The primary health care network in Pakistan consists of more than 13,000 health facilities, including 'Basic Health Units' and dispensaries, which provide primary care services to the masses. It represents one of the largest service delivery systems in the country.

The information produced and processed by this network is formally organized by a 'District Health Information System' (DHIS). The DHIS, in TDO terms, is organizing three types of resource descriptions (figure below). First is the individual health and disease data (resource description) of every patient (primary resource) that comes in contact with the system. Second is the service delivery and administrative information of each health facility (a resource description of each facility). Third is the statistical summaries and reports that are generated through collation and analysis of the first two. These summaries, however, are not descriptions of individual patients but instead a resource description of the whole population (resource).

Information collected at health facilities during patient encounters is recoded manually into different tools such as Outpatient Register, Maternal Child Health Register, Prescription forms, etc. At the beginning of every month, the staff manually prepares a monthly report (link to sample) of last month summarizing the patient flow, disease conditions observed, stock details of drugs and other consumables, etc. This report is delivered to the District Office by 5th of the month. At the district office, a Data Officer enters these reports into a DHIS Software (developed by JICA). The digital form of the report is then transmitted to the Provincial Health Department by 15th of the month. This is where all of the district reports are again combined into a single state-level report, which in some provinces is published online.

The goal (or why) of organizing these resources is to enable meaningful interactions for health facility managers, district health officers, and policy makers at state level. These be simple ones at facility level such as finding patients in records who missed their vaccination date, or drug and stock management. District and state level utilize more complex interactions of the system such as identifying disease patterns, making public health decisions to respond to it, measuring service utilization and quality, and making budgetary allocations for future.

How much are the resources organized, varies by level of the system. At health facilities, the information is most granular i.e. individual details of each patient and service delivery event are recorded. However, at district, provincial, and national levels, progressively summarized information is organized in the form of monthly reports. A seemingly mundane decision about what the monthly report should look like, leads to category design issues. As population disease patterns evolved over time, the originally defined categories of diseases are no longer sufficient to capture the required level of granularity. However, changing a reporting format which is in use for 30+ years will inevitably lead to challenges of maintaining compatibility with past data.

When: Resource descriptions at facility level are organized as they are created (point of contact). However, at higher levels of the system, information is organized in a delayed and periodic fashion by employing the monthly reporting scheme. At all levels, this can be considered 'one the way in'
organization because in almost all cases, this information is retrieved only later when needed for decision making.

**How** are these resources organized? This involves a set of tools (paper based registers, and electronic databases) as well as concerned data entry staff or data manager at each level. Final summary statistics at provincial and national levels may be produced by a computer software as well. The historical decision to employ paper based tools at the health facilities had important implications. A time-sensitive interaction required is the emergency notification of outbreaks highly contagious diseases. Absence of digital data collection at point of care makes this interaction very slow and ineffective. Some provinces have adopted mobile-phone based to address this challenge.

Regarding **location**, the original paper-based record (resource description) of patients’ interactions with the health system is always stored at the concerned health facility, and only a monthly summary report is sent upwards. The collated reports are stored in paper form at district offices, entered into a software manually, and transmitted to provincial office in digital form.

An overarching challenge is the **lack of interoperability** with other systems. Disease categories were defined by the government departments for this system but another weekly reporting system (DEWS) employed by World Health Organization classified diseases differently. Vertical disease control and community services funded by international agencies also created their own categorizations. None of these follow ICD scheme, and thus international comparability is even more challenging. This is a classic example of **incompatibilities in abstraction and granularity** causing interoperability challenges.

A related issue is the non-use of data for policy and planning. One of the reasons for this could be that the **presentation tier** of the system is poorly designed and does not afford easy interpretation and intelligent decision support.

Another challenge faced by DHIS is **where it intersects other organizing systems**. The human resource in health facilities was organized for service delivery and data collection for the essential services. As years progressed, new programs for Polio Eradication and Disease Early Warning System etc. were implemented by assigning these tasks to the same human resource. This overburdened the staff so much that completing data entry for all these systems was difficult, and the quality of data suffered greatly. Solutions would therefore include either providing dedicate human resource for data collection or making the data collection highly efficient.


Online published reports of DHIS KP at: http://www.dhiskp.gov.pk/reports.php


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Figure - Organizing system design perspective of District Health Information System