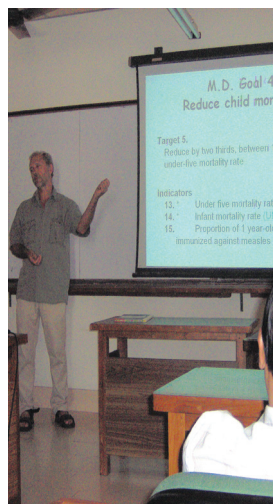


Maturing Information Use

- ⊙ Maturing Use – Towards the Nurturing of an ‘Information Culture’
 - ⊙ Cultivating Capacity for Local Action
- ⊙ HIS Policy – Role of National, Regional and Global Levels in Building and Promoting HIS in Countries
 - ⊙ Technology, Health and Development





Maturing Processes of Use: Impact of Integrated Health Information Architectures

The third and concluding part of this book concerns the impact of IHAs in terms of how they contribute to the maturing of processes of information use, which arguably is a key input to making improvements in public health outcomes, such as improving institutional deliveries or improving coverage of vaccination, all crucial to the attainment of the MDGs. This part is comprised of a set of three chapters, and is followed by a concluding chapter.

In the first chapter of this set, 9, titled “Maturing use – towards the nurturing of an information culture” the focus is on first defining the concept of information culture, and then operationalising it over three levels of increasing maturity. These three levels are illustrated through country examples from Zanzibar, Mozambique, South Africa and India, as a vehicle to describe strategies and impacts of maturing information use. This chapter then discusses the challenge of institutionalising information culture, and describes three strategies relating to educational programmes in public health informatics, creating structures within governmental processes, and approaches to break the vicious cycle of data non-use.

Chapter 10, the second in this set, is titled “Cultivating capacity for local action” focuses concretely on what means capacity in the context of HIS and the ability to take action, and how this can be cultivated. Three facets of capacity are identified including related to technology, the domain of public health, and the implementation context. In each of these areas, we specifically identify the concrete skills that a health staff needs to take local level action oriented towards making health programme



improvements. Finally, we discuss how this capacity can be scaled in order to be useful at the level of the health system. The strategy of collaborative networks of action, a cornerstone of the HISP approach is discussed as an approach towards this challenge. An example from Kerala, India is taken in order to illustrate this approach.



Chapter 11, the concluding chapter of this set is titled “HIS Policy – Role of National, Regional and Global Levels in Building and Promoting HIS in Countries.” There is an inherent paradox when we address this question since the role of State and policies emanating from there tend to favour centralisation and upward reporting, while we have argued the normative aims of an effective HIS is towards supporting local action. How can policy and effective HIS support each other is the challenge addressed in this chapter. In this context, we identify some key roles that the State can play the policy needs, including the definition and governance of standards, addressing of inequities, supporting the development of capacity and infrastructure. We draw upon the efforts of the Health Metrics Network (HMN) to support the development of HIS related policy to illustrate this issue.



Chapter 12 titled “Technology, Health and Development” presents in brief the conclusions from this book. We reflect on the role of technology in shaping larger concerns of Health and Development.

9

Maturing Use – Towards the Nurturing of an ‘Information Culture’

9.1 Introduction: The Historical Problem

Health Information Systems (HIS) in many developing countries have historically been trapped in the domain of (poor quality) data, and not really moved to the stage of information, generation and much lesser knowledge creation and its use in practice. The reasons for this entrapment are many, ranging from the centralised form of functioning, the shackles of which are institutionally complex to break free from, the dominance of statisticians who favour centralised control, the near absence of public health specialists in Ministry M & E departments responsible for HIS, the dominance of vendors who have managed to thrive in a framework of ‘sell and run,’ and the role of donors in promoting vertical programmes and islands of systems and experts to support them. A data led approach has thus thrived, which can be described to have the following underlying characteristics:

- More (data) is better – preference for raw data rather than processed indicators.
- Data is for upward reporting and not to support local action.
- Data represents an independent statistical artifact rather than a public health event.
- Central ministries taking the role of monitoring rather than evaluation and impact analysis of health programmes.

How does one break out of these deep rooted institutional conditions and nurture an ‘information culture’ is the focus of this chapter. This chapter sees this challenge of nurturing a vibrant information culture as a process, which can be identified as passing certain levels. We start by describing these three levels of maturity of information use, using country specific examples, before trying to unpack the characteristics of an information culture.

9.2 Information Culture, and ‘Levels’ of Maturity of Information Usage

Active and engaged analysis and use of information for decision-making, management, planning and more generally for supporting health services delivery, at all levels, are key objectives for all efforts to strengthen the HIS in a state or in a country. ‘Statistics save lives’ was the bold slogan used by the HMN in their promotion of HIS strengthening. Despite such slogans, the prevailing and important problem in most countries is that health information is poorly used and that this information is made

up of data of poor quality. Poor quality data is not used, and because it is not used, it remains of poor quality. Although, however, data quality and information usage are closely linked, as only through use of data close to its source as well as through use more generally, may data quality be improved. In reality, countries struggle more with getting to the first step of generating quality data rather than the following steps of exploring ways to actually use the data.

There is a dynamic interlink between demand, supply and quality of information. If information needs are not being specified and quality information not requested by the various user groups, this information will not be provided, and use of information will not improve. An effective and proactive linkage between this demand and supply determines the quality of information, which shapes to what extent information is appropriate, timely, easily accessible, and presented in understandable ways so that it is actually used. Strengthening the quality of information requires efforts along the following dimensions:

1. **The organisational use dimension:** This concerns the institutionalisation of the processes wherein information is demanded, and its supply and use promoted. This is the basis of a vibrant 'information culture' reflecting institutional mechanisms and incentives for information usage; for example data-driven budgeting.
2. **The information system dimension:** This relates to the strengthening information practices along various dimensions of the entire information cycle (see Figure 9.1 below) required to promote information use. Use of information is not restricted to data collection or only to its actual application (action), but also to various

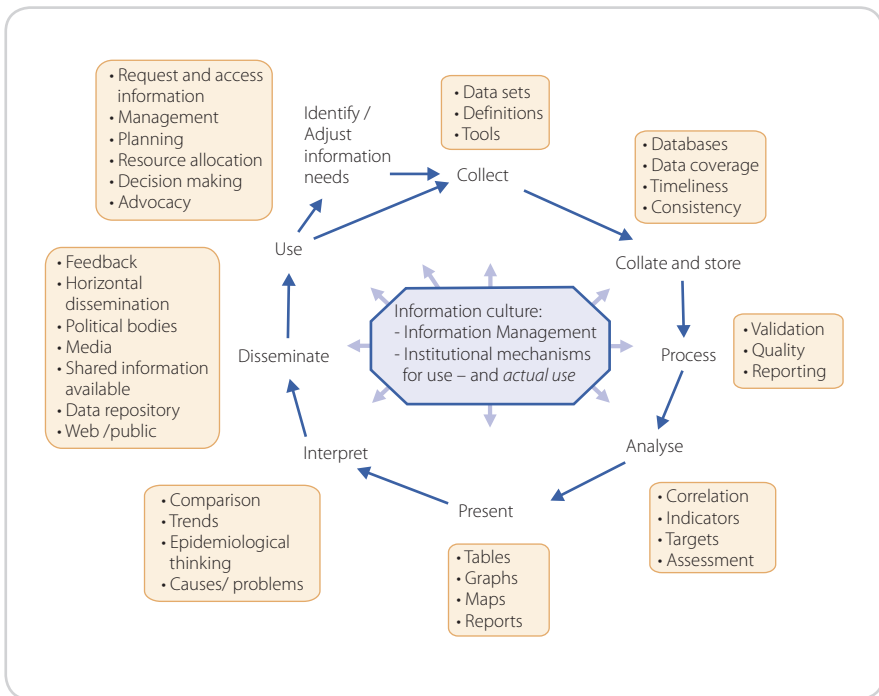


Figure 9.1 The information cycle

inter-connected practices concerning analysis, interpretation, presentation and dissemination of information. Without committed data collectors seeing that their interests are being addressed by the system, poor data will result. Further, without user participation and a sense of ownership to the information system among the users and producers, quality information and its sound use will be hard to achieve.

3. **The technical and tools dimension:** This relates to all the tools such as computers and paper-based tools, as well as standards such for data, indicator sets, and for data exchange. The presentation layer of the data warehouse discussed in earlier chapters are important in order to visualize data for users and to analyse data using maps, graphs and tables.

Strengthening information culture and the maturing of information use is necessarily a long-term and ongoing process. While in the next section we describe an example (from Zanzibar) of a participatory methodology for improving data use, in the section that follows, we generalise from this process, describing it over three analytical levels, or thresholds, although in practice there will be a multitude of ‘levels’ of information usage maturity.

9.3 District Data Use Workshops – Methodology to Promote Data Use

9.3.1 The Case of Zanzibar-Background and Methodology

Zanzibar consist of two islands called Unguja and Pemba, each of which make up a Zone in the health system, which cover 6 and 4 districts respectively. A process to revise data reporting, implement the first version of DHIS and to strengthen the HMIS more generally in Zanzibar started in 2005, and was carried out for 3 years as part of the overall HMIS strengthening project. This programme consisted of a series of quarterly data use workshops at which District Health Management Teams (DHMTs) presented their own data to their peers. Participants came from each of the 10 districts including all the DHMT members (roughly 7 per district), and the major users of data, which were the District Health Information Officers (DHIOs) District Medical Officers (DMOs) and District Reproductive Health Co-ordinators (DRCHCs). Workshops were organized by zone, with districts from both islands meeting for approximately 5 days at a time. Workshops were facilitated by external facilitators from HISP, supported by the Zanzibar HMIS unit and selected Zonal staff. The main methodology was based on three principles:

1. Each district and programme presents their own data and their peers from other districts would discuss, provide feedback and critique these presentations.
2. Comparing presentations, and identifying issues of data quality and related to health services performance across all districts.
3. Overall, the data use workshops need to be part of a larger scheme to strengthen the HMIS, enabling these workshop findings to feedback directly to the system developers in relation to both revision of datasets (longer cycle, for example, annual revisions) and to the DHIS developers; requesting new functionalities, reports, and so on. (short, ‘agile’ cycles).

As participants became more familiar and proficient with the data analysis process and the tools (for example, Excel pivot tables and graphs), the length of participation in workshops by individuals became shorter. At the same time, as more programmes started to use the DHIS (for example, HIV, TB, Hospitals, Malaria) more programme managers participated and the overall workshop duration increased.

Achievements/Results

Data collection: Forms were simplified during the overall HMIS reform process, based on the revised indicator and datasets, dramatically reducing the number of data elements collected, thereby reducing workload on facility staff. This was achieved mainly by showing how various disaggregations of data (by age, gender and diseases) were not used, and by identifying and eliminating duplications. Duplication of data collection by different programmes (for example, Reproductive and Child Health (RCH) unit collecting HIV, EPI, Malaria, but not Emergency Obstetric Care) was virtually eliminated due to increased communication promoted by the workshops directed by strong leadership from the Ministry of Health.

Data submission improved considerably over the 3 years, with most districts reporting increasingly regularly on most forms. From a modest start which focused on Outpatient Department and Antenatal care, a number of additional programmes started using the DHIS, including maternity, Tuberculosis, HIV/AIDS and all hospitals, including the National Referral Hospital. Indicator set changes were negotiated annually with programmes and the number of indicators per programme being considerably reduced, though total indicators increased as more programmes started to participate. The HMIS unit, HISP and the Zones jointly negotiated with programmes to introduce changes to datasets and reporting forms, based on agreed indicators.

Integration: These workshops provided a stimulus for integration of the previously separate databases of PHC units and hospitals and the vertical programmes, allowing DHMT members to get a better idea of the roles played by the different actors.

Integration of programme data into DHIS was a major achievement, and by the end, there was only one national dataset that covered MDGs, poverty reduction and national strategic plan indicators as well as programme-specific indicators. This was a slow process, as the more powerful, externally funded programmes were reluctant to share 'their' data and initially did not trust quality or the timeliness of the national database.

Data quality: Data quality improved dramatically, mainly due to increased awareness by data collectors of data quality checks (timeliness, correctness, consistency, completeness) at facility level and follow-up by the Zonal, District and HISP co-ordinators. During workshops, mistakes were identified when data was analysed and often it was peer identification of these quality issues that made the greatest impression on participants.

Data analysis and interpretation: At the start of the process, most DHMT staff (and even HMIS/HISP staff) did not think in terms of indicators and presentations were on raw data rather than on indicators. As the workshops continued and a cadre of officers competent on HMIS developed, and data analysis tools became more widely used and understood, 'epidemiological thinking' became stronger. The link between goals, targets and indicators was emphasised, contributing to increasing analysis

and use of indicators at the local level. For example, while initially most programme managers did not analyse service delivery interventions, but with this growth of capacity and perspective, various examples of information analysis and use could be found, such as:

- RCH unit developed indicators to monitor Emergency Obstetric and Neonatal Care (EmONC), availability and quality of Antenatal Care (ANC), introduced Maternal death audits and developed indicators to monitor quality of skilled birth attendant coverage. They also introduced the concept of Couple Year Protection to measure uptake of family planning services.
- Malaria programme placed increasing emphasis on ITN (bed net) coverage, Malaria in pregnancy as well as clinical treatment of confirmed cases – for example, reduction of Pemba malaria incidence by 80% by convincing the military hospital to use Rapid Diagnostic Tests (RDTs).
- Expanded Programme on Immunisation (EPI) investigated high dropout rates and coverage over 100%.
- HIV/AIDS and STI reduced excessive data categories and age groupings when they realised that 90% of the different categories had zero data.
- Hospitals were stimulated to improve systems to:
 - ◆ Collect basic inpatient indicators like Average Length of Stay and Bed Occupancy Rate.
 - ◆ Focus on emergency obstetric signal functions, not just complications.
 - ◆ Include laboratory data to check quality of diagnosis, particularly of Malaria.
 - ◆ Report OPD data elements identical to PHC, enabling meaningful comparisons.
 - ◆ Streamline special clinic data and add it to the database.
 - ◆ Implement data flow guidelines and send data to Districts (not to Zones as before, which bypassed the district).
- Human Resources developed workload indicators to measure staffing needs.

Other results: Use of the database for analysis, presentation and dissemination improved, along with understanding of basic hardware and software maintenance, virus protection and backups. Active interaction during workshops gave developers new requirements from users to develop, and developers could see weaknesses in context, such as related to local configuration.

Presentation skills were initially weak, with DHMT members unused to drawing graphs, using power point, engaging in debate or offering constructive criticism. These skills improved dramatically as the workshops continued, and when the HMIS unit and HISP developed standardised templates for presentation.

Overall results: The data use workshop methodology, first developed in Zanzibar, is general in nature and has later been introduced and used also in other countries, such as in Kenya, where the aim is to make them a ‘compulsory’ part of the quarterly review process.

The Zanzibar example describes a process of maturing of information usage from which we develop some general principles relating to the maturing of information use.

9.4 Three Levels of Maturing Information Usage

Maturing of information use, as described above, must necessarily be viewed in a process perspective, which will take years and not months to nurture. Both the dimensions of organisation use and information systems need to be cultivated over time and in conjunction. For example, even if high-quality data are produced by strengthening the information systems dimension, this may not necessarily result in their effective use in decision-making, which requires making the organisation-use dimension more proactive and accountable. Examples of some of these measures would include:

- Developing mechanisms for linking data/information to actual resource allocation (budgets).
- Developing indicator driven short (1 year) and medium-term (3–5 years) planning.
- Establishing organisational routines, where managers are held accountable for performance, based on routine and/or survey-based health indicators at all levels of the health system.
- Addressing behavioural constraints, for example, through the use of incentives for data use, such as awards for the best service delivery performance for the most improved district, or for the best HIS products utilisation.
- Providing a supportive organisational environment that puts a premium on the availability and use of data for decision-making.

All these measures are fundamentally concerned with processes of organisational change, and history and experience tells us these are hard to achieve and takes time. For example, even after setting up an information system that can competently convert data into information (a relatively short-term task), this information needs to be used on a regular basis at meetings, displayed on walls for staff and the public, as well as disseminated to politicians and managers in health-related sectors. These involve creating new practices, and for people to give up their existing ways of doing things, which due to human and institutional nature, are difficult to achieve in practice. By definition, these change processes involve learning through cyclical iterations involving design, action taking, reviewing outcomes, and making required revisions. By learning through hands-on experiences, problems are identified, new needs are defined, new features are added, which with the next cycle around can be criticized and improved.

This process of learning, is described at three levels, and is operationalised through the TALI tools (see Annexure 1), which has also been discussed earlier. These three levels and the characteristics of HIS are discussed below.

Level 1: Technically working information system, emphasising data completeness:

Data flows are established with high levels of completeness of data reporting and data are of reasonable quality and basic data quality control procedures are in place. There are designated 'Information officers' in place with job descriptions placing responsibilities for information handling, data reporting and data management at all levels. At the central level a HIS unit is in place. Even within this level, there can be different degrees of sophistication, for example, reflected through the ability of the system to synthesise data from multiple sources, the capacity to examine inconsistencies and contradictions, and be able to summarise and synthesise this

into a consistent assessment of the health situation and trends, including the burden of disease, patterns of risk behaviour, health service coverage, and health system metrics. Establishing a data repository as a shared resource at national, sub-national and district levels is, therefore, an important step in improving information practices. Data completeness and timeliness are key indicators for assessing this level.

Level 2: Information system characterized by analysis, use and feedback of data:

Summary reports using graphical tools and maps (where appropriate) on key indicators for the facility or district are produced every month and disseminated to all relevant stakeholders and fed back to the facility level. Information is used and discussed and indicators are assessed against performance targets on a regular basis at review meetings, staff meetings, and so on. These practices are towards creating an information culture, where information is actively used in the running of the health services, programmes or districts. This level of information usage is indirectly about data quality, as active data use is the only way to ensure data quality – only by analysing and using the data in relation to the local context, it is possible to verify the data and ensure data quality. Indicators to assess this level of information usage are the availability of analysed and disseminated information; graphs on the wall, monthly/quarterly bulletins, presentation of information at review meetings, and the creation and dissemination of feedback reports. In short, there are ‘conversations’ taking place around data.

An important aspect of this level, is the ability of the system to recognise the multiplicity of users and functions it needs to support. Users range from those delivering care to those responsible for the management and planning of health programmes, including those financing and external donors. Users of health-related data are thus not confined to health care professionals or statisticians, as often is the assumption in the design of HIS, which ignores also the informational needs of the wider community, including civil society as well as policy makers at senior levels of government. They have varying information needs in terms of the level of detail and technical specificity required. For example, health care planners and managers who are responsible for tracking epidemiological trends and the response of the health care system, generally require more detailed data than policy-makers who need data for broader strategic decision-making.

Level 3: Information system shows evidence of impact on decision-making: This level is about moving towards an active use of information in planning and evaluation, and the institutionalisation of these processes in the practices of the health system. While of course it is hard to assess such impact of information, but we would expect such information usage to be documented in the evaluation of achievements as according to annual plans, and the using of information to follow-up on planned activities. This level of maturity is also reflected in information use for diverse and higher levels of sophisticated impact assessment such as budgeting, resource allocation, equity management, and performance measurement. Bringing together a comprehensive analysis of the health situation and trends with data on health inputs, such as health expenditure and health system characteristics is particularly important. Such analytical work requires planning and investment and institutionalizing this work as a joint activity of multiple constituencies in the country.

In summary, this three-level roadmap highlights the criteria to achieve different levels of information use maturity. We now present certain country examples from where

we have been engaged with to illustrate these different levels of maturity. While these examples necessarily span these different levels, we tend to emphasise one primary level for purposes of illustration.

9.5 Achieving Level 1: Technically Working Information System, Emphasising Data Completeness

1. Example from Kenya

In a traditional implementation phase, users and support staff are trained to run and maintain the system. In Kenya, the initial rollout of the system included basic training, 'homework', on-site supervision and refresher training. Table 9.1 summarises the process followed.

Table 9.1 Training process to establish Level 1 information maturity in Kenya

Weeks	Generic rollout activities and schedule for each training unit (not more than 50–60 people) – This is to establish the new system technically.
Week 1	<i>Activity 1:</i> One week training of information officers, and introducing them to DHIS2. Bring own data for practicing data capture. All general aspects; data entry, evaluation and report generation – data completeness first focus. Homework specified: Enter backlog data and report generation
Week 2–4	<i>First homework session:</i> Duration 2–3 weeks. Entering data for 2011. Run evaluation and data quality checks. Generate data completeness reports. Systematic follow-up of data completeness. Make analysis, report and plan for ensuring data completeness. Also more general report generation.
Week 4–6	<i>Activity 2:</i> On-site follow-up 2–4 weeks after training. All districts to be visited. On-site refresher training and problem solving. Meet with District Medical Officers Health (DMOH), present the project and discuss and 'sensitise' how DHIS2 rollout can support management and how DMOH should be in charge and require good information. Training in report generation and use of DHIS2.
Week 5–10	<i>Second homework session:</i> Duration about 4–6 weeks.
Week 10–12	<i>Activity 3:</i> Three days refresher training and review meeting with managers. Information officers present analysed data and managers feedback on their information needs. DMOH should participate in at least one of the three days. Repeat training on all aspects of DHIS2 use with focus on report generation and data analysis and use. Including pivot tables which are important part of data analysis and use.
Week 11–12 onwards	<i>Third homework session:</i> Guidelines and procedures for data management, report generation and information dissemination for districts, hospitals and other facilities will be developed, including job descriptions for District Health Record Information Officer (DHRIO) and Health Record Information Officer (HRIO) in terms of tasks to be performed every months and quarter, how information should be disseminated, etc. This third homework session will represent an effort to institutionalise these new guidelines.
Week 16–20 All review meetings	<i>Activity 4:</i> Data use workshop, including DHMTs and programme managers from Province. DHIS2 trainees are convening for two days practicing before, preferably, the quarterly review meeting. Alternatively, we conduct normal three-day session with participation from DMOHs and other managers. Use and analysis of data will be sought institutionalised by applying key elements of the 'Data use workshop' methodology to the quarterly review meetings that are held at all levels in Kenya every quarter.

In the initial phase, all efforts were geared towards getting the data in, and data completeness was the key indicator used to monitor progress. This was done through an online and a constantly updated ‘League Table’ comparing completeness across reporting units at the same level (districts, counties, provinces). This stimulated a competition amongst districts who wanted to be the best, inspiring them to make extra efforts to get the data capture done quickly and efficiently. The Figure below shows one such league table from Nyanza province.

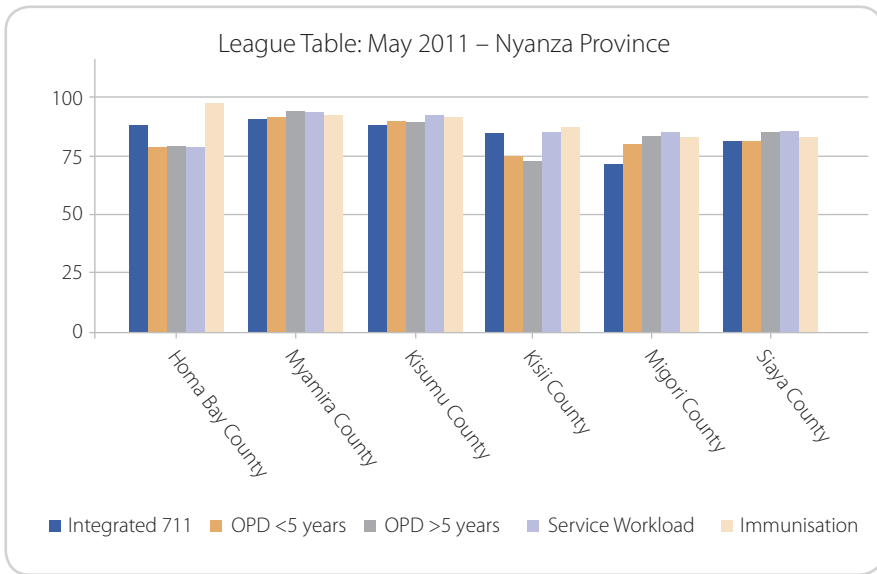


Figure 9.2 League table Nyanza, Kenya comparing data completeness between counties

Example 2: Mozambique

Another example from early 2000 from Niassa province in Northern Mozambique illustrates the significance of data completeness. Studying the data at the provincial information office, we found data to fluctuate much more than what seemed natural for particular months. As the districts were reporting aggregate district totals it was not possible to drill down to the facilities and investigate the reason for the fluctuation. One example was of the number of reported institutional deliveries in Mecula district, for the first 7 months of the year (see Table below) where figures fluctuated between 6 and 40. It could of course be due to rain in January and February, that mothers could not reach the facilities, we reflected. But when visiting the district office in Mecula, we found that the fluctuation was simply due to a similar variation in reporting, as the changing numbers of deliveries correlated with the number of facilities reported. The only thing that we could read from the data was that the rain prevented the reports to be submitted, about the deliveries, we know nothing about. The Figure below could be seen as telling the obvious, namely that data reported was a function of the number of facilities actually reporting. That may be so, and that is the purpose; to demonstrate that data completeness is an extremely significant dimension of data quality. Further, it is important that the information system allows the ability to ‘drill-down’ to assess the quality of the data in the system.

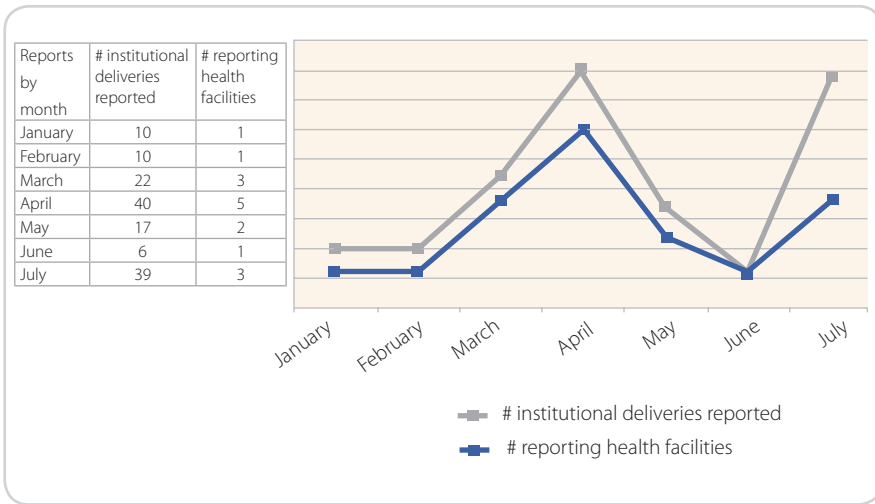


Figure 9.3 The importance of completeness: Correlation between number of facilities reporting and total reported deliveries. Table and graphical representation where the number of facilities are multiplied with 6 to provide similar scale

Example 3: India

Data quality problems are often seen as something ‘bad’ requiring normalisation and correction. However, a mature HIS should not recommend normalisation without drilling down to the root of the problem, and understanding the information hidden within a data quality aberration. Often, there is important information there, requiring analysis as a public health event, rather than normalisation as a statistical artifact. For example, in India we found a higher number of polio cases being reported from a certain state, which was surprising as Polio Surveillance studies had not shown such figures. While trying to understand the why for this, it was found that Acute Flaccid Paralysis (AFP) cases were being reported as polio cases as the HIS had no data element to record AFP cases. This then highlighted certain systemic issues:

- The need to align reporting to a single window (Polio surveillance and HIS figures to be synchronised).
- To establish institutional ownership of data reported.
- Data entry operators to be trained to understand basic data elements such as:
 - ◆ The difference between AFP and Polio cases.
 - ◆ To raise a red flag when abnormal figures are identified.

A level 1 system should allow drill down to enable more granular analysis on the quality of data – the what of the reports? Particularly alarming is the picture, as seen in many countries, including India and Tajikistan, where we have had first hand experience, with respect to the percentage of zeros reported. For example, in India, on an average districts tend to show 25% to 40% completeness; while in Tajikistan, this figure was about 10%. However, on drilling down on these filled values a more alarming picture emerges with respect to ‘zero’ values, showing a significant drop on completeness. See for example, Table 9.2 from one state in India.

Table 9.2 Data completeness with and without ‘zeros’

<i>District</i>	<i>Nov % (with 0s)</i>	<i>Nov % (without 0s)</i>	<i>Dec % (with 0s)</i>	<i>Dec % (without 0s)</i>	<i>Jan % (with 0s)</i>	<i>Jan % (without 0s)</i>
District 1	99%	20%	75%	16%	11%	2%
District 2	53%	17%	52%	18%	53%	17%
District 3	74%	13%	78%	14%	84%	19%
District 4	15%	10%	11%	6%	91%	12%
District 5	26%	10%	27%	11%	26%	11%
District 6	28%	6%	8%	5%	3%	2%

The reporting of zeros per se need not be bad, and can reveal pertinent information requiring further analysis. The reasons could be that either a service which should be available in a facility is not available, and is thus being reported 0; or, the data is just being entered as 0 to fill in the numbers. Either case is problematic, and needs to be investigated by field visits to examine primary registers and to educate the service provider and data entry operator on the different implications of a zero, blank and a non-reported figure. Data (in)completeness may not be uniform across all data element groups, as Table 9.2 below depicts.

Table 9.2 Variations in completeness across data element categories

<i>Data element category</i>	<i>Data filled % (Nov to January average) including 0s</i>	<i>Data filled % (Nov to January average) excluding 0s</i>
JSY (an incentive programme for pregnant mothers)	76%	67%
Delivery	46%	15%
Pregnancy outcomes	60%	29%
PNC	54%	26%
MTP	42%	0%
RTI/STI	45%	6%
Family Planning	52%	19%
Immunisation	72%	57%
ANC services	62%	39%

These figures show relatively complete data for immunisation, poor data on delivery and pregnancy outcomes (see data excluding 0s). Worrying is MTP data where 46%

of data is reported, but all these values are 0s. Since different groups of data are the responsibility of different programmes, understanding the weak spots helps to identify areas of focus.

With respect to data quality, often, the larger challenge is often related to who defines the problem and how. When there may be an agenda of some to discredit the HIS, it gets branded as a problem of data quality instead of as a symptom of deeper institutional conditions, which need correction. This is harder to do and requires long-term measures rather than the quick fix methods of normalising aberrations. A mature HIS should constantly be engaged in carrying out increasingly fine grained analysis, including on the following dimensions:

- Patterns of data across provinces and districts, drilled down to the facility level.
- Patterns across periods, helping to identify seasonal variations.
- Patterns across data element categories.

The HIS becomes a valuable tool to carry out the analysis of patterns which helps to distinguish between data and health programme artefacts. A data artefact reflects a problem in data such as a typing error or a deliberate changing of the figures, while a programme artefact indicates that the data is correct and it reflects issues in the health programme component. For example, as in the table above with the example of MTP, the problem could actually be that services are actually not available. However, to be able to carry out such an analysis, the HIS needs to be treated not as the source of the problem where people are making typing errors or manipulating numbers, but as a tool to be used to drill down to and analyse the problem and identify alternative explanations of the situation. This requires a reformulation of the perspective towards HIS, wherein data issues are not branded as reporting errors and manipulation by users but a reflection of the conditions of the health system.

This reformulation then requires also a fundamental shift in who carries out such analysis. Statisticians who see the situation primarily from the lens of 'data' may not be addressing the public health context that shapes the data, and the analysis of statistical trends thus necessarily needs to be complemented with a public health interpretation. Else, we may continue to be addressing the wrong problem, and reprimanding state and district staff for problems out of their control, and their response is in the form of a 'normalisation' of data, which does not show up as an outlier painted in red on the Excel sheets.

In summary, increasing maturity of a HIS reflects a growth in capacity to carry out fine grained analysis of variations across facilities, time, data element groups and types of data values – zeros or blanks. Further, the HIS should allow to distinguish between data artefacts and programme artefacts, and examine data as a public health event and not just as an isolated statistical element.

Example 4: Analysing based on 'Life Cycle Events' from Mozambique and India

Completeness of data is a key indicator for assessing the functional quality of the HIS. 'Eyeballing' is a first level approach to scrutinise data quality based on experiential and public health knowledge to identify obvious anomalies, outliers and otherwise suspicious values of data. A way to approach eyeballing in a more systematic way, which we may call as rapid data assessment techniques, by comparing data across related programmes and with denominator data and target populations:

‘The life cycle data assessment technique’ is one such way to examine programme data related to the numbers of pregnant women (ANC clients), deliveries, infants for BCG and measles vaccinations, and various types of post-natal controls. We illustrate this approach with an example from Mozambique using official data for 2003 from the EPI and MCH programmes from three administrative levels, including:

- Three health districts in Niassa province.
- The whole province (Niassa).
- The national level.

Further, the database included population data, which was based on Mozambican 1997 Census projections (see Figure 9.3). In terms of coverage rates, which by definition cannot exceed 100%, the figure shows significant over-reporting of ANC visits and BCG, sometimes even three times the target population. Furthermore, the figures also indicate that the health services or data, are not correlated across these related events. For example, in Niassa province while ANC coverage is nearly 200% (which is not possible), while at the same time reporting about 100% coverage on Polio 0. Both the ‘perfect’ results on Polio and the improbable result on ANC coverage show problems in data or programme conditions or both. If seen together, and assumed correctly reported, these two figures indicates that only roughly 50% of the expected babies are given Polio 0. This example shows the importance of the MCH and EPI programmes to discuss and correlate their data to jointly identify anomalies in data and to also assess effectiveness of programme delivery.

Adding together erroneous numbers from local levels gives wrong aggregates at the higher levels. For example, the national figure for ANC shows nearly 100% coverage, which is perfect. However, given that this figure includes an incorrect figure of 200% coverage in Niassa, one of the 11 provinces in the national aggregate, we can conclude that the national figure is incorrect.

There is a stark dropout between the first ANC visit and institutional deliveries. For example, in Marrupa district, only 20% of the women attending the first antenatal visit, had an institutional delivery. Similar dropout rates can also be seen in other districts, province and at national levels. This raises questions about the quality of services being provided, including facilities to travel long distances, lack of maternity waiting homes, and other cultural and social factors, in addition to the quality of data. If ANC visits are over-reported, and institutional deliveries are not, then the dropout would be shown to be less. These are issues that should have been checked when ‘eyeballing’ such data in the first place. Lichinga is the province capital with the provincial hospital and see many referrals for deliveries. The dropout from ANC to delivery is therefore much less here.

The pattern that BCG is higher than Polio 0 is driven by the fact that, while Polio 0 and BCG (ideally) should be administered right after birth, given the low institutional delivery rate, the higher number of BCG is because it can be administered at any time before 12 months of age while Polio 0 must be administered within 6 weeks from birth. In Marrupa district, we see that, despite this explanation, the BCG data is wrong. BCG doses given is systematically over-reported, which may be partly due to wastages of vaccines being reported, and for BCG a vial of several doses need to be used the same day, providing an incentive to reduce wastages.

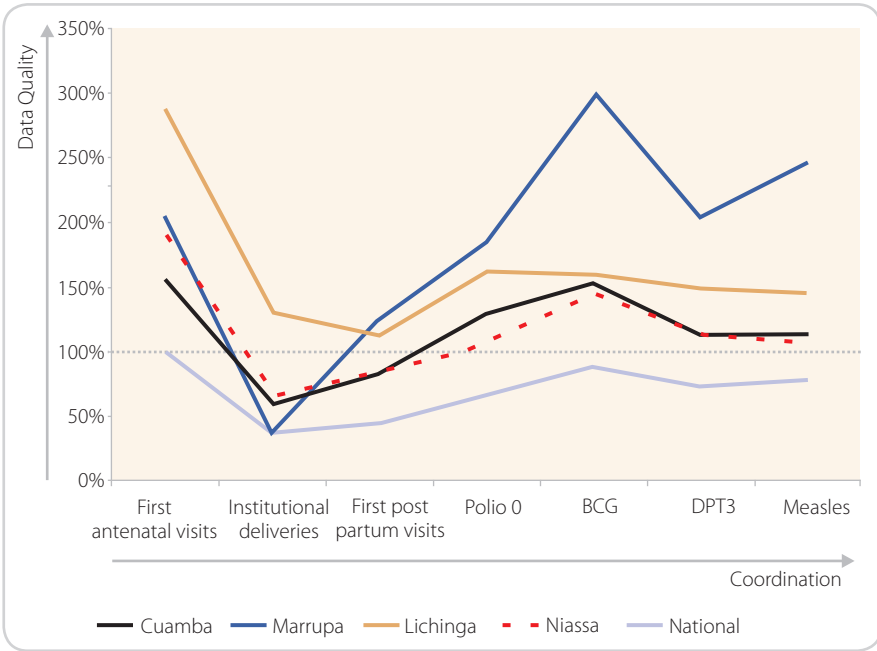


Figure 9.4 Graphical representation of data from ‘life cycle events’ of MCH and EPI programmes in Mozambique. Data from three districts – Cuamba, Lichinga and Marrupa in Niassa province, Niassa province and the country, for 2003.

We use the same approach to analyse data from India (see Figure 9.5). While in the example from Mozambique, we used institutional deliveries, in India registered births was used as the reference. We see a stark dropout between ANC clients and births, and a similarly sharp increase in the numbers of BCG doses given, and a slight decrease in measles doses. This indicates that a significant number of births are not registered.

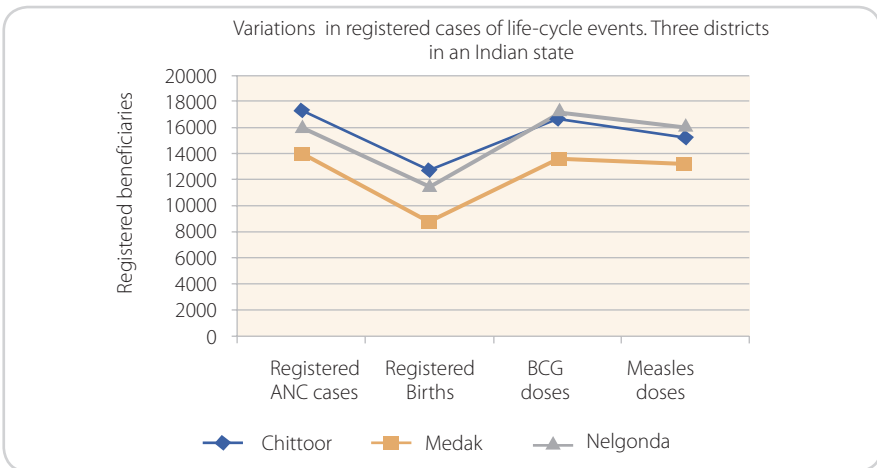


Figure 9.5 Three districts in India; reported data on the ‘life cycle events’; ANC cases, registered births, BCG doses given and measles doses given.

This life cycle events approach to data analysis described here represents a good way to identify both target groups missing services and missing data. In the examples used here, the focus has primarily been on identifying data incompleteness, and may therefore be seen as a method used to see to what extent Level 1 in data use is achieved. This also represents a more general approach to present, discuss and make sense of data, a precondition for achieving Level 2.

9.6 Achieving Level 2 – Improving Information Analysis, Use and Dissemination

Example: Sierra Leone

While Level 1 deals with establishing technical systems and data completeness, Level 2 reflects a higher level of maturity in analysis and dissemination of information. We present an example from Sierra Leone showing efforts towards achieving Level 2.

The process in Sierra Leone started in a post-war situation of very poor infrastructure and general conditions, and obviously, from a very low level of information availability and use. The challenge was then: How do you promote use of information for decision-making in a setting where this has earlier been lacking? Three years of efforts in Sierra Leone can provide some examples of both grand strategies and concrete measures to achieve this. First, it is seldom a question of introducing completely new concepts. Nurses, doctors, and health managers use information all the time, the issue is rather to change from informal, adhoc, ‘gut-feeling’ management based on incomplete, and often mistrusted, data, to a more systematic, transparent reliance on complete and up-to-date information. Linking a dormant demand to a new supply of quality data was the strategy followed in Sierra Leone from 2007 onwards.

Main efforts in Sierra Leone evolved around capacity building, improving data quality and disseminating information and turning it into use. In short, to increase the amount and quality of data available for use, while at the same time train staff at all levels to process, analyse, present, disseminate, interpret, and evaluate this data. These processes can be self-reinforcing, as limited use is often the root of poor data quality, and vice versa. The use of data is necessary to create the incentives for improving quality, and good quality is necessary to sustain use. The first step in improving the system was to improve completeness and quality of data through disseminating the data and ranking the districts from worst to best performers of data reporting by using so-called league tables, which quickly became a popular way to compete about having best data. Since the early focus was on improving data quality, a couple of the indicators were on that, awarding data completeness and consistency of data (which could be checked by validation rules in the DHIS2 software). The Table 9.3 gives one such example of a league table for districts.

The league tables were widely disseminated through quarterly Health Information bulletins and had immediate effect on data completeness, which improved quickly. The reporting rates for most districts quickly rose to above 90% (of facilities providing key reporting forms to the districts), for several districts, and by 2010 almost for all. The distribution of league tables to the districts in terms of feedback, while initially causing some stir due to the sudden visibility in the ranking of districts, also contributed the districts to start using information more for planning. The picture shows the front

Table 9.3 League table comparing districts from Sierra Leone

<i>League table of district performance, January to April 2009</i>							
	<i>Data</i>	<i>Data quality 1</i>	<i>Data quality 2</i>	<i>Penta 3</i>	<i>Deliveries in PHU</i>	<i>Services/clinician</i>	<i>Total score</i>
Pujehun	99	3	3.6	102	60	20	19
Bonthe	66	7	0.9	111	52	11	15
Kailahun	98	6	1.3	65	30	11	15
Kenema	85	6	1.7	75	38	12	15
Bombali	47	8	2.1	75	30	15	14
Moyamba	97	7	0.4	85	44	9	14
Kambia	60	7	0.6	79	33	12	13
Western	88	8	0.7	92	26	6	13
Bo	45	8	0.8	46	37	12	12
Kono	92	8	0.4	70	27	9	12
Port Loko	67	7	0.6	87	24	12	11
Tonkolili	19	6	0.6	102	38	18	11
Koinadugu	32	6	0.3	80	31	13	9

page of the bulletin from 2010, which is focusing on analysing information on, in this case, immunisation. In the following Figure 9.6 provides an example on active use of information in Sierra Leone.


In 2009, Western Area (mostly consisting of the capital Freetown) was one of the districts scoring very low in term of institutional deliveries. Being very concerned by the poor performance of his district, the District Medical Officer (DMO) in Western Area decided on two strategies to improve.

To collaborate with private facilities (of which the district has many more than more rural districts) to get their data on institutional deliveries.

To release a note in the newspaper informing the public that maternal and child health care was now to be free of charge in Western Area district.

As shown in the Figure 9.7 below, institutional deliveries have increased steadily in the district. The free maternal health care policy could not alone explain this increase, the involvement of private facilities has to be taken into account. But, in any case, the results were remarkable and soon distributed globally by the HMN as a strong case for investing in HIS. The new figures, in turn, helped them plan well and advocate for adequate resources for the district.

Better Information,
Better Decision, Better
Health



This bulletin provides statistics from the District Health Information System (DHIS) through routine data collected by facility workers of the Ministry of health & sanitation of the Government of Sierra Leone.

Government of Sierra Leone
Ministry of Health & Sanitation
Health Information Bulletin

Volume 2, Number 1

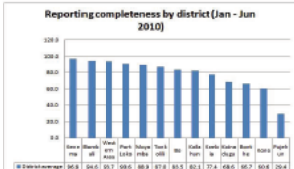
Jan-Jun 2010

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1. Reporting Completeness

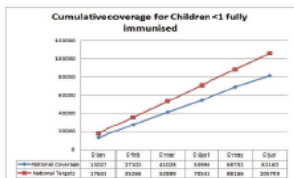
The District Health information System (DHIS) manages data from 5 key data collection forms submitted monthly by each health facility to report on services, stocks and HR. Statistics generated from this system permits district and national officials to continually monitor health care services including those related to the Free Health Care (FHC). Figure 1 shows the reporting completeness by district for the first half of 2010. Overall, 80% of health facilities reported for the first 6 months of 2010. Only 4 districts (Koinadugu, Bonthe, Kono & Pujehun) had less than 70% reporting completeness (see figure 1), a remarkable improvement from the 30% rate in 2007. There is a need to support the districts to sustain and even improve on this rate so that effort in 2011 could be focus on improving timeliness and data quality.



2. Child Health

2.1 Immunization

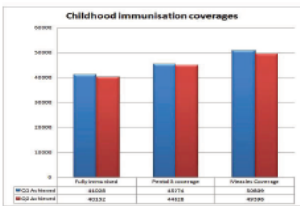
The objective of Immunization program is to see that all children are fully immunised before their first birthday. A child is certified as fully immunised if he/she has received full doses of following vaccines according to schedule: BCG, 3 doses of OPV and Pentavalent vaccine, a dose of measles and yellow fever vaccines. Figure 2 clearly shows that the immunisation coverage for the second quarter of 2010 (the period after the launch of free health services) seem to show a downward trend rather than the desired increment. There is need to review this trend and institute necessary measures to improve on coverage. This is because, the higher the fully immunized coverage (FIC), the higher the herd immunity of the children which is a strong guarantee reduction in mortality and morbidity due to vaccine preventable diseases.



2.2 Underfive Consultation

Treatment of <5 children with ACT within 24hrs of onset of fever reduces the possibility of malaria becoming complicated and leading to death. As seen in figure 4 below the ACT uptake amongst under-five children increased considerably with the launch of the FHC by 148% in April further rising to a peak of approximately 372% in May and tapering down to 272%. The sudden increase in May could be related to the FHC and the decline may be as a result of patient flow regularising itself after the FHCI euphoria or distortion in the supply line of the ACT. In its fight against the key killer disease the Ministry has adopted several strategies including the use of com-

Childhood immunisation coverages



As seen in figure 3 above, the country is progressively slipping further from the set immunisation targets which are underscored by the same trend for two anti-gents (Penta3 and measles coverage).

Figure 9.6 Front page of a Quarterly Health Information Bulletin from the Ministry of Health, Sierra Leone, 2010

Districts also had their monthly review meetings, and following the example of the bulletin and league tables, several districts started to make chiefdom league table, ranking the sub-districts (chiefdoms) in a similar way. These review meetings were attended by all district stakeholders such as health partners, community counsellors, health providers, traditional and religious leaders, and so on, and have led to the plethora of locally driven initiatives on improving service delivery in their respective communities. The development of district and chiefdom league tables covering

Maturing Information Use

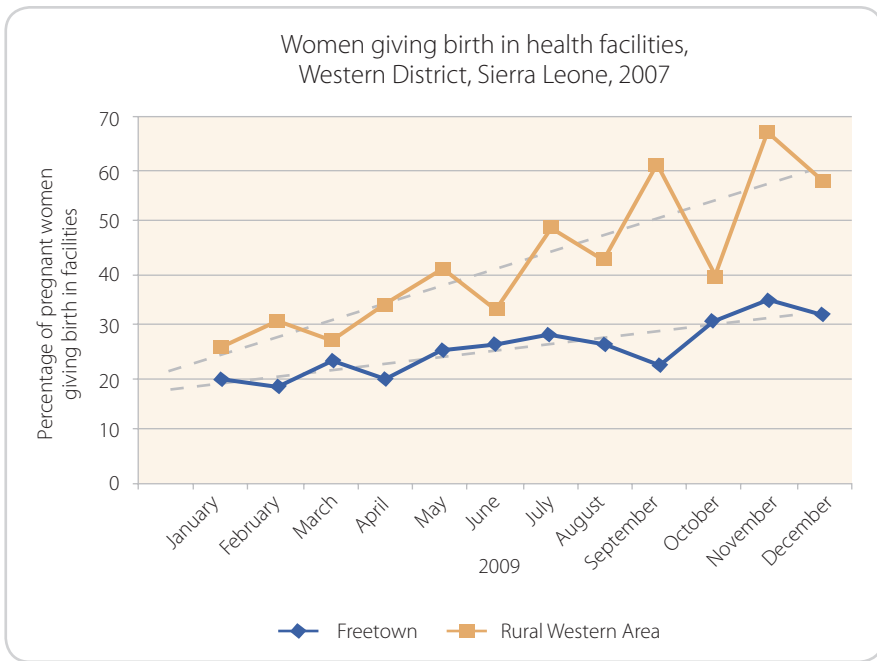


Figure 9.7 Increasing institutional delivery rates in Western Area, HMN Results Report (2010)

important health indicators, the active dissemination of these, and discussions with key stakeholders on how to improve on these indicators form the highlight of such review meetings. For instance, the use of the chiefdom league table showing performances of each chiefdom on key health indicators (such as institutional delivery, fully immunised children, and so on) in Moyamba district raised a competitive feeling among the local communities. Table 9.4 shows an example of chiefdom league table.

In this case, Kongbora Chiefdom, after coming last in the first quarter review, improved to take the first place in both the second and third quarter reviews. Fakunya Chiefdom was the sixth in the first quarter review, but improved to take second and third places in the second and third quarter reviews. Dasse Chiefdom was eighth in the first review meeting but took third and second places in the second and third quarter reviews. Certificates of this, provided to the paramount chiefs at the review meetings, were brought to local council meetings as proof of good performance, as shown in the Figure 9.8.

By comparing themselves and knowing more about health indicators, local community leaders decided to better organise health service delivery in their community and put more pressure on upper level for more resources and more support. In many communities, local counsellors started putting in place bye-laws for the Traditional Birth Attendants (TBAs) to help pregnant women deliver in the health facility, where they can have a clean and safe delivery with trained staff in attendance. The DHMT also organised outreach activities eagerly requested by community leaders (Paramount chiefs) after the review meetings to increase the coverage for key health outcomes like childhood immunisation. Some communities have also used these meetings to

Table 9.4. Chiefdom league table in Moyamba district, comparing data between those sub-district traditional units.

Chiefdoms	% Full Immunised 2nd Quarter	% PHU Delivery 2nd Quarter	% 3rd ANC Visit	% 2nd Dose of IPT	% MMRC Submitted	% Exclusive Breastfeeding at Penta 3	Average Score	Ranking
Kongbora	98.2	45	170.9	96.6	86.6	93.3	5.3	1
Fakunya	124.3	62	154.3	86.2	100.0	48.1	5.0	2
Dasse	134.9	57	90.5	86.3	100.0	45.9	4.8	3
Kaiyamba	90.3	55	162.7	93.4	75.0	71.3	4.8	3
Timidale	140.3	46	106.8	91.7	91.7	33.0	4.8	3
Kowa	118.4	52	96.5	46.7	100.0	78.2	4.7	6
Lower Banta	88.3	48	201.6	120.8	100.0	35.6	4.7	6
Bagruwa	61.4	37	110.3	92.4	93.0	32.1	4.3	8
Kamaje	55.6	35	69.7	140.7	100.0	86.5	4.3	8
Kargboro	80.4	45	93.2	77.6	100.0	36.5	4.3	8
Kori	49.8	40	92.6	89.4	86.6	64.0	4.3	8
Ribbi	71.8	26	53.7	57.4	100.0	60.5	3.7	12
Upper Banta	61.1	29	68.0	101.2	77.8	38.6	3.7	12
Bumpeh	54.9	29	73.8	38.2	100.0	28.3	3.2	14
Total	91.4	43	114.3	32.4	93.6	20.8		



Figure 9.8 P. C Banya (Kongbora chiefdom) with chiefdom league table certificates (2nd and 3rd quarters) at Moyamba district council monthly meeting, where health and other local issues are discussed

advocate for more resources (human, financial and infrastructure) in order to address the low uptake of services in their catchment areas. In some chiefdoms, where institutional delivery rates were low, the paramount chiefs mobilised local resources to build birth waiting homes where pregnant women staying far away from health centres could stay until they delivered.

Involving the communities, including religious leaders, traditional health service suppliers, and the paramount chiefs, the districts started to improve institutional delivery rates, an efficient strategy to reduce infant and maternal mortality. The Moyamba DMO was very proud of the interest expressed by the community members who were now determined to improve service delivery coverage in their communities. 'Using the data from the DHIS for the quarterly review meetings, the population could better understand the health services performance and were happy and interested to be involved' claimed Dr. Kandeh, the Moyamba DMO, 'without their interest, we could not move forward and have high performance'. Being able to show improvement in service delivery by using health information at district level, regularly shared with key stakeholders, led to a major change in prioritizing health services with community involvement.

The possibility of being part of a larger set of other communities made it easier for local communities to compare themselves with neighbouring communities which in turn triggered the propagation of best practices leading to improvement of health services and high performance. While the data quality shown in table 9.4 is obviously an issue, as seen from the rather wild percentages for some of the chiefdoms, this triggered a review into denominator data such as population figures, which tended to be outdated and not taking into account recent migrations.

9.7 Achieving Level 3 – Information for Decision-Making and Impact

Action means that information should have impact – in decision-making, planning, allocation of budgets, evaluation of planned activities and in strategy and policy formulations.

Example 1: South Africa

Information use in South Africa has gradually moved through the three levels of focusing on:

- Completeness and quality data.
- Data use for analysis.
- The current trend of actively using information for improving the health services.

Data and information form for the HIS is now used for planning purposes at all levels of the health system such as for annual performance plans, their formulation and evaluation of achievements according to plans. All districts are engaged in expenditure reviews, where financial data on expenditures and data on human resources, which make up the major financial input, are used alongside more traditional ‘HMIS’ data on performances of the health services. The planned introduction of the National Health Insurance will represent the next challenge for the HIS, as such a scheme will include a close relationship between data on health services delivery and budget allocations.

Increased granularity of data important for annual performance planning and expenditure review is a general trend in South Africa; when data is actively used, the users will always tend to require more details and better quality, for example, more data derived from individual records of TB patients and patients with chronic diseases.

Example 2: Thailand

Thailand has a population of 66 million people and is divided into 75 provinces and 795 districts. The HIS in Thailand may be regarded as a best practice among mid-income countries and uses an extensive Internet and ICT infrastructure that reaches all districts and most of the health facilities. Data on individual patients is captured electronically in most health facilities and standard datasets are submitted online to the central, from where feedback and key information for the management of the health services is accessible through the web ([http:// eng.moph.go.th](http://eng.moph.go.th)). The health system works well, and according to the 1997 constitution, every Thai has the right to health care. From the inception of the universal coverage insurance scheme in 2001, there was a tremendous push to improve data quality, in order to, justify the decentralised distribution of funds based on capitation costs (paid per capita) for prevention and health promotion and for direct costs for hospital and high-cost patient care. The National Health Insurance Scheme has established a system of contracting units (CUPs) in each district, consisting of a hospital and their network of clinics, which are then paid for the services they are rendering according to the data submitted. The actual payment, quality control, and accounting are decentralised to the province level. The CUPs are provided with Internet and computers as part of their payment. Two sets of standard national data are identified:

- The first covers community services and is made up of 18 sub sets including immunization, family planning, disease surveillance, chronic diseases, and so on.

- The other covers hospital services and consist of 12 sub sets including inpatients, outpatients, patient payment, referral, and so on.

As more and more districts got adequate Internet and web access over the last 10 years, interchange of data and information between local and central levels has become increasingly robust and scaleable and providing high quality data.

The Thai system was initiated and built, in order to solve one very specific problem – the model for financing the health services. The data required for this purpose turned out to be useful for other purposes as well. In Thailand, there is a maturity around the use of information that can be gauged from the fact that the information is being used to support the everyday working of the health department as well as national initiatives of ‘Healthy Thailand’, and the national insurance scheme. The key to improved information use in Thailand is the direct linkage between payment of contractors and the routine reporting of services delivered. Regular surveys are used to triangulate accuracy of routine information.

Thailand also reflects a strong culture of information dissemination in the form of books, periodicals and journals. The annual Thailand Health Profile is a particularly impressive consolidation of a wealth of information from numerous data sources within and outside the Ministry of Health. Web-based dissemination is also very strong in Thailand.

The direct links between information and resource allocation in Thailand and gradually also in South Africa have radically increased the potential for ‘internal’ advocacy, where managers at lower levels use information to argue for higher budgets, more staff, better equipment, reforms, and so forth.

Summarising the two cases of Thailand and South Africa, we may conclude that the ‘holy grail’ of promoting analysis and use of information is clearly to link information to resource allocation (budgets) as well as developing indicator-driven short- and medium-term planning. We now discuss some emerging trends with respect to information for decision making and impact.

Payment for performance programmes and their link to information

We saw that in Thailand, the link between performance of the health services and payment for these services was established and managed through the use of information. Without quality data on performance, the insurance scheme in Thailand cannot work. Such national insurance schemes, however, may still be too expensive for most developing countries, but efforts to link performance to funding is nevertheless being explored by donors and administrations alike. In this section, we explore this growing trend.

With the increasing global prominence of initiatives like the MDGs, President’s Emergency Plan for AIDS Relief (PEPFAR), Global Fund and Global Alliance for Vaccines and Immunisation (GAVI), focus is very much on what have been the impacts of these programmes, on outcomes such as reducing maternal and child deaths, or on improving health access and coverage. Various studies are reporting that while building clinics, buying drugs, recruiting consultants are important to improve health outcomes, they only address a part of the larger problem of improving overall health quality. What is being identified through these studies are that even when the health service providers (for example, governments) have the required inputs (human resources, drugs, logistics support) to produce health services of adequate quality, they are unable to do so and we see a very low utilisation of services which remain sub-standard and of inadequate coverage. And from the demand side, mere awareness

of services available are not leading the population to access the health services for various reasons including their negative prior experiences of public health services.

The current thinking in the Global Health community towards addressing this problem is through the provision of incentives for both the demand and supply side of health services. Incentive schemes of various types – Performance Based Financing (PBF), Pay for Performance (P4P), Performance Based Incentives (PBIs), Conditional Cash Transfers (CCTs), Results-Based Financing (RBF), Differential Planning are currently being designed and implemented by donors and national governments in various countries. A common aspect of these schemes is that it involves the transfer of money or material goods conditional on taking a measurable action or achieved predefined targets. Some examples of such schemes are given below:

- Health facilities receive a financial incentive when they achieve pre-defined service delivery and quality targets. Some of the countries where such schemes are being implemented include Brasil, Congo and Tanzania.
- Health facilities receive services on improving quality of services such as reduction in C-section deliveries. For example, in South Korea.
- Patients receive financial incentives to obtain services at health facility, including covering costs of transportation and food, for example in India.
- Pregnant mothers are given cash incentives for accessing institutional delivery service, for example in India.
- District authorities receive a bonus payment when the service outputs of their districts improve. This scheme is being implemented in Ghana, Rwanda and Tanzania.

Some of the expected benefits that such schemes are supposed to provide, for example, related to improving maternal health, include:

- Increased expenditure on maternal services.
- Increased access to ANC or facility services.
- Increased coverage for maternal services.
- Increased deliveries attended by skilled birth attendants.
- Improved quality of services, including aspects related to prenatal care, delivery and child preventative care.
- Increased utilisation of services.
- Enhanced equity through targeting and differential planning.

But along with these expected positive consequences, various people taking a more cynical view have pointed to the negative implications for such schemes. These include:

- Unintended effects such as neglecting schemes that are not being rewarded.
- Misrepresentation of achievements to obtain higher incentives.
- Use of coercion to obtain financial incentives, such as through limiting family size and forcing the use of contraceptives.
- Undermining team morale for example in a facility where some workers get higher incentive than the other because of being affiliated to richer activities.
- Decreased access to unrewarded incentives.
- Fraud within schemes, such as misrepresenting names or giving incentives to those who do not qualify for the schemes.

- Exclusion of ownership and autonomy when people affected by the schemes are not invited to participate in the design of the schemes.

From the perspective of this chapter, the important point to emphasise is that to understand the impact of these schemes, from both demand and supply, and also from the input and output side of the incentive schemes, there must be in place effective and robust HISs as stated by Dr. Margaret Chan, the Director General of WHO.

The report (Keeping promises, measuring results) and its recommendations are a major achievement to public health and will help us save the lives of women and children.... But our work is only beginning. One of our top priorities must be investing in helping countries build the capacity needed to capture this health information – that means giving them the financial and technical resources required to monitor things such as births, deaths and causes of deaths, and achieve the mutual accountability needed to save women and children from dying.

The report has highlighted a list of 10 recommendations, including health indicators, that need to be monitored to assess the impact of various initiatives concerning maternal and child health. These recommendations summarised in Box 9.1.

Box 9.1

Keeping promises, measuring results, 10 Key Recommendations.
United Nation Commission on Information and Accountability for
Women's and Children's Health

Recommendations that need to be monitored to assess the impact of various initiatives concerning maternal and child health:

- Increasing the number of countries with well-developed systems to measure births, deaths and causes of deaths.
- Measuring against 11 common indicators on reproductive, maternal and child health.
- Helping countries to integrate the use of Information and Communication Technologies in their national health information systems.
- Countries with high maternal and child deaths, track and report resource indicators.
- Country governments and major development partners put 'compacts' in place that require reporting based on country format, on externally funded expenditures and predictable commitments.
- All governments have the capacity to regularly review health spending and to relate spending to commitments.
- Countries have established national accountability mechanisms that are transparent, inclusive of stakeholders and recommended action as necessary.
- All stakeholders are publicly sharing information on commitments, resources provided and results achieved annually at both national and international levels.
- The Organisation for Economic Co-operation and Development's Development Assistance Committee (OECD-DAC) agree on how to better capture all reproductive, maternal, newborn and child health spending by development partners.
- An independent Expert Review Group is reporting regularly to the UN Secretary General on results and resources related to the Global Strategy for Women's and Children's Health and progress of the implementation of these recommendations.

From the perspective of IHAs, the need to design effective monitoring systems need to adhere to certain key design principles, which is line with our discussions in the earlier chapters:

1. A lot of data required for the monitoring of these indicators are already available through the routine system or ongoing surveys. There is no need to design systems from scratch.
2. There will be need for some new types of data, such as related to financial figures. While such data may not be available in the existing routine system, they could be available in other systems such as those for finance and accounting. Developing interoperability mechanisms between these various systems would be a key aspect of design.
3. Cross cutting indicators would need to be developed through inter-disciplinary groups, as such monitoring necessarily brings together programmes and activities which till now were independent.
4. An architecture perspective based on a data warehouse approach, which seeks to create a repository of various data types would be essential in creating an integrated monitoring system.

A contrary approach to an architecture one, as is very much in evidence today, is to only focus on isolated systems such as the mobile device for data capture. An example of this reflected in the following quote from a senior official of the ITU.

“In addition to (mobile phones) facilitating data gathering, sharing and analysis, platforms like the Internet and social media can also be used as tools to create safe and empowering spaces for women, where they can obtain accurate, up-to-the-minute health information in a confidential, multilingual environments.”

While not denying the power of mobile technology to gather useful and timely data, we often tend to forget this collected data needs to be ‘sent somewhere’ to another system, which can aggregate data received from various phones, provide the processing and visualising capacity to the data, and make it available to larger audiences, and to health planners in a manner that allows them to make relevant decisions. In the ‘feel-good’ and hype about the mobile technology, we often tend to overlook this important need for integration, a point that is emphasised through the IHIA approach.

9.8 Information Culture – Institutionally Approaching its Cultivation

At the outset, we define the process of maturing use in terms of the cultivation of an ‘information culture’, which values how information generated from the HIS is geared towards supporting public health action and interventions at various levels of community, field level service providers, the medical doctors in peripheral facilities, the district and state administrators, the health programme managers at district and state levels, to the national policy makers. Another aspect of this heightening maturity concerns users having more awareness about the value and use of a HIS and also having more capacity at data management including skills to carry out analysis of data quality, health status, and to integrate such analysis with making practical health programme improvements.

Some guiding principles an institution can adopt to nurture a vibrant information culture would include the following:

1. *Focus on information use – Technology for information and information for action:* A primary focus of the HIS on information use rather than on the tool. For example, planning budgets could establish norms where 80% to 90% of the budgets are towards capacity building, implementation and hand holding support. Currently, the reverse is the case with hardware, software and equipment purchase accounting for the bulk of budgets. The technology supporting the system needs to be designed and developed in a way that it can process the data (for example, validation checks) and convert it to useful information through easy-to-use representations of charts, graphs and maps. How this information is then converted into action and knowledge largely depends on institutional conditions of leadership, motivation, and capacity building focus and efforts.
2. *Decentralised information for decentralised action:* Decentralised information is based on the globally established pyramidal principle of hierarchy of information with the lowest level requiring the most disaggregated information (for example, the field nurses need to know the names and addresses of pregnant women) while the national level the most aggregated (for example, percentage of institutional delivery) to be able to measure programme impact and take policy measures. A pyramid based information flow acknowledge varying information needs by levels, and supports ecentralised information for decentralised action – rather than centralised information for centralised and top down action.
3. *Integration of information flows – Data warehouse approach:* Today integration, both technical and institutional, has been established as the largest challenge to effective systems. While technically, flows can be relatively easily integrated, institutional linkages are more complex to establish. An approach being advocated to address this challenge is through data warehouses, based on open standards and open software to facilitate data interoperability irrespective. The approach of creating a monolithic ‘single window of truth’, which does not interoperate with other systems runs counter to this current thinking, and leads to further fragmentation in the longer run.
4. *Strengthening collaborative participatory design:* Participation of end users into processes of system design, development and use promotes more ownership of systems, stronger capacity to use them, and systems better configured to support more focused use. Often systems fail because of ‘design-reality’ gaps, implying a deep schism between the worlds of technology development and its use. For example, a centrally designed system which only allows for web-accessed use is distant from the reality, where such access is relatively non-existent. Or the promotion of high-priced and sophisticated statistical packages does not match with the reality of the district user, who is insufficient in statistical expertise, and further who can get all analysis required performed by an off-line Excel system. Participatory design provides a mechanism to bridge this gap, and encourages a prototyping approach, where systems are never frozen, but represent versions fluid in time and space.
5. *Networks of action to support sharing and learning in collectives:* Experience of HIS implementations in the developing world point to the problem of systems dying as pilots, and being of little use to managers who want full scale data. The HISP strategy of ‘networks of action’ seeks to address this problem by getting users and

developers to support and strengthen each other by the sharing of experiences, advocacy, ideas, products, software, and training resources. This network model necessarily requires a shift from a centralised model of bureaucracy based on principles of discipline, surveillance and reprimand, to one where the onus is on the network members themselves to share and learn through their respective experiences. Such a networked model of sharing and collaboration becomes a fundamental aspect of a vibrant information culture.

Example of cultivating an information culture – India

In India, while significant challenges exist, significant gains have been made with respect to nurturing an information culture. Some of these gains are summarised:

1. District wise reports now (in 2011) report nearly a 100% coverage, and also various states have initiated processes of decentralised data reporting and its institutionalisation. A case in point is the state of Bihar, where since 2010 block (sub-district) level reporting has been initiated and today nearly 95% of the blocks are reporting. From initially in 2007-2008 when many districts were even not reporting data, the State has made systematic efforts, where first all districts, and then from the beginning of 2010 all block level data entry has been initiated. Today 95% of blocks report data.
2. Various states have initiated processes providing evidence that they have moved beyond data to information. For example, in Manipur every district analyses their monthly data using graphs and charts, and identify action points to make data quality improvements. In Bihar, all districts used HIS analysis to develop their 38 district Health Action Plans.
3. In a more limited amount of states (say 3–5), we can see evidence of them moving from the stage of information to knowledge, where information is actually being put to action in identified areas of programme improvement.
4. Large scale capacity building programmes have been completed in nearly all states, and in many states nearly 3 rounds of training have taken place at the state level, and in more limited amount of states training has been carried out at the district level, where the district and block staff have attended.
5. These capacity building efforts have contributed to the development of a cadre of Master Trainers in various states at the district level, which in the longer run with continued and focused efforts can help to ensure sustainability of systems and processes in the states.
6. Large scale training materials have been prepared, discussed in training programmes and distributed to the state, district and even block level teams. These materials relate to software manuals, implementation frameworks, data dictionary and indicator manuals.
7. Large scale infrastructure improvements have been carried out in various states, including initiating processes of server upgradation whereby the state applications and data will be moved to the state server, making improvements in providing computers and Internet access to sub-district levels and in some cases even to the facility levels. Some states like Uttarakhand have also been innovative and districts have established local AMCs with vendors to provide hardware maintenance support, thus reducing their dependency on state support for locally solvable problems.

These improvements have come through intensive institutional efforts, spanning domains much larger than just the technology.

9.9 Strategising – The Way Ahead Towards a Strong Information Culture

In this section, we discuss at a strategic level, what long-term interventions can be made to mature the use of information within a health systems perspective. To understand the nature of strategic interventions, we need to first elaborate on the 'gold standard', which we want the health system to attain. Following which, a situation analysis can provide light on what is the existing situation, what interventions have been made in the recent past, their impacts and remaining gaps. This process can be depicted through the Flow chart 9.1.

Three sets of strategic interventions are identified:

1. Broad basing of education in public health informatics.
2. Institutionalising public health information related structures and systems in the government.
3. Providing appropriate software support that encourages local information use.

9.9.1 Broad Basing and Institutionalising of Education in Public Health Informatics

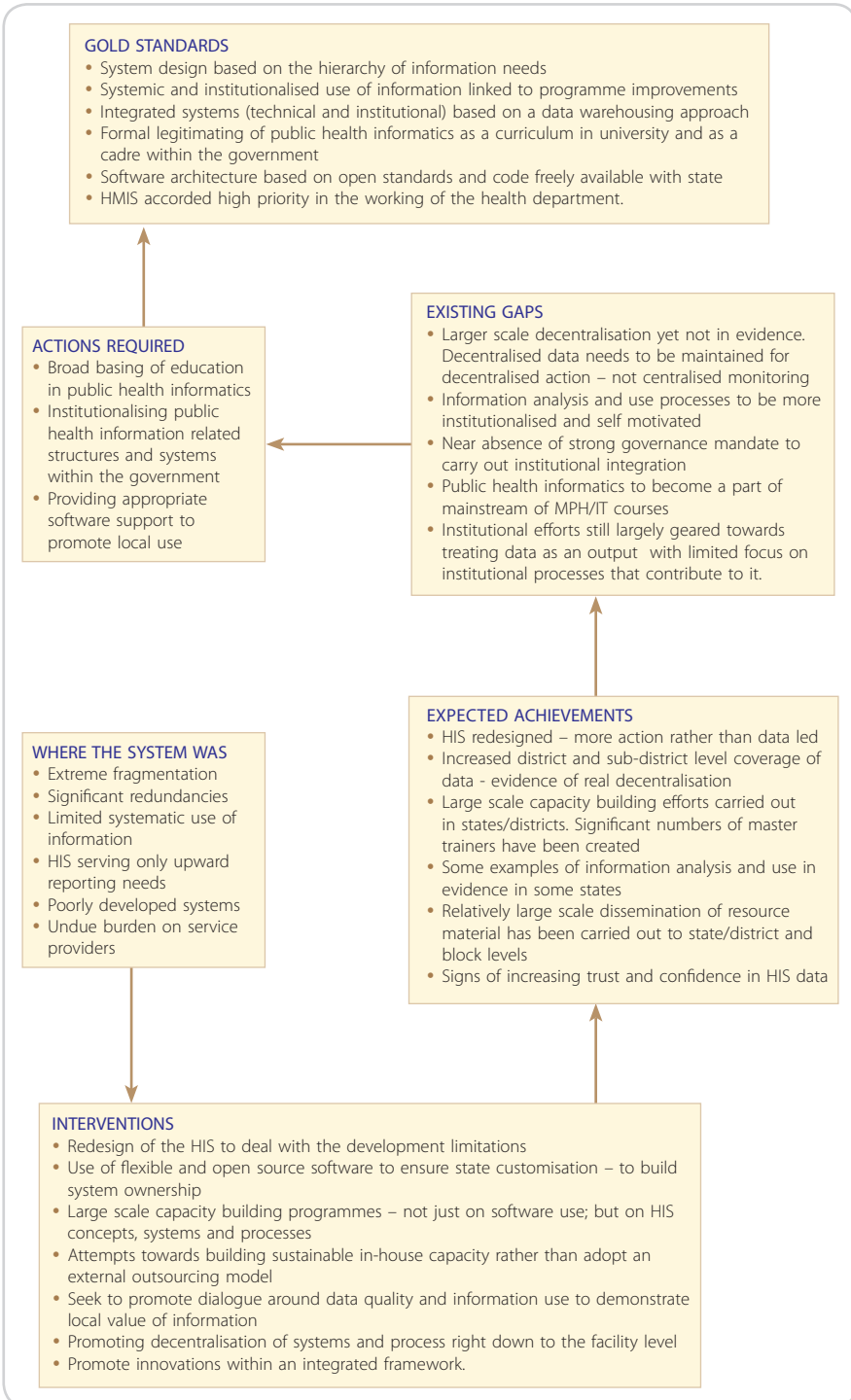
This topic of education including Masters and Doctoral programmes has been discussed in an earlier chapter of this book. Keeping in mind the danger of repeating, we just outline some of the strategic aspects of this intervention.

In most developing countries, educational programmes in computer science focus primarily on the development of technical skills such as programming and networks, with limited or no focus on the aspects of information systems, which deals with the interaction between technology and the application domain. Such a technical focus has strengthened the outsourcing industry. For example in countries like India and Vietnam, by being able to provide low-cost 'bodies' but not able to retain significant high intellectual property, which fundamentally requires the blending of domain and contextual knowledge with the technical. The strategic implication, in terms of the design of educational programmes in public health informatics, is to create interdisciplinary programmes that combine public health and informatics. This will help to reduce the significant existing gap in the production of specialists who are grounded in the public health domain and have competencies enough in informatics that they are able to apply these computerised tools in addressing public health problems and challenges. Till date, this gap has been tended to be filled by statisticians, and this too comes with its own limitations of being able to nurture a public health grounded perspective towards information. The University of Oslo Masters and Doctoral programmes described earlier is an effort towards addressing this gap.

9.9.2 Institutionalising Public Health Informatics Processes Within the Government

With respect to governance of HIS in developing countries, two cadres of staff are predominant including statisticians and computer personnel, with the public health cadre largely absent. While, this imbalance needs to be urgently corrected, doing so is a non-trivial challenge. Various measures could be instituted to support this task, such as including public health specialists in the team with statisticians in the M & E team

Flow chart 9.1 Strategising a strong information culture



at the ministry. This can help to redefine the thrust of M & E activities from one of enforcing data discipline to understanding the public health significance of data and how it can feed into making health programme improvements. Further, national level ministries can consciously seek to shift their mandate from one of monitoring to that on evaluation, where indicators reach them and not raw data. Similar kind of structures incorporating public health people need to be created at the district and sub-district levels. In South Africa, such a structure has been created through the cadre of Health Information Officers who have been appointed at the district and facility levels.

9.9.3 Breaking the Vicious Cycle of Data Non-use

Many developing countries tend to be locked in a cycle, which broadly can be described as follows:

- Historically, data from the routine HIS is described as being of poor quality and thus not trusted and used.
- For reporting on performance, the national level then relies on survey data ignoring the routine HMIS data. Survey data does not provide the required granularity to support programme related everyday interventions, and its primary function is for upward reporting of statistics.
- The more the routine data is not used and formally ridiculed, the less is the attention given to its process of strengthening.
- The lack of trust in routine data continues to be high resulting in its non-use.

The vicious cycle described above needs to be broken, using at least two sets of arguments.

1. To argue that data currently on flow in the routine system is adequate, arguably of sufficient coverage and level of quality to be put to use by planners.
2. To argue that for existing level of planning needs for information, the level of quality tolerance is not so extreme that the current routine data cannot satisfy.

Both these issues are now elaborated:

1. *The data perspective – Level of coverage and quality:* There are always actors in the system who would like to undermine the value of routine data, arguing that its quality and coverage is of inadequate quality. Their interest may be to use other sources of data or not at all. Such arguments need to be countered by unpacking what they mean data quality is inadequate. In India, where similar arguments are heard on data quality, we see on drilling down that there exists nearly 100% of district and 30% of sub-district coverage. Given the right environment and support, this coverage can be further heightened. By all accounts then, the volume of data available tends to be non-trivial and quite sufficient to meet more than 90% needs of the planners. Further, a focus on 'essential data elements' (for example ANC registration, immunisation, and so on), where data is relatively better that can help to strengthen information use. Often the non-use of data is justified by the argument of poor quality legacy data. Such an argument is counter-productive, and constant reprimand for gaps which current staff has little control over will continue to de-motivate them from the present task at hand. It thus becomes important to live with the limits of what exists, which is a product of the historical legacy of systematic inefficiencies, and instead focus attention on strengthening present and future systems.

2. *The planning perspective – Level of quality tolerance needed:* In public health planning, arguably the quality level tolerance on data can be much lower than what may be used in patient level clinical trials. For example, if we take the level of information support required for managing the problem of maternal mortality, we see that a majority of the data is available in the existing HIS. And what is not available, can be easily obtained by a phone call to the district (for example, to get the number of gynaecologists available in a district). While this is not, in the least, an argument being made that existing HIS is perfect, in its present form and in relation to planning needs, there may be a reasonable level of sufficiency in it to warrant its use. Further, the more important point is that to establish a degree of trust and confidence in the data, planners need to convey to the others they are not adverse to using it. A contrary message of lack of confidence and the non-use of data will continue the overall neglect and apathy towards the HIS, and continue the entrapment in the vicious circle of data non-use.

We can further attempt to break out of this vicious cycle by having the districts to report only on actionable indicators rather than raw numbers. For example, with respect to deliveries, it may be more effective if districts give figures of percentage by different facility types that are not providing expected level of services (such as deliveries, safe births, C-sections, Basic Emergency Obstetric Care services (BEmOC), and so on). This can then be used by planners to strengthen coverage of BEmOC services with direct implications on maternal mortality. Details of raw numbers of deliveries will always be available at state or district levels and can be called upon if needed. Disaggregated data can always be at hand, say in offline systems, and can be called upon if required. This represents the established principle of hierarchy of information, where the most detailed information is at the lowest level and national level reviews aggregated and actionable information. Similarly, there can be other examples like stocks, where national level reviews only percentage of stocks out, while the lowest level maintains details of receipts and consumption of stocks. This also helps to re-direct our attention from being continued to be locked in data to its transformation to information and knowledge, towards a more vibrant information culture.

After outlining the process and levels of information use, and discussed key strategic interventions required towards creating an information culture, in the next two chapters, we delve further into the challenge. We first discuss what are interventions required at the local level to build appropriate capacity, and following that, we discuss the role of the State.

Summary

- A ‘data-led’ rather than ‘action-led’ condition of HIS dominates in most developing countries.
- Strengthening quality of information requires efforts around the following interconnected dimensions:
 - a. Organisational use.
 - b. Information systems.
 - c. Technical and tools.

- Maturing of information use can be conceptualised as a process comprising of three analytical levels:
 - a. Establishing technically working systems emphasising data completeness.
 - b. Information systems characterised by analysis, use and feedback of data.
 - c. Information system shows evidence of impact on decision-making.
- The TALI tool developed in South Africa provides an instrument to assess these three levels of maturity of a health information system.
- Examples of Level 3 HIS are relatively scarce, but will play an increasingly important role in future in order to support global initiatives such as Pay for Performance and Performance Based Financing.
- Life cycle events approach to data analysis represents an effective way to identify both target groups missing services and also missing data.
- Maturing of information use fundamentally involves the nurturing and cultivation of an information culture.
- A mature HIS would look at data quality problems as comprising of both data artefacts and health programme artefacts. This implies data 'aberrations' not being dismissed as isolated statistical events that require 'normalisation', rather as public health events that need sensitive contextualisation.
- Institutional efforts towards cultivating an information culture:
 - a. Focus on information use: Technology for information and information for action.
 - b. Decentralised information for decentralised action.
 - c. Integration of information flows: Data warehouse approach.
 - d. Strengthening collaborative participatory design.
 - e. Networks of action to support sharing and learning in collectives
- Strategising towards a strong information culture requires:
 - a. Broad basing and institutionalising of education in public health informatics.
 - b. Institutionalising public health processes within the government.
 - c. Institutionally breaking the vicious cycle of data non-use.