (WHO) defines a health system as “all organizations, people and actions whose primary intent is to promote, restore or maintain health.”⁹ The Indian health system, which is responsible for caring for a population of more than 1.2 billion¹⁰ people across 35 states and union territories ranging from the peaks of the frigid Himalayas to the arid Thar Desert to the tropical climate of Mumbai, is massive by any definition. The sheer number of health facilities, as presented in Figure 2 below, provides a sense of the system’s enormous scale: ¹¹

Figure 2: Overview of Health Facility Distribution under NHRM in India



9 WHO: Everybody's business. Strengthening health systems to improve health outcomes: WHO's framework for action. WHO, Geneva. 2007.

10 Office of the Registrar General: Census of India, 2011.

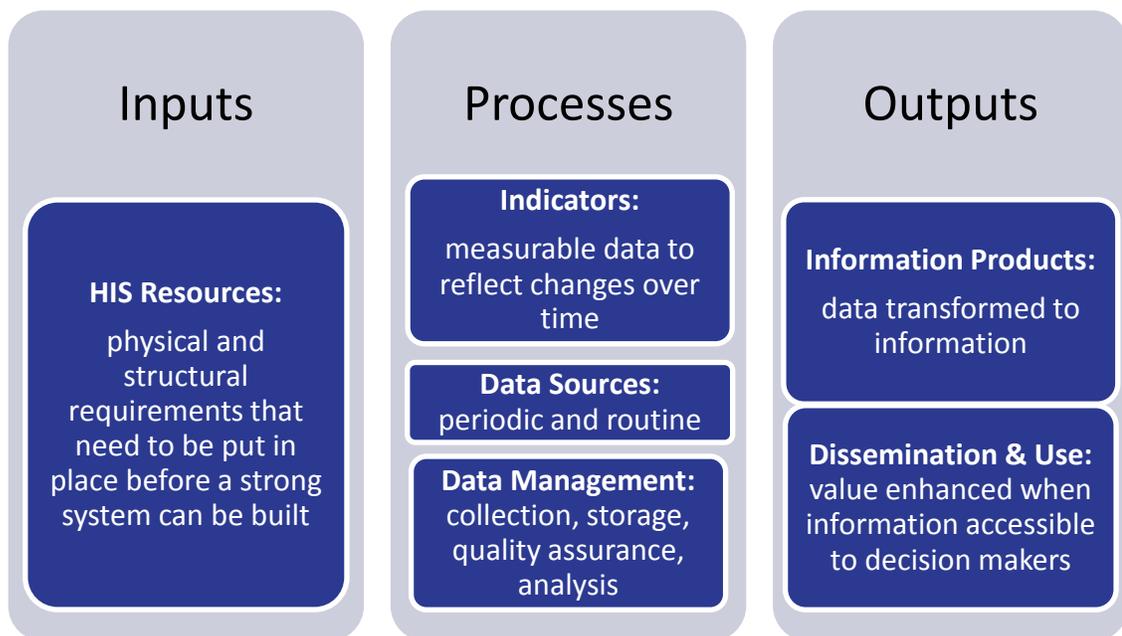
11 MoHFW: National Health Profile, 2012, Central Bureau of Health Intelligence, Directorate General of Health Services.



The National Rural Health Mission (now consolidated into the National Health Mission) was originally created to strengthen public health management in India by promoting a decentralized approach to managing resources and emphasizing the provision of health services as close to the population as possible relative to the health need. Preventative services, such as immunizations and antenatal check-ups were to be provided at sub-centers and primary health centers, while more complex services would be provided at higher levels in the system. The Concurrent Evaluation of the NRHM structure in 2009 done by IIPS found that only 58 percent of the Sub-Centers from its sample in India were functioning from government buildings and only about 30 percent of Primary Health Centers had regular power supplies.¹²

The Health Metrics Network was launched in 2005, the same year as the NRHM, and for the past decade has been promoting a systematic approach to evaluating the performance HIS and strengthening a national HIS through a county-driven process. The HMN Framework divides the components of an HIS into three standard systems categories – inputs, processes and outputs.

Figure 3: Components of the HMN Framework



The inputs category reflects the ability of those responsible to lead and co-ordinate the process; the existence of necessary laws and policies; financial resources and people with the necessary skills to do the work; and finally the underlying infrastructure that binds the HIS system together. The processes used by an HIS combine the indicators used to measure health system progress over time, data sources from both routine and periodic means, and data management that facilitates easy access to relevant information for those who need it, while protecting the privacy of individual patients. The outputs reflect the analysis and results of the HIS reporting process, allowing information to be packaged in a way that is useful to a wide range of audiences.¹³

¹² Evaluation Study of NRHM in Seven States, 2009, IIPS

¹³ WHO: HMN Framework, 2008. WHO, Geneva.

The HFG research team sought information sources to document the components and standards of the Indian health system relative to the structure of the HMN Framework. A broad search was conducted by the HFG team in online global databases like PubMed and POPLINE in an effort to identify comprehensive research and scientific articles on HIS, HMIS, data quality and data use in India. A database search specific to India was then conducted using the multiple combination key word searches: Health Information System, Health Management Information System, HMIS, State Health Management Information System, District Health Information System (DHIS) and DHIS 2.0. GoI web portals were also extensively reviewed for statistical information, research reports and evaluations of NRHM program as part of this research. The abstracts of the articles were reviewed to verify whether they were related to the national HMIS web portal or other HIS sub-systems within India relevant to understanding the various components of the Indian national HIS. In many cases, each article reviewed led to references for additional sources, which were in turn evaluated.

An assessment of the articles from this search determined that most found in published journals evaluated only the experiences of a single or several states relative to the national HMIS or of experiences with a single HIS sub-system (such as the Maternal and Child Tracking System or Maternal and Infant Death Reporting System). Another large category of articles found during the review referenced the experiences of implementing an electronic clinical information system in a single service delivery organization in India, such as a hospital. While publications were found with summaries of data quality reviews conducted across a number of states, these had only tabular summaries, without any analysis of the likely or possible causes of any data quality issues found. None of the articles identified through the search process specifically documented a holistic analysis of the Indian national HMIS in a framework similar to HMN's. A representative listing of the articles reviewed for this report can be found in the Bibliography. The following sections of this report reflect the findings from the articles relevant to the HIS strengthening process in India and related to the relevant components of the HMN Framework.

2. RESOURCES

India has significant financial and technical resources at its disposal to address the primary health concerns of its population, unlike many other countries with similar women and child health indicators. A larger question asked by many in the public health sphere is whether India has most effectively allocated enough of its resources to address its priority health issues. Unlike many countries, India relies predominantly on internal resources to fund health programs. According to the 2004 National Health Accounts (NHA) exercise, which was conducted in part to provide a baseline on public health expenditure at the launch of the NRHM, only 2.28 percent of health program funding came from sources outside of India (e.g., funding agencies like UNICEF).¹⁴ The vast majority of internally supplied funds for health care come from private sources in India rather than from the government. The NHA data shows that private funds accounted for 78.05 percent of expenditures on health in 2004 in India, while total public funds from central, state and local government accounted for less than 20 percent combined.¹⁵

Table 1: Fund Flow to Health Sector by Source, 2004-2005

Source of funds	Expenditure (in 000 Rupees)	Percent distribution
Public Funds		
Central Government	90,667,581	6.78
State Government	160,171,666	11.97
Local Bodies	12,292,886	0.92
Total Public Funds	263,132,133	19.67
Private Funds		
Households	951,538,903	71.13
Social Insurance Funds	15,073,973	1.13
Firms	76,643,295	5.73
Non-governmental Organizations	879,761	0.07
Total Private Funds	1,044,135,932	78.05
External Flows (via)		
Central Government	20,884,614	1.56
State Government	3,272,854	0.24
Non-governmental Organizations	6,337,673	0.47
Total External Flows	30,495,141	2.28
Grand Total	1,337,763,206	100.00

¹⁴ National Health Accounts India, National Health Accounts Cell, MoHFW, 2004-2005.

¹⁵ Global Health Observatory Data Repository, 2012, WHO, <http://apps.who.int/gho/data/node.main.75?lang=en>

The GoI began an ambitious effort to improve access to and the quality of health services for its rural population in 2005. The NRHM was formally launched in April 2005 with a vision to “provide effective healthcare to rural population [sic] throughout the country with special focus on 18 states, which have weak public health indicators and/or weak infrastructure.”¹⁶ As laid out in its founding documents, NRHM’s primary operational strategies were:

- Decentralizing health planning and management to the village and district level
- Appointment of Accredited Social Health Activists (ASHA) to facilitate access to health services
- Strengthening the public health service delivery infrastructure by providing additional health workers, health facilities, and drugs, particularly at village, primary and secondary levels,
- Mainstreaming of homeopathic and traditional medicine (now known as AYUSH in India),
- Improving management capacity to organize health systems and services in public health,
- Emphasizing evidence-based planning and implementation through improved capacity and infrastructure,
- Encouraging the non-profit sector to increase social participation and community empowerment, and,
- Promoting healthy behaviors and improving intersectoral convergence.

The last three bullets of the NRHM strategy are particularly relevant to this report, as they rely heavily on the availability and use of reliable, timely and relevant data to inform program monitoring, progress toward health improvement targets and accountability to communities. The NRHM Mission Statement explicitly calls out reducing India’s MMR to 100/100,000 live births and IMR to 30/1,000, in line with the Millennium Development Goals (MDGs) established by the United Nations as targets for countries by 2015.¹⁷ A well-performing HIS is a critical requirement to document progress achieving the MDGs.

The 2004-05 NHA India exercise, which was completed in 2009, made provisional estimates for the years 2005-06 to 2008-09. In that analysis, summarized in Table 2, it can be seen that centrally allocated funds to the states for NRHM generally increased at the same rate as those from the state’s increase, except for 2007-08, when NRHM funding increased at twice the state rate of increase.¹⁸

Table 2: State Expenditure and Central Transfer Post NRHM (in Rs. 000)

	2005 - 06	2006 -07	2007 - 08	2008 - 09
State's own resources	211,721,600	252,204,000	285,935,300	342,957,300
Central transfers for NRHM	59,350,900	70,926,000	89,400,500	106,496,500
Other sources	<u>4,741,900</u>	<u>5,330,400</u>	<u>7,453,900</u>	<u>7,223,900</u>
Total Health Expenditures	275,814,400	328,460,400	382,789,700	456,677,700
State % increase over prior year	--	19.1%	13.4%	19.9%
NRHM % increase over prior year	--	19.5%	26.0%	19.1%
Other sources % increase over prior year	--	12.4%	39.8%	-3.1%

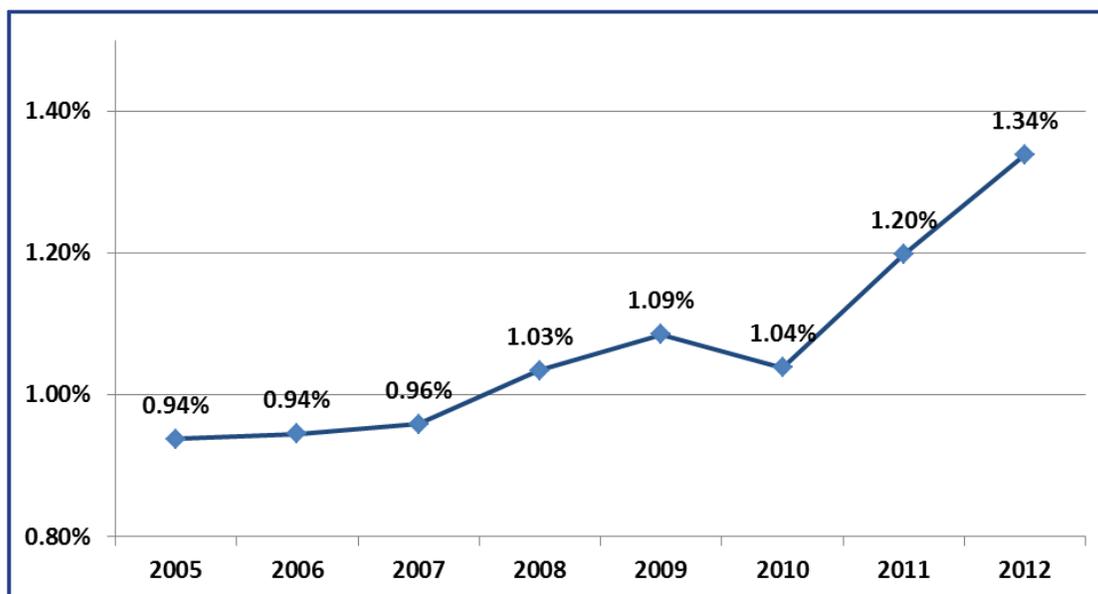
¹⁶ MoHFW: National Rural Health Mission, 2005-2012, Mission Document.

¹⁷ Ibid.

¹⁸ MoHFW: National Health Accounts India, National Health Accounts Cell, 2004-2005, Table I.6, p.9.

Of particular relevance to the resource discussion is that with the creation of the NRHM in 2005 the Gol also explicitly committed to “raise the outlays of public health from 0.9 percent of GDP to 2-3 percent of GDP.”¹⁹ According to WHO data, however, during the period that NRHM has been in operation the percentage of public health spending has only moved from 0.94 percent of GDP on health in 2005 to 1.34 percent of GDP being spent on health in 2012.²⁰

Figure 4: Indian Public Health Expenditures as a Percentage of GDP



The development of the national Health Management Information System (HMIS) web portal from 2008 on has prompted the expansion of computer and internet access being supported down to the Sub-Center level, in order to facilitate direct electronic data entry by health facilities. No documentation could be located to substantiate that such actions have comprehensively taken place across India. All health facilities across India are mandated under NRHM to directly enter data into the national HMIS web portal as of 2013. Additionally, each health facility operated by the NRHM is meant to be staffed by a trained Information Assistant or Data Entry Operator whose responsibility is to consolidate and report health statistics on a monthly basis. According to the 31 December 2013 quarterly status report from NRHM, 81,347 facilities across the country had Auxiliary Nurse Midwives or Data Entry Operator posted and trained for data capture using the MCTS formats, including posting the data to the MCTS web portal.²¹ If accurate, this would represent roughly 45 percent of all public health facilities operated by NRHM having trained data entry staff for reporting.

However, a closer review of the data and sources shows that there are different methods used for classification of health facilities, which makes matching these statistics challenging. The first column of data comes from the Rural Health Statistics 2012 publication compiled by the Statistics Division within MoHFW and released on their website under the HMIS Portal section. The Second column of data comes from Quarterly MIS Report for October through December of 2013, also published on the

¹⁹ National Rural Health Mission, op. cit.

²⁰ WHO: National Health Account database, <http://apps.who.int/nha/database/DataExplorerRegime.aspx>

²¹ <http://nrhm.gov.in/images/pdf/mis-report/Dec-2013/1-NRHM.pdf>

NRHM website, but from the MIS Reports section of the website. Table 3 below summarizes the approximate coverage of health facilities with trained data reporting staff.

Table 3: Approximation of NRHM Health Facilities with Trained Data Capture Staff

Facility description	Infrastructure details from RHS 2012	Number of facilities with ANMs/DEOs posted and trained for data capture on MCTS formats and uploading on MCTS Portal	Percent covered with trained data capture staff
Sub-centres (SC)	148,366	62,956	42%
Other health facilities above SC but below block level (may include APHC, Mini PHC etc.)	--	880	--
Primary Health Centres (PHC)	24,049	11,953	50%
Community Health Centres (CHC)	4,833	4,502	93%
Other than CHC at or above block level but below District Level (may include SDHs)	--	513	--
Sub-District Hospitals (SDH)	987		0%
Area Hospitals / General Hospitals	--	79	--
District Hospitals	722	464	64%
Totals	178,957	81,347	45%

It is worth noting that the statistics in Table 3 reflect training and reporting into the MCTS rather than the national HMIS web portal. The HMIS web portal is used to capture a broader set of data than is captured in MCTS. While the HMIS web portal captures primarily reproductive and child health related data, there are also deaths captured and stock management details captured as well. MCTS primarily focuses on identifying and registering pregnant women and then ensuring that clinical decision support guidelines built into MCTS are applied so that the women receive the clinical care appropriate to their health status. The research team could find no comprehensive resource materials that independently verified that data reporting into the national HMIS web portal is being done by facility level staff, as opposed to being sent manually to higher levels and consolidated there. However, according to responses from a telephone survey conducted by HFG India staff of the NRHM State Data Managers in the USAID-priority states and territories of Haryana, Uttarakhand, Himachal Pradesh, Punjab, Jharkhand and Delhi, facility-based data capture to the national HMIS is taking place on a monthly basis across all districts.

3. INDICATORS

There is broad agreement that India has made significant strides in achieving improvements in key health objectives over the past 25 years, such as reducing the maternal mortality ratio (MMR) and the under-five mortality rate (U5MR). Data from the Sample Registration System of India indicate that from 1990 to 2001, the Indian MMR dropped from 437 per 100,000 live births to 301 per 100,000 live births.²² These reductions, however, fall short of the targets established under the United Nations-developed Millennium Development Goals (MDGs), which pledged member countries to reduce their MMR by three-quarters and to reduce U5MR by half by 2015.²³

According to the 2001 census, 72.18 percent of India's population was residing in rural areas.²⁴ Disparities in health outcomes between urban and rural areas of India were quite stark; in 2001 the infant mortality rate in rural India was 30 more deaths per 1,000 live births than in urban areas (44/1,000 versus 74/1,000).²⁵ These disparities were a key driver for the restructuring of the Indian health system to focus on rural health by creating the NRHM in 2005. Due to the sheer volume of pregnancies and births each year, India accounts for roughly 19 percent (56,000) of all maternal deaths globally.²⁶

NRHM has defined key indicators that reflect the specific health outcomes of highest priority. The RMNCH+A initiative was launched in 2013 by a broad consortium of technical resource partners, including international agencies, locally based non-governmental organizations and key MoHFW divisions. The RMNCH+A initiative promotes a Continuum of Care approach that focuses on the reproductive life cycle: reproductive age group, pregnancy care, child birth, postnatal maternal and newborn care.²⁷ Strategic, evidence-based interventions targeted to these stages in the reproductive life cycle – ranging from promoting nutrition among adolescent girls on the one hand to improving the care of sick newborns on the other hand – are being implemented in India and are being tracked by a core set of indicators.

The RMNCH+A monitoring and evaluation framework is structured and tracks a core set of indicators that follow the same reproductive lifecycle approach using a scorecard system. The scorecard, which is intended to improve the initiative's accountability and to allow for initiating necessary corrective actions, comprises of indicators derived from the national HMIS and aligned with the reproductive lifecycle as illustrated in Figure 5. Per the guidance in the RMNCH+A strategic handbook, scores will be determined on basis of their ranking relative to the national average for India; those states whose scorecard indicators fall above the national average will receive 'positive' scores, while those falling below the national average will receive 'negative' scores. Each state is responsible for compiling their own indicators and scorecard on a quarterly basis, including compiling scorecards for all districts in their state.

²² Maternal and Child Mortality and Total Fertility Rates, Sample Registration System, Special Bulletin, Office of Registrar General, India, 7 July 2011.

²³ <http://www.unmillenniumproject.org/goals/gti.htm>

²⁴ http://www.censusindia.gov.in/Census_Data_2001/India_at_glance/rural.aspx

²⁵ Ibid.

²⁶ A Strategic Approach to Reproductive, Newborn, Child and Adolescent Health (RMNCH+A) in India: For Healthy Mother and Child, MoHFW, GoI, February 2013.

²⁷ Ibid.

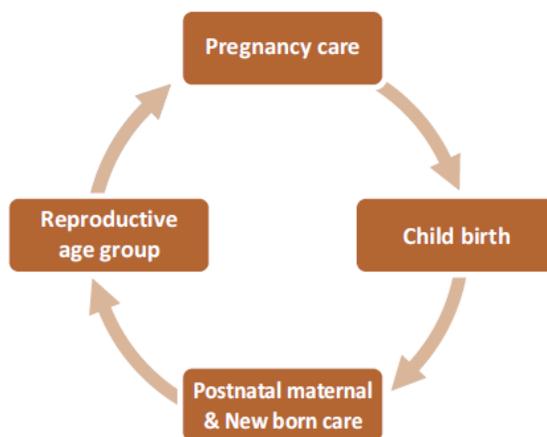
Figure 5: RMNCH+A Indicators Across the Reproductive Life Cycle

Proportion of:

- 1st Trimester registration to total ANC registration
- Pregnant women received 3 ANC to total ANC registration
- Pregnant women given 100 IFA to total ANC registration
- Cases of pregnant women with Obstetric Complications and attended to reported deliveries
- Pregnant women receiving TT2 or Booster to total ANC registration

Proportion of:

- Post-partum sterilization to total female sterilization
- Male sterilization to total sterilization
- IUD insertions in public plus private accredited institutions to all family planning methods (IUD plus permanent)



Proportion of:

- SBA attended home deliveries to total reported home deliveries
- Institutional deliveries to total ANC registration
- C-Section to reported deliveries

Proportion of:

- Newborns breast fed within 1 hour to total live births
- Women discharged in less than 48 hours of delivery in public institutions to total number of deliveries in public institutions
- Newborns weighing less than 2.5 kg to newborns weighed at birth
- Newborns visited within 24hrs of home delivery to total reported home deliveries
- Infants 0 to 11 months old who received Measles vaccine to reported live births

The scorecard seeks to improve state accountability for RMNCH+A indicators and catalyze states into using the HMIS data for improved decision-making. The effectiveness of the monitoring efforts will in large part be reliant on the reliability and timeliness of the data reported through the national HMIS. All of the indicators defined in Figure 4 are compound indicators, with numerators and denominators. Taking ‘cases of pregnant women with obstetrical complications and attended to reported deliveries’ as an example, one can see the complexity of tracking the indicators. To begin with, as presented in Figure 5, which comes directly from the RMNCH+A strategic guidebook, the indicator does not match exactly with the HMIS reporting formats and guidelines. In the NRHM Service Providers’ Manual, which provides guidelines on HMIS reporting formats and data definitions, the full description of the data element is ‘cases of pregnant women with obstetric complications and attended *at public facilities*.’²⁸ Without including these last three words, the number of cases reported might leave facility staff to interpret it as both women attended at public and at private facilities, which will distort the indicator. This type of issue also highlights the need for routine data quality checks to be performed by NRHM staff at all facilities to confirm that consistent data definitions are being used for in reporting.

²⁸ Service Providers’ Manual: Understanding HMIS, Volume I, NRHM, January 2011. M5 – Complicated pregnancies, p. 49.

A second component of the RMNCH+A monitoring program rests on a survey-based scorecard which compiles a broader set of 19 indicators that reflect health outcomes and program coverage. This scorecard includes health, nutrition, gender and sanitation indicators, most of which are not routinely reported through the national HMIS or through MCTS. The main complicating factor for the indicators is that they require data from 8 distinct surveys, each of which is compiled on a different frequency and using different sampling and estimation methods. The survey-based scorecard for RMNCH+A draws on the following sources: Sample Registration System (2009, 2010, 2011), Coverage Estimate Survey 2009, District Level Household Survey 2007-08, National Family Health Survey 2005-06, Census 2011 and Annual Health Survey 2010-11. The following section will take up a more detailed discussion on data sources and further highlight some of the challenges that the survey-based scorecard approach may face.



4. DATA SOURCES

The HMN Framework divides data sources into those derived from population-based sources and those that are derived from institution-based sources, as presented in Figure 6.²⁹ Examples of the population-based sources are censuses, which are generally conducted no more frequently than every 10 years, civil registration systems, which routinely cover births and deaths, and various surveys, which take place on a variety of frequencies. Provided here is an overview of the key data sources for health information in India.

Figure 6: Health Information Data Sources per HMN Framework



The Sample Registration System (SRS) in India is referred to by some as the largest demographic survey in the world covering approximately 1.5 million households and 7.35 million people. It has continued to be the main source of information on fertility and mortality indicators both at the state and national levels in India since introduced in 1971. The system has a unique feature of dual recording of births and deaths. In the first collection of data, a resident part-time counter continuously records births and deaths in each of the sample villages or urban blocks. A retrospective survey is conducted every six months by an independent supervisor in the same sample location and the two records are then verified to confirm matching and results sent to the Registrar General of India for tabulation, analysis and publication at the national level. The system provides a cross check on the correctness and completeness of the events of birth and death listed by the two independent functionaries.³⁰

Based on the dual record system, the SRS has been considered a reliable source of estimates of fertility and mortality on a regular basis from 1971 onward. It includes data on population composition by broad age groups, sex and marital status, fertility and mortality levels, for India and bigger states (with population 10 million and above) separately for rural and urban areas. Tabulations on certain items of

²⁹ HMN Framework, 2008, p. 22.

³⁰ An Overview of the Sample Registration System in India, Paper presented by Prasanta Mahapatra at the Prince Mahidol Award Conference & Global Health Information Forum 2010, Bangkok, Thailand.

demographic interest such as mean age at effective marriage for females, interval between current and previous live birth and also distribution of live births by birth order have continued to form part of the SRS report. The sex ratio at birth has been included since 2001 and the sex ratio of children (age-group 0-4 years) has been included in the SRS since 2002. Moreover, estimates of U5MR for India and larger states for both rural and urban areas, by sex, were introduced into the SRS in 2008 in order to facilitate effective tracking of the MDGs.

In order to check the completeness of registration of vital events by the SRS, several evaluations of the SRS were done during the 1970s and 1980s which showed reliable findings and minimal recording errors. However, one independent evaluation from the late 1990s that compared the SRS results with those of the National Family Health Survey (NFHS) found that the SRS appears to have over-estimated births by about 10 percent during a period from 1978 to 1992.³¹ Although SRS is considered a reliable and continuous source of vital statistics in India, it would probably benefit from systematic reviews of its methodology and findings.

The GoI routinely carries out health-related research studies in partnership with India's many academic and social sciences institutions. In one notable example, the Registrar General of India is working with more than 20 institutions on the Million Death Study to supplement the data from the CRS and SRS. The Million Death Study began monitoring nearly 14 million people across 2.4 million nationally representative households in 1998 for any deaths that may occur in these households through 2014. The deaths will be assigned a probable cause, as determined by a verbal autopsy methodology. The resulting dataset on causes of death is anticipated to provide the most comprehensive pool ever compiled in India. This study exemplifies the extensive technical research resources supporting India's efforts to understand and improve its health systems.

The Annual Health Survey (AHS) was conceived as a means of monitoring the performance and outcomes of various health interventions, particularly those under the NRHM since 2005. The AHS, which is also implemented by the Office of the Registrar General and covers nine of NRHM's 18 special-focus states which account for 50 percent of India's population, 60 percent of annual births, 71 percent

of infant deaths and 62 percent of maternal deaths, is a particularly relevant source of vital indicators such as IMR, MMR and total fertility rate, as well as process and outcome indicators.³² One argument used to justify the use of the AHS is that there are large inter-district variations in the states covered. However, news reports in India last year, citing the Deputy Registrar General, indicated that the most recently completed AHS (August of 2013) would be the last time that the survey would be implemented.³³

AHS OBJECTIVE - "To yield benchmarks of core vital and health indicators at the district level and to map changes therein on an annual basis" – Release of AHS Bulletin 2010-11.

The MoHFW has designated IIPS (Mumbai) as the coordinating agency for conducting the District Level Household and Facility Survey (DLHS), although at least 15

separate agencies facilitate data collection, data entry, tabulation and preparation of district level and state level reports. In line with the NRHM efforts to decentralize programs to the district level, the

³¹ Narasimhan RL, et. al. Comparison of Fertility Estimates from India's Sample Registration System and National Family Health Survey. Mumbai, India & Honolulu, Hawaii, USA: International Institute for Population Sciences & East-West Center Program on Population, September 1997.

³² Office of the Registrar General, Ministry of Home Affairs. Annual Health Survey Bulletin, 2010-2011. 10 August 2011.

³³ Krishnan, V. "Govt discontinues annual health survey," <http://www.livemint.com/Politics/zjD4pm80nNrUgpbpcBRKK/Govt-discontinues-annual-health-survey.html>, First Published: 25 July 2013.

DLHS is designed to provide information on family planning, maternal and child health, reproductive health women and adolescent girls and utilization of maternal and child healthcare services at the district level. It is a household survey at the district level that was initially implemented in 1998 in 252 districts from 25 states and five union territories of the country. The second phase (DLHS-2) of the survey was conducted in 1999 in 255 districts from 25 states and 5 union territories, and in the third round of implementation (DLHS-3), the survey covered 611 districts in 34 states and union territories in India. An important component of DLHS-3 is the integration of the Facility Survey of health institutions (Sub-center, Primary Health Center, Community Health Center, Sub-district Hospital and District Hospital) accessible to the populations from the sampled villages. The focus of DLHS-3 is to provide health care and utilization indicators at the district level for the enhancement of the activities under NRHM, including the recently launched RMNCH+A.³⁴

The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. The survey follows an internationally recognized methodology known as the Demographic and Health Survey, utilizing large sample sizes (usually between 5,000 and 30,000 households) and typically are conducted about every 5 years to allow comparisons over time. Four rounds of the NFHS have been conducted in India including the first survey conducted in 1992-93. The survey provides state and national information (as opposed to district-level for the DLHS) for India on fertility, infant and child mortality, family planning practices, maternal and child health, reproductive health, nutrition, utilization and quality of health and family planning services.

Each successive round of the NFHS has had two specific goals: a) to provide essential data on health and family welfare needed by MoHFW and other agencies for policy and program purposes, and b) to provide information on important emerging health and family welfare issues, such as HIV/AIDS transmission patterns. As with the DLHS, IIPS (Mumbai) is the designated managing agency responsible for providing coordination and technical guidance for the survey. Eighteen Population Research Centres (PRCs), located in universities and research institutes across India, have assisted IIPS in the various rounds of the NFHS. Forty-eight state-level and national-level reports for the survey have been published based on data from the DLHS-I, with similar results from subsequent rounds. The NFHS is considered one of the best sources of health data for international research agencies, which draw heavily on the data sets for their work.³⁵

One area where the variety of data sources in India has led to concerns is when divergent population figures are used for evaluating program coverage indicators; they often lead to distortionary results. Immunization coverage provides a good example that has been documented in reports routinely compiled by the NHSRC. As shown in Table 4 below, drawn from the report, there's a more than 20 percentage points variation between child immunization rates for measles based on 'expected live births' versus 'reported live births.' While both nominally come from the same source, the denominators clearly do not coincide.³⁶

³⁴ http://www.rchiips.org/pdf/INDIA_REPORT_DLHS-3.pdf

³⁵ See as one of many examples: Chalasani, Sativika. 2010. *The Changing Relationship between Household Wealth and Child Survival in India*. DHS Working Papers No. 69. Calverton, Maryland, USA: ICF Macro.

³⁶ NHSRC: HMIS Analysis – Jharkhand, April 2012 – March 2013, May 2013.

Table 4: Comparative immunization rates for children, April 2012- March 2013, Jarkhand

Indicator using survey estimates	Coverage rate	Indicator using HMIS data	Coverage rate
Measles given against expected live births	85%	Measles given against reported live births	111%
Fully immunized children against expected live births	81%	Fully immunized children against reported live births	105%

5. DATA MANAGEMENT

There are many approaches to managing data across a national HIS. The HMN Framework and many experts in the field of health informatics promote the concept of moving toward data integration – tying distinct data sets together using common identifiers within each system. Unique patient identifiers and unique health facility identifiers are two of the most common approaches to facilitating data integration. Regardless of the mechanism, there can be many benefits to connecting HIS databases together. For example, as the RMNCH+A indicators are tracked by NRHM, should there become a clear discrepancy in newborn outcomes in one district, it would be useful to be able to connect the databases on such things as the types and location of health workers with training in neonatal care to try to identify gaps in service delivery.

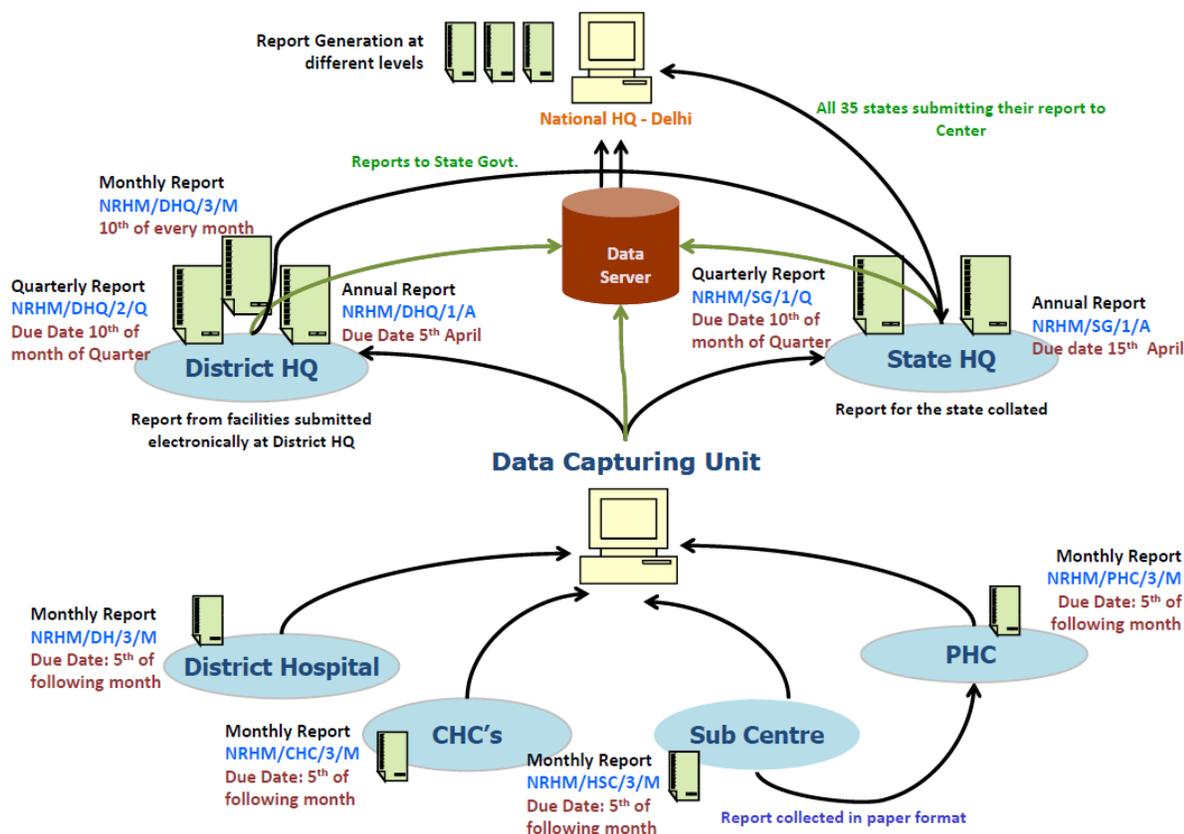
The current version of the national HMIS in India was launched by the Statistics Division of MoHFW in 2008. Prior to the launch of the web-based electronic HMIS, NRHM went through a process of building the monitoring and evaluation (M&E) capacity of the national-, state- and regional-level staff responsible for reporting and exhaustively reviewing and streamlining the required reporting formats and data elements for each agency type in NRHM. This process reduced the required reporting data elements from nearly 3,000 to approximately 300 critical data elements and took a full two years. Shown in Table 5 is a summary by facility type of the monthly data elements, grouped into reporting domains that are required to be reported to NRHM through the national HMIS.

Table 5: Number of Data Elements in Revised NRHM Monthly Reporting Formats

Section of Reporting Format	SC	PHC	CHC/SDH/DH
Antenatal care	8	9	10
Deliveries	9	5	5
Caesarean Section	--	1	1
Pregnancy Outcome	7	7	7
Complicated Pregnancies	--	4	5
Medical Termination of Pregnancy	--	3	2
Reproductive Tract /Sexually Transmitted Infections	--	3	3
Post-natal care	2	3	3
Family planning	12	17	17
Child immunization	28	27	28
Vitamin A doses	3	3	3
Childhood diseases	3	9	9
Other programs (e.g., blindness control)	--	4	6
Patient services	2	17	20
Lab test	2	15	15
Total	76	127	134

Reducing the number of data elements was a time consuming process, but only one of several steps required to move NRHM forward in improving its data management practices. NRHM worked in conjunction with the National Informatics Centre to facilitate development of the HMIS web portal and promote the vision of an electronic data reporting structure as illustrated in Figure 7. The national HMIS web portal was officially launched in October 2008, with paper-based reporting initially taking place at the facility levels and districts data entering the paper reports into the web-based system. This has transitioned to requirements for facilities to directly enter their data into the HMIS web portal and they are being provided computers, internet access and a Data Entry Officer for that purpose. Although not documented in any independent, publicly available resource materials, anecdotal information from multiple state offices responsible for data management and publicly released MoHFW presentations indicate that extensive data entry into the national HMIS from the facility level is now taking place. One estimate cited in a presentation made by the MoHFW in 2013 put the number of health facilities directly reporting into the national HMIS at 94,536 or roughly 52 percent of NRHM facilities.³⁷

Figure 7: Data Flow Envisioned Under National HMIS Rollout (2008)



³⁷ Khera, Dr. Ajay. (Deputy Commissioner, MoHFW). Presentation on Improving Accountability: India Scorecard, Child Health Summit, Chennai, India. 8 February 2013.

The extension of the reporting infrastructure – comprising computers, internet access, system user identifications and training of Information Assistants – over the past four plus years to the facility level has certainly produced more extensive reporting of NHRM data directly from the health facilities. However, the accuracy and timeliness of that information is not being routinely and comprehensively documented to ensure that the data from the national HMIS can be trusted for program planning and monitoring purposes. Discrepancies between HMIS and other estimations were noted as part of a WHO presentation in Delhi last year encouraging the implementation of routine data quality checks to produce ‘data quality report cards.’ In the presentation, it was noted that there was a discrepancy of roughly 6 percent between population estimates from the 2011 Indian census versus UNFPA 2011 projections. While 6 percent does not reflect a large difference in small population estimates, in Bihar that difference equated to 6 million more people represented in the Indian census.³⁸ When combining population estimates with HMIS data on coverage indicators, wide variations will result in such cases.

An assessment on HMIS data quality and use of information in 35 districts of 18 states (including five of the USAID-focus states except for Delhi) by the National Health Systems Resource Centre (NHSRC) found that in more than three quarters of the study districts (77 percent), facility registers were incompatible with the required HMIS forms (see Table 5). Furthermore, the study found that in 85 percent of the study districts, handmade registers were being used in the District Hospital and more than half (52 percent) of the District Hospital managers did not know what the reporting requirements were. The problem of non-standard reporting tools was also found at the PHC and CHC levels where makeshift registers were used to record out-patient data and in-patient data. The NHSRC study found that quite often these registers (printed locally) were missing several data elements mandated by the national HMIS format, as summarized in Table 6 below.³⁹

Table 6: Average Number of Data Elements Missing from Facility Registers

States reviewed	Missing elements from SC registers	Missing elements from PHC registers	Missing elements from CHC/DH registers
Haryana	14	15	17
Himachal Pradesh	10	20	16
Jharkhand	8	19	19
Punjab	19	10	11
Uttarakhand	5	19	20

³⁸ Kavita (partial name). Facility Level Data Quality Assessment. WHO. Presentation in New Delhi, India, 27 February 2013.

³⁹ NHSRC (HMIS Division): National HMIS Assessment Report. June 2012.

Additionally, the NHSRC study noted that health workers found it difficult to carry the primary registers while on field visits. Therefore, an alternate mechanism (using an ad-hoc diary) was created for primary data capture before transcribing the data into the main register upon return to the facility. These ad-hoc diaries did not have written instructions to guide data entry processes.⁴⁰ Some states have taken steps to address some of these concerns, such as seeking technical support from resource partners and financial resources to ensure printing and availability of official primary registers. Recent field visits to ten health facilities across four districts in the State of Haryana during a data quality audit exercise by HFG confirm that very few health facilities were using the officially approved, printed and distributed NRHM registers to record key RMNCH+A data.⁴¹

MoHFW launched the Mother and Child Tracking System (MCTS) in 2010 to capture name based health information about all pregnant women and infants born in the country. Its development coincided with the continuing push by NRHM to improve the understanding of where and how pregnant women and newborns interact with the health system. The MCTS was envisioned as being more than a static clinical record documenting the care provided to women and children. It was designed to take the RMNCH+A guidelines for effective care of pregnant women and newborns and build them into work plans based on the status of the patients. It is particularly geared toward tracking of high risk patients. For example, there are built-in templates to create work plans based on requirements for antenatal care, receiving the appropriate vaccinations, connecting the patients to a health facility for follow ups and following up with the mother in the post-partum period for documentation of family planning services.⁴² The MCTS modules contain system generated growth charts for ANMs to compare the progress of children with standard clinical metrics. Based on the data captured in MCTS, the report outputs for ANMs will include work plans that indicate when follow ups with specific patients should occur. The NHRM and NIC teams in Gujarat have been the primary developers of the software systems and user manuals for the web-based MCTS, which is referred to as e-Mamta.

While training is taking place across NRHM facilities on both the national HMIS and MCTS systems, there are no plans yet developed to integrate or share data electronically between information systems. As much of the patient level MCTS data feeds into the NRHM and RMNCH+A indicators, there could be a logical flow of information from MCTS to the national HMIS (or even to DHIS 2.0 in those states using the system) rather than a duplication of data entry. Additionally, new electronic systems are continuing to be developed independently by state teams that contain subsets of data required by the MCTS and national HMIS. Two examples from Haryana are the Maternal and Infant Death Registration System (MIDRS) and the Anemia Tracking System (ATM). MIDRS records details of infant and maternal deaths, while the ATM is intended for tracking anemic women to ensure that they receive the clinically indicated care.

The last two Common Review Missions (5th CRM and 6th CRM), undertaken by a broad consortium headed by the National Planning Commission and MoHFW to evaluate the performance of key programs operating under NHRM, made explicit mention of concerns with the current use of data and compatibility of various HIS. The 5th CRM called out the need for more effective central coordination in its bulleted recommendations:

- “There should be greater attention from the Centre to setting up data policy, data quality standards, and standards of interoperability with more autonomy to states to develop state specific systems.

⁴⁰ Ibid.

⁴¹ Singh, Gajinder Pal, Jordan Tuchman, and Michael P. Rodriguez. May 2014. *Improving Data for Decision-making: Leveraging Data Quality Audits in Haryana, India*. Delhi, India: Health Finance and Governance Project, Abt Associates

⁴² National Informatics Centre, Gujarat: Operational Manual, Mother and Child Tracking System. NRHM, August 2010.

- HMIS data should be analyzed at all levels and be used for planning and decision making. Root Cause Analysis should be undertaken for any deterioration in indicators and time bound action plans should be formulated to take action. The focus needs to be on “hands-on” training for HMIS from district to block levels on priority.”⁴³

The 6th CRM went further to specifically call out the need for interoperability between HMIS and other systems:

- “States could be encouraged to put in systems as required at any level especially those which have facility and local area information, but such systems must lend themselves for local analysis at facility, block and district level, and be able to aggregate and export the information required at state and central level. Further HMIS systems should be able to share data electronically with databases of disease control programmes, MCTS and even the ICDS programme and civil registration systems.
- States need to systematically apply data quality assessment tools to identify and remove sources of error. Most common data quality issues relate to poor primary records, data duplication and other easily identifiable and correctable process errors.”⁴⁴

There is broad recognition across NRHM that there is a need to improve the coordination of HIS development and information exchange between systems, and to institute systematic reviews of the quality of data being generated from the systems. Both activities are seen as likely to improve the opportunities to use high quality data for decision-making at the district levels as intended under the NRHM mandate.

⁴³ NRHM: Fifth Common Review Mission Report 2011, p.23.

⁴⁴ NRHM: Sixth Common Review Mission Report 2012, p. 66.

6. DISSEMINATION AND USE

The WHO has promoted equitable and universal access to health-care information as an important part of worldwide strategies to reduce global disparities in health and to achieve the health related MDGs.⁴⁵ Passively providing access to information is not the same as actively managing and promoting the use of the information. Knowledge management is the term commonly used to define systematically making the best use of organizational learnings. This is particularly applicable to volumes of data collected through a routine national HIS.

There are two primary audiences for the products developed from data compiled from India's national HMIS: internal to the managing programs in India and external to researchers, evaluators and the general public. The volume of health related data publicly available through the MoHFW, NRHM, Department of Statistics, Census Commissioner, to cite just a few, is overwhelming. The Right to Information Act of 2005 in India mandates the timely access and open access to information, with few restrictions. It is, however, quite difficult to document the degree to which the public citizens (or researcher or government auditors) in India access the plethora of sources available to them and thus how much of the health information is used as intended.

A principle of HMN is that country information should be made a core part of the day-to-day management of health system planning and delivery.

One example of a systematic effort in India to promote the access to relevant child health was the creation of the portal 'Repository on Maternal Child Health' that was developed using an open source content management system and standardized processes for collection, selection, categorization and presentation of resource materials. This effort was undertaken in 2010 by the National Institute of Health and Family Welfare. An evaluation of the portal's impact over an 18-month period noted nearly 44,000 unique visitors accessing the site some 53,000 times. The evaluation also noted that a key contributor to the site's success in engaging visitors was the 'efficient management of health information...for informed decision making.'⁴⁶ There is a need to develop similar mechanisms for other portals within the MoHFW and interlink them to facilitate access to a variety of health information from a single platform in order to more effectively promote external usage of the data.

The HFG research team found several sources that may reflect examples of usage of NHRM's health information for its intended purposes. According to published guidelines from NHRM, state teams are expected to document their plans for the rational and equitable deployment of resources with the highest priority accorded to high focus, high needs districts and delivery points through the preparation and submission for approval of State Project Implementation Plans or PIPs to the National Programme Coordination Committee.⁴⁷ Reasoning that the state PIPs would most effectively be used to advocate for resources from the central level by referencing relevant health information, HFG undertook a comprehensive review of the 2013-2014 state PIPs to validate this hypothesis. The review documented that the state PIPs cited an average of seven different sources for health data to support their plans. The

⁴⁵ WHO: World report on knowledge for better health: strengthening health systems. WHO, Geneva, 2004.

⁴⁶ Khanna et al. Repository on maternal child health: Health portal to improve access to information on maternal child health in India. BMC Public Health 2013, 13:2

⁴⁷ NRHM: Guidelines for Preparation of Annual Programme Implementation Plan, National Rural Health Mission, 2013-2014.

most commonly cited source, found in 31 (or 89 percent) of the 35 PIPs, was the 2012-2013 national HMIS data, followed by the 2011-2012 national HMIS data, which was cited in 30 (86 percent) of the 35 PIPs. The least commonly cited source, showing up in only one PIP was the DLHS-II, which contains data for the 2002-2004 period. This indicates that state programs understand the value of leveraging the most recently available health data for their PIPs. Although no specific conclusions can be drawn from the finding, it was notable that the MCTS was cited in none of the 2013-14 PIPs reviewed by HFG. The complete summary of sources cited in the PIPs is presented in Table 7.

Table 7: Sources Cited in State PIPs for 2013-14

State Name	HMIS (2011-12)	HMIS (2012-13)	RNTCP	NVBDCP	IDSP	AHS	CES (2009)	DLHS II	DLHS III	SRS (2004-06)	SRS (2007-09)	SRS (2011)
Andhra Pradesh	✓	✓					✓	✓	✓	✓	✓	
Andaman & Nicobar Islands	✓	✓	✓	✓	✓							✓
Arunachal Pradesh	✓	✓	✓				✓		✓			✓
Assam	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Bihar	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
Chandigarh	✓	✓	✓	✓		✓	✓		✓	✓	✓	
Chhattisgarh	✓	✓					✓		✓			
Dadra & Nagar Haveli	✓	✓	✓	✓					✓		✓	✓
Daman & Diu	✓	✓										
Delhi	✓	✓	✓				✓		✓			
Goa	✓	✓	✓	✓	✓		✓		✓	✓	✓	
Gujarat	✓	✓	✓	✓	✓		✓			✓	✓	✓
Haryana	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
Himachal Pradesh	✓	✓	✓	✓	✓		✓		✓	✓	✓	
Jammu & Kashmir	✓	✓					✓		✓			
Jharkhand	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Karnataka			✓		✓	✓				✓	✓	✓
Kerala	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
Lakshadweep	✓	✓				✓	✓		✓			

State Name	HMIS (2011-12)	HMIS (2012-13)	RNTCP	NVBDCP	IDSP	AHS	CES (2009)	DLHS II	DLHS III	SRS (2004-06)	SRS (2007-09)	SRS (2011)
Madhya Pradesh	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	
Maharashtra	✓	✓	✓	✓	✓		✓		✓		✓	
Manipur	✓	✓	✓		✓		✓		✓		✓	✓
Meghalaya	✓	✓	✓	✓	✓		✓		✓		✓	✓
Mizoram	✓	✓	✓	✓	✓		✓		✓		✓	✓
Nagaland	✓	✓	✓	✓	✓		✓					
Odisha			✓	✓	✓						✓	✓
Puducherry		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Punjab	✓	✓		✓	✓		✓		✓	✓	✓	✓
Rajasthan	✓	✓	✓	✓	✓		✓		✓			
Sikkim	✓	✓	✓		✓		✓		✓	✓		
Tamil Nadu	✓	✓				✓	✓		✓	✓	✓	✓
Tripura	✓	✓	✓	✓	✓		✓		✓			
Uttar Pradesh			✓	✓								
Uttarakhand	✓	✓	✓		✓		✓		✓		✓	✓
West Bengal			✓	✓	✓						✓	✓
Total	30	31	28	22	24	7	27	1	27	16	23	16

The HFG research team was able to find another possible indication that program teams within NRHM are using HIS-generated data, this time focused on the MCTS-derived information. According to the 31 December 2013 quarterly status report from NRHM, 87,138 health facilities across the country were generating and using work plans from MCTS. If accurate, this would represent roughly 49 percent of all public health facilities operated by NRHM having trained data entry staff for reporting. CHCs and Sub-Centres (SCs) reflected the highest level of work plan usage at 57 percent and 50 percent, respectively. District Hospitals showed the lowest level of usage at 34 percent.⁴⁸ While global judgments cannot be made based on these data, they provide ideas for possible further exploration of the data to more systematically review the patterns of data usage.

⁴⁸ <http://nrhm.gov.in/images/pdf/mis-report/Dec-2013/1-NRHM.pdf>

A review of the data and sources requires noting again that there are different methods used for classification of health facilities across the data columns, which makes matching these statistics imperfect. The first column of data comes from the Rural Health Statistics 2012 publication compiled by the Statistics Division within MoHFW and released on their website under the HMIS Portal section. The second column of data comes from Quarterly MIS Report for October through December of 2013, also published on the NRHM website, but from the MIS Reports section of the website.

Table 8: Estimates of Health Facilities Using MCTS for Program Planning

Facility description	Infrastructure details from RHS 2012	Number of facilities generating and using work plan of MCTS	Percent covered with trained data capture staff
Sub-centres	148,366	74,094	50%
Other health facilities above SC but below block level (may include APHC, Mini PHC etc.)	--	373	--
Primary Health Centres	24,049	9,484	39%
Community Health Centres	4,833	2,749	57%
Other than CHC at or above block level but below District Level (may Include SDHs)	--	143	--
Sub-District Hospitals (SDH)	987	--	--
Area Hospitals/General Hospitals	--	52	--
District Hospitals	722	243	34%
Totals	178,957	87,138	49%

7. PUBLISHED RECOMMENDATIONS

Numerous research studies have demonstrated that full and systemic adoption of electronic HIS can lead to quality improvement and improved health outcomes.⁴⁹ In 2005, researchers at the RAND Corporation estimated that ‘properly implemented and widely adopted [HIS] would save money and significantly improve healthcare quality’ in the United States (US). The RAND study projected that \$77 billion in annual savings (or 5 percent of the \$1.7 trillion annual health expenditure in the US) would be attributed to efficiency improvements alone. The caveats to these estimates, however, were that \$8 billion in annual HIS investments would be required, more than 90 percent of the points of care in the US would have to adopt the standardized HIS, information would have to be shared electronically with all points of care and 100 percent of the patients would have to receive the recommended course of care for their specific health conditions.⁵⁰ As in India, the US operates on a federated model, where much of the decision-making power for healthcare programs is managed by states. The route that the US took to promote the systematic adoption of HIS across the country was to centrally mandate that HIS and HIS-subsystems, whether paid for with government funds or private funds, would have to conform to a uniform set of data exchange (or interoperability) standards to ensure that different HIS could share data electronically regardless of who built the systems, managed the systems or needed data from the systems. These efforts have been coordinated through the Office of the National Coordinator for Health Information Technology for the past decade.⁵¹

The HMN Framework for evaluating and strengthening national HIS is founded on a core set of principles that focus on empowerment of the country’s leadership team. The HMN Framework also promotes building upon the systems and infrastructure in place and moving forward in an incremental fashion. HMN summarizes the phased processes for achieving systematic improvement of a national HIS as follows:

- 1. Leadership, coordination and assessment** – This phase in the process is characterized by setting up national working groups and guidance committees to coordinate across key stakeholder constituencies and by carrying out an assessment of the current HIS (and the many subsystems) using a structured set of tools.⁵²
- 2. Priority-setting and planning** – As a secondary step, HMN envisions countries using the results of the assessment to focus the working groups’ attention on the performance gaps and problems that appear to deserve highest attention and then to generate the strategic ideas needed to strengthen the priority HIS sub-systems. The implementation of these interventions is then planned across a medium-term time period with detailed cost estimates for carrying out these plans. The interventions are then presented for review and approval by the guiding stakeholders.

⁴⁹ See for example: Miller AR and CE Tucker. *Can health care information technology save babies?* J Polit Econ. 2011; 119(2):289-324.

⁵⁰ Girosi F., et al., *Extrapolating Evidence of Health Information Technology Savings and Costs*, RAND Corporation, MG-410-HLTH, 2005.

⁵¹ US Office of the National Health IT Coordinator: <http://www.healthit.gov/policy-researchers-implementers/federal-state-health-care-coordination>

⁵² *Guidance for the Health Information Systems Strategic Planning Process Steps: Tools and Templates for HIS Systems Design and Strategic Planning*, Version 6, March 2009, Health Metrics Network, WHO, Geneva, 2009.

3. Implementation of HIS strengthening activities – Based on the resource allocations available, a time-phased implementation of agreed upon strategies is then undertaken, with monitoring and re-planning taking place at regular intervals.

The HIS strengthening efforts in India have largely been driven by the Gol rather than by outside interests. However, the HIS strengthening efforts have not been coordinated by a single authority at the central level. The lack of coordination has resulted in the development of multiple competing HIS and sub-systems operating in parallel to each other, in spite of the fact that in many cases the data captured is the same across the systems. While no systematic assessments of the national HIS in India have taken place, numerous evaluations and reviews of components of the health system (including those by Gol agencies) have called out the lack of HIS coordination and integration as a major concern.

India has tremendous potential to improve the reliability and efficiency of its data reporting and the use of information by addressing some key components:

- One approach to standardizing electronic health data standards is to constitute a national level, multi-stakeholder, multi-sectoral group responsible for and empowered to develop a strategic plan for strengthening India's national HIS.
- Define and distribute a set of electronic HIS data standards that system developers must follow to ensure data consistency across systems. This consistency will improve opportunities to exchange data electronically between systems and eventually to streamline the number of HIS sub-systems in place to eliminate duplication and reduce reporting burdens.
- Conduct a comprehensive comparison of data being captured in the national HMIS and the MCTS system to identify overlaps and unnecessary elements. The MCTS system is a patient-level reporting system which can likely feed key data into the HMIS without having to be separately captured in both. For example, MCTS is intended to ensure that pregnant women are receiving antenatal care. The number of antenatal care visits is also a key data input within the national HMIS.
- Develop and implement a system for uniquely identifying health facilities and patients that will be utilized uniformly and consistently across existing and future databases.
- Establish a formal coordination mechanism for technical resources across and/or within states. There are numerous technical resources for HIS development, health system strengthening and health systems research throughout India. Ensuring a coordinated and consistent support structure for the states will increase the uniform reporting, quality and usage of health data for program purposes.

*“While it makes sense to not have many surveys, the NFHS ought to be expanded and be carried out in shorter intervals. **More importantly, we need real-time data with better use of information technology in health.** Once in three years may not be adequate...”*

– Srinath Reddy, President, Public Health Foundation of India

Source:

<http://www.livemint.com/Politics/zjD4pm80nNrUgpybpcBRKK/Govt-discontinues-annual-health-survey.html>

- Institutionalize data quality reviews at the district level in order to routinely review the validity of data being reported within districts and improve trust in the data being reported. The data quality reviews should incorporate both review and feedback mechanisms to ensure that an effective dialogue is established between facility level staff and district level staff on access to services, disease patterns and trends, the quality of care being provided and health outcomes.
- Institute routine training and develop (or revise) state-specific capacity building strategies to augment knowledge and skills related to data collection and data entry for district and health facility level staff. Analysis of program indicators and data sources should become a core skillset for health facility staff and should be routinely updated and upgraded.

The findings and recommendations from this report are based on a review of publicly available articles, research and data from a wide range of sources. These recommendations are intended to serve as a reference point for dialogue on strengthening the tools available to the GoI in monitoring, evaluating and improving health information and the health outcomes that the NRHM programs are intended to impact.

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