

Report on UiO mission to Punjab

May 28-29, 2018

Background	2
Report on meetings	2
Meeting with HMIS, EPI and CDC	2
Meeting at IRMNCH&N Program	4
Meeting at HISDU	4
Meeting at PITB	5
Debrief meeting	6
A rapid situational analysis	8
Guiding principles for HIS integration and development of integrated data analysis tools	10
Key principles	10
A multilevel approach to high quality data repositories for decision making	11
A stepwise prototyping approach to software development	12
Prioritising indicators for integrated data repository and dashboards	12
Suggested plan of action - next steps	14
Short term plan (6 months)	14
Steps	14
Costed plan for technical assistance to the short term plan (6 months)	17
Longer term (1-2 years)	19
Gradually build out the integrated data repository and dashboards	19
Harmonisation of data collection and use of common standards across systems and programs	19
The role of EMRs in the integrated data repository	20
Annex 1 - key systems in place and under development	21

Background

University of Oslo (UiO) was invited by UNICEF Pakistan to do a scoping visit to Punjab and Sindh province end of May 2018.

Punjab government has requested UNICEF to support in strengthening the capacity of the government in further development and upgradation of Management Information Systems (MIS) software. This MIS expected to play important role in visualizing the data developed by multiple partners into one integrated dashboard linked with LMIS and HMIS.

The scope for the Punjab mission was to examine the existing MISs and provide detailed report/roadmap with recommendations on areas of Strengthening the existing Dashboards, how best implement visualization of the data developed by multiple partners into one integrated dashboard with linkages to LMIS and HMIS data.

This report has a quick summary of meetings attended, a situational analysis including an overview of the electronic health systems and applications presented during the mission, and finally some suggestions for a way forward.

Report on meetings

Quick summary of meetings conducted during the 2 day mission.

UiO Delegation

Zubair Asghar Raja, DHIS2 Core Developer, zubair@dhis2.org

Ola Hodne Titlestad, DHIS2 Implementation Coordinator, olati@ifi.uio.no

Monday, May 28, 2018

Meeting with HMIS, EPI and CDC

- Formal opening of the mission
- HMIS and EPI program represented

Systems demonstrated in this meeting:

DHIS (HMIS)

<http://phispb.com/dhis>

This DHIS system was initially developed by central government in 2004 and is a Pakistan-developed HMIS software not to be confused by the global/UiO DHIS2 which shares the same name. This system has been further developed and is now fully managed by the Punjab ministry.

Key summary of the presentation:

- Monthly summary forms from 4007 health facilities.
- A total of 25 paper forms
- Dashboards providing key analytical outputs per health program.
- Challenges and bottlenecks presented:
 - Fragmentation and many parallel systems by vertical programs
 - Data quality
 - Capacity to do data analysis
 - Lack of formal data sharing between vertical programs
- Identified way forward:
 - Develop an integrated real time data collection system
 - Strengthen capacity on data quality and data analysis
 - Develop better tools for data validation and alerts/notifications

DSS

A disease surveillance system collecting cases on 81 diseases from teaching hospitals, DHQs, THQs, BHUs, and RCHs facilities with data entry through mobile apps and SMS.

EPI Surveillance

System for vaccine-preventable diseases building on and integrated with the DSS system. Has built in alerts and is now under pilot for 4 diseases.

EPI MIS

<http://epi.punjab.gov.pk/login>

vLMIS

Presented by the USAID partner Chemonics who is supporting this national initiative. Key points:

- Three major modules
 - Inventory management
 - Stocks consumption reporting
 - Stock requisition module
- Seems to overlap quite a bit with both EPI MIS and DHIS in terms of reporting routine immunisation services
- Expressed interest to set up interoperability solutions with the other systems

Other systems presented briefly:

Dengue Patient Portal

Vector Surveillance

Health CMS

Dengue tracking system

Meeting at IRMNCH&N Program

The IRMNCH&N program presented their health information systems and ongoing plans to develop EMR based system.

The IRMNCH program was mainly interested in talking about their ongoing software development efforts to build a patient-centered EMR system for RMCNH services. Not clear how far this initiative is in terms of developing and implementing the system.

In addition to the EMR presentation they also presented:

LHW (Lady Health Worker)

LHW/LHS is a online database for tracking worker in the field with comprehensive Information about their geographic location and visits in the field. System is capable of generating analytical dashboards and LHW monthly reports.

Meeting at HISDU

Departments represented:

- HISDU
- TB
- Hepatitis

This meeting was really a marathon of many smaller presentations of all the systems developed at/for HISDU, TB, and Hepatitis.

The Health Information & Service Delivery Unit (HISDU) is a relatively new unit established in 2016 as a common IT centre serving the health department with software development and network operations. They presented an impressive activity and in total 17 applications including an HR system and ongoing efforts to develop an EMR system. It wasn't very clear from the brief presentation how many of the systems that very fully operational at scale in the province. The HR system seems very interesting in terms of providing key summary data on HR useful for integrated data analysis. Opportunities to extract this information automatically(through web APIs) should be explored. We tried to ask about how these many applications link and exchange data, but did not have a lot of time for these discussion. The impression was that they had been developed in silos without much focus on data integration and sharing across systems and applications. It was interesting to see the "operations room" at HISDU with all the different screens showing dashboards and reports from the many system, many impressive dashboards, but again not clear how these many systems are integrated.



Photo of the HISDU “operations room” showing all the screens displaying data from the various online sub-systems in Punjab.

Tuesday, May 29, 2018

Meeting at PITB

Departments and people represented:

- Program Director PITB
- Program Officer DSS/ Dengue

The meeting at PITB had two parts, the first with a series of software demonstrations by the different developers and teams, and a second smaller meeting with the director for a more strategic discussion on the overall system architecture in the health department and potential ways forward for better integration and enhanced data use.

Some of the systems demonstrated had already been presented the day before as PITB delivers systems to the different sections of the health department. Key systems demonstrated:

HRS system

Used by hospitals as a line listing system capturing individual data from hospitals. Not clear which activities that are being collected here, but the impression was that this is an effort to integrate all services at the hospitals. PITB also referred to a HIMS system which is integrating hospital data.

eVaccs

<http://open.punjab.gov.pk/evaccs/> (Punjab child vaccination)

Open source system for real time with real time data about vaccination in punjab. It generates monthly coverage and attendance maps. Those maps can also be converted to Geographical Coverage reports. It include Android apps to digitise fieldwork and monitor attendance and performance. System is developed and maintained by PITB and is fully capable of getting integrated with external system using RESTFul APIs¹.

This system seems to overlap quite a bit in terms of services being collected for routine immunisation with the DHIS and EPI MIS systems.

¹ https://en.wikipedia.org/wiki/Representational_state_transfer and https://en.wikipedia.org/wiki/Web_API

There were some discussions between Chemonics and PITB in terms of exchanging data between eVaccs and vLMIS and PITB demonstrated the open portal for immunisation data on open.punjab.gov.pk that includes dashboards on key data and APIs for other software applications to extract data.

Discussion with PITB director

It was quite clear that PITB has an impressive capacity in terms of developing IT systems for the department of health (as well as other government sectors). When we discussed integration and the idea of bringing key data together for data analysis in common dashboards the impression we got is that PITB develops systems based on instructions from different departments and vertical programs in the health department and that there has not yet been any requests from the health department to develop a more integrated system for data analysis across all programs and sub-systems.

It was also clear that there is lack of standardisation of data standard for the data and indicators collected in the different systems, of course making it difficult to exchange data between system when the definitions are not clear and shared. Still PITB developers have in-depth knowledge of the different data structures and data collected in all the systems they have developed, so they have the capability to extract standard data on demand, but right now that would be a very ad-hoc and manual process.

As a word of advice moving forward the PITB director said that it will be easier for stakeholders and system owners to think of the integration efforts as a “system consolidation” process rather than “system integration”.

Debrief meeting

The debrief meeting Tuesday afternoon brought together all the key staff that had attended the previous meeting. UiO team gave a debrief presentation followed by an open discussion.

The debrief presentation focused on the key objective of the mission, to advice on how the health department can move towards better data integration to strengthen data analysis and use:

1. Facilitate integrated data analysis for decision-makers across all health programs –at all levels
2. Up to date key indicators from all health programs available in one place with easy access to all levels of the health system
3. Bring together data from different data sources allowing for more powerful data analysis and a holistic view of the health system
 - a. Service data from facilities, hospitals and community, HR data, stock data, population data etc.
 - b. Public and private sector

In the presentation we also took some time to review some recommended architectures for HIS that can enable the above, building on the key concepts going back to the WHO HMN framework as well as recent work by WHO HQ to develop standards based DHIS2 dashboards and data analysis guidance to countries. These concepts are explained in much more detailed later in this report.

Given the big focus on developing EMR/patient systems in Punjab, we also took some time to talk about the role of EMRs and how these related to the objective of integrated data analysis. In short the two objectives are not contradicting and should be proceeded in parallel. Over time most data collection of health service data will move from aggregate data collection to medical records (patient data), which will greatly improve quality and availability for data analysis of health interventions, but EMRs doesn't remove the need for building solid integrated HIS architectures and systems that are standards-based and enable integrated data analysis bringing together service data with logistics, HR, lab and other key data sources from the health system.

At the end of the presentation we outlined a possible way forward and this will be covered in detail later in the report. Key message was to establish an integrated data repository on top of the many existing systems, extracting standards-based data from the underlying system and enabling data analysis in integrated dashboards following recommended data analysis guidance from WHO. This does not have to pose a treat or radical changes to the many existing systems, but rather try to bring data from these systems together in an integrated way.

The discussion after the presentation was quite energetic (despite approaching Aftar dinner in Ramadan). Questions were quite varied and although many were related to the suggested next steps we also talked about EMRs, DHIS2 features in general, data quality issues as well as many other topics.

A rapid situational analysis

Our overall impression of the health information system in Punjab is that the use of technology is very advanced and that there is availability of high-level IT capacity in the province to develop applications for the health sector.

During the two days mission we were presented with an impressive number of IT applications used in the health sector, probably more than 30, developed by different groups within and outside the health department. Many of these had been scaled up and seemed to function well. As we did not get a chance to study any of these systems in great detail or to do visits in the field to see these systems in use, our review of the many systems is quite superficial and based mainly on slide decks and presentations. However, the objective of the mission was not to do an in-depth review of any particular application, but rather to understand the full landscape of the applications, their areas of use, and of course how they are interlinked.

The main focus of the mission was to advise on integration of data and tools for better data analysis across data from different sources and partners. Both in the presentations from health department as well as in the follow-up discussions in the various meetings we got the impression that integration and sharing of data across systems and vertical programs are big challenges. The many systems operate mainly in silos addressing very specific needs, and many of them in a very impressive way. But during these two days we failed to identify an overarching structure and governance body taking care of how these systems fit together, how sharing of data is facilitated, and how these many data sources contribute to a bigger architecture that allows for integrated data analysis.

Although this obviously was the trigger that initiated this mission in the first place, from our meetings in Punjab it was also not clear that this was a big priority in the different departments and vertical programs. This is a quite common scenario in many countries, vertical programs and specific health initiatives will typically prioritise their own key data needs first.

In summary we can describe the landscape of HIS applications in Punjab health department as follows:

- Working well:
 - Tailored systems and apps to specific program needs
 - Responsive to immediate needs of specific projects and programs
- Challenges:
 - Difficult to analyse data across programs and projects
 - Difficult to get an overview of the health system status (manual process to link data from different sub-systems/applications)

We'll get back to the recommended steps to address these challenges further down in this report, but would like to reflect quickly on the potential of the IT capacity in Punjab. PITB has an impressive portfolio of health applications and vast experience working with the health

sector. The newly established HISDU unit also seem promising with a big team of IT staff and high ambitions. It's quite unique to have such capacity at hand for a ministry of public health. From our discussions at PITB it emerged that the main challenge for Punjab in terms of integrated data analysis is perhaps not the IT skills available to develop the necessary applications, but for the ministry to ask for the right kind of systems.

Annex 1 has a more extensive list of key systems that were demonstrated during our mission.

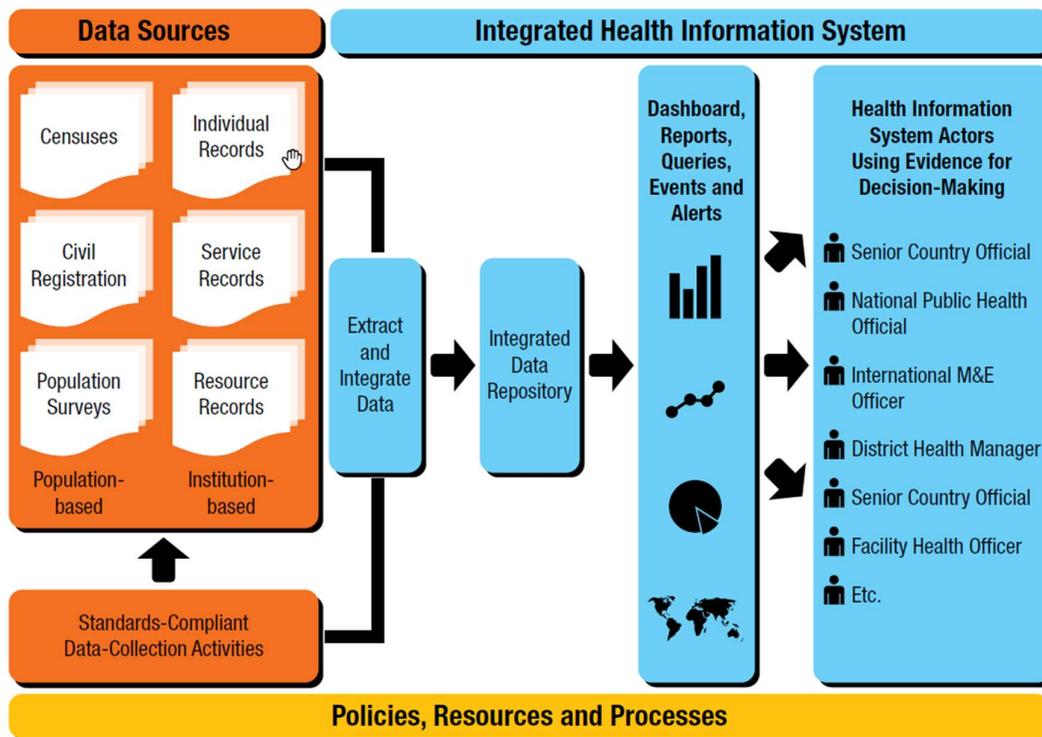
Guiding principles for HIS integration and development of integrated data analysis tools

The following section provides some key concepts and guidance to establish an integrated data analysis platform, that we believe is also highly relevant for Punjab. Although this outlines a long term process and significant work in terms of governance, awareness raising, capacity building and software development, we believe that this can be addressed in a stepwise manner with several short term benefits. The suggested next steps for Punjab follows after this more general description of the concepts and processes.

Key principles

The need for a more integrated approach to management and use of HIS data has been identified in the WHO HMN Framework. The heart of an integrated HIS architecture is a standards-based data management system that enables data to be integrated from data sources such as individual records, service records, resource records, population surveys, civil registration and census, and makes this data available for data analysis and information use across stakeholder groups and levels of the health system.

The drawing (WHO HMN Framework) below illustrates the architecture of such an integrated system with all the different data sources and sub-systems on the left, the integrated data repository in the middle, and the dashboards for data analysis serving various decision-makers on the right.



In developing such a system there is a need for an approach that takes into account 4 key processes:

- 1) Standardization of indicators and data collection systems across all HIS data sources
- 2) Advocacy and awareness-raising of the benefits of an integrated HIS
- 3) Long term capacity building on data management and information use
- 4) Development of appropriate ICT-based solutions (integrated data repository and dashboards for integrated data analysis) for an integrated HIS

To move from a silo-style system towards an integrated one there is a need to standardize and rationalize data collection systems across health programs and other data collection initiatives. The rationale behind an integrated HIS applies equally at all levels, and the integrated data repository should thus be introduced at both national and local levels, independent of what technology is selected. An integration of data management structures is also important, with one dedicated HIS group at each level supporting the data repository.

HIS integration is a politically sensitive process that might require substantive change to how organizations operate. Key stakeholders at all levels need to be aware of the benefits of integration and information sharing and be allowed to actively participate in the change process in order to allow for change. Only through long term focus on capacity building on data management and information use, and strong commitment to change across the stakeholder groups an integrated HIS can be achieved.

Information and Communication Technologies (ICTs), specifically within the area of data warehousing can make a real difference to an integrated HIS in terms of data storage, transport, processing, analysis, visualization and dissemination and be a key support function in strengthening evidence-based decision making. However, the computerized solution will only be as good as the HIS it is meant to support, and its success depends heavily on the other three processes.

A multilevel approach to high quality data repositories for decision making

Most of the key data sources of the integrated HIS are found at the lower levels of the health system, and data collection, management and use at the local level to a large extent dictate the data quality of the national-level data repository. All levels of the information chain from the health facilities up to the central level both influence the quality of the data and are also equally dependent on high quality integrated information for decision making.

An effort to develop a national data repository that neglects the local levels is highly unlikely to succeed. The health district is often the first level of the health system where most of the important data sources meet and as such forms a natural first level for an integrated data repository to operate. While the district data repositories might not be as extensive in terms of data sources, required data processing, or of applied technological tools they are still crucial to get right in order to achieve a well functioning integrated HIS at the central level, and more importantly will have a real impact on the ability to do evidence-based decision making at these levels.

Therefore the 4 key processes of data repository development listed above are equally important to apply at least down to the district level, and in terms of capacity building the community and health facility levels are crucial in terms of strengthening the first level of data collection, data quality control, and information use. Electronic transmission of data

from a local data repository to the higher levels also improves timeliness and quality of reporting.

A stepwise prototyping approach to software development

Developing an ICT-based solution to support the integrated data repository and dashboards for analysis is a complicated task, and there are more examples of failures than successes. Here are some key principles that can help you in this challenging task, but the most important advice is to fully understand that this work will only succeed within a broader approach focusing on all key 4 principles listed above.

- 1) Quickly come up with an attractive prototype to illustrate the key benefits to the main stakeholders to get buy in for your project, a visual example can say more than a thousand words.
- 2) Keep in mind future expansion of the system, and adhere to global standards for future data transmission.
- 3) Plan for a collaborative process with participation from a wide range of stakeholders at all levels and be responsive to feedback by allowing for an iterative development process that is flexible to change. Use the prototype actively in interaction with the users.
- 4) Involve local IT and HIS staff in all phases of development and emphasize learning by doing
- 5) Let the organizational needs drive the process, the end goal is to strengthen information use at all levels and not necessarily an advanced technological solution .
- 6) Don't reinvent the wheel, there are many data warehousing tools available for customization and use.
- 7) Keep it simple and sustainable, and scale up based on available local capacity and resources.
- 8) Make sure your solution fits well with the context of use, both in terms of human capacity to use and maintain the integrated data repository and dashboards, and the ICT infrastructure needed to run your solution.
- 9) Give due emphasis to capacity development. Local knowledge about the importance of use benefits all levels through local interest in data quality. As the user maturity increases, typically data quality will improve, and more functionality will be requested.

Prioritising indicators for integrated data repository and dashboards

What data to integrate? Which systems to interoperate with? Where to start?

The data landscape of a health system is complex and is typically addressed through a range of specialised sub-systems each with limited scope and focus on specific program and health intervention needs. The range of technology solutions in place to support data collection and analysis in these sub-systems is typically broad and vary from basic paper tools on one side to advanced web-based and mobile solutions on the other. In developing the integrated data repository and dashboards it is easy to get lost in the jungle of sub-systems, and for each of them in the technical challenges of developing interoperable solutions and the organisational change needed to establish data sharing agreements.

To gain attraction and to maintain momentum for the benefits of integrated data analysis, it will be key to approach this development in a stepwise manner, and to start with high-priority information needs and gaps. Instead of starting with all systems and data points at once, rather start with some key analytical outputs e.g. some key dashboards and visualisations that address real needs, and then map where the data needed for these indicators are located across the various sub-systems. Then prioritise your interoperability development on these identified sub-systems and the data so that you can quickly populate the minimum indicators and dashboards.

In short, start with the high-level information needs and drill down towards the sub-systems and the discrete data points required to do the analysis:

1. Identify key interventions and M&E analytical outputs
2. Design mock-ups of the dashboards and visualisations needed
3. Identify indicators and their finer data elements and disaggregations needed
4. Map out which systems and their data points are needed to extract
5. Develop processes for extracting this data from the identified sub-systems

Suggested plan of action - next steps

These suggested next steps builds on the rapid situational analysis and the general guidance outlined above. This plan is limited in scope to focus on establishing an integrated data repository to enable integrated data analysis and does not intend to cover the overall ICT development of the health sector in Punjab.

There are no quick-fixes to developing a sustainable integrated HIS that is actively used by decision makers at all levels, but as state earlier we to believe in addressing this in a stepwise manner and to ensure that there are short term benefits along the longer route to a truly integrated and standards-based system. This is definitely the case also for Punjab and the existence of skilled IT capacity available to the health services to make us optimistic in terms of shorter term deliverables that can work as attractors to gain more momentum and support for a longer term roadmap.

Short term plan (6 months)

Objective: develop a functioning integrated data repository and key dashboards demonstrating the power of integrated data analysis.

Steps

1: Define key dashboards and analytical outputs

Start by defining some high priority analytical outputs, e.g. some key dashboards for EPI and IRMNCH&NP that brings together a summary service data, logistics data and HR data that are useful for health managers to monitor the overall situation and key health interventions. Health managers and data managers from the programs and IT experts from PITB should work sit together and agree on these dashboards and draw up some mockups.

The WHO Health App and related curriculum for integrated data analysis developed by WHO HQ and UiO in collaboration was presented at the debrief meeting. This work can be an important source of inspiration when selecting some key dashboards to start with. As of now, the WHO dashboards include HIV, TB, Malaria and EPI dashboards, but future expansions to RMNCH and Nutrition is under way.

2: Identify indicators and data points needed for the selected dashboards

Working from the selected dashboard mockups, identify the indicators needed and where the necessary data is collected. For this process it will be important to involve the data managers that use the systems and the IT developers that understand the underlying database structures and how to extract the data. It is likely that to get complete data on a particular indicator there is a need to connect to multiple systems, as different applications may be in use to collect the same service at different levels (hospitals, lower level facilities, community, public and private facilities etc.).

In order to make sure the extracted data from the different systems is compatible when added together it will be important to have very clear definitions of the indicators, data points/variables and the disaggregated (age, sex etc). Another metadata dimension that needs standardisation for data to be compatible is the organisational/geographical dimension. Health facilities and districts need to be clearly defined and match up across the various sub-systems before the data can be brought together. HISDU mentioned a health facility register with standard codes, but it may not be in use across all the systems yet.

Establishing these standard definitions is the beginning of establishing a standard data dictionary and metadata registries for the health services in Punjab, a key building block of the integrated data repository. Again, we advice to focus on the data needed for the selected dashboards, so scope is limited, but the processes established should be forward-thinking and aim at establishing routines that can scale when additional dashboards are needed and the integrated data repository grows is scope.

3: Set up the data structures for the integrated data repository

The next step is to implement the defined standards in a structured data repository. We recommend using an existing open source platform for this purpose to avoid a lot of software development in this short term phase and to focus on the contents (metadata).

PITB (and perhaps HISDU) should take the role as system administrators defining the necessary metadata in the integrated data repository.

The platform configuration at this point should include the following steps:

- Set up the facility list and the full hierarchy of the health system with geo-coordinates
- Based on the identified data needs in step 2; set up the indicators, numerators/denominator elements, and disaggregation categories
- Define key user roles and access control needed both for external systems (for interoperability) and for system administrators

4: Extract data from the sub-systems and populate the integrated data repository

Based on the identified data needs and systems in step 2, extract data from the various systems on the format required by the integrated data repository as configured in step 3.

Depending on the ability of each of the sub-systems and their developers, choose the appropriate mode of exporting data to the data repository, either manually using standard export files and the import user interface, or automated using the Web API.

UiO data repository experts can work with the local software developers at PITB and/or HISDU and provide guidance on the data export formats and on the use of the Web API.

5: Design dashboards on top of the integrated data repository

Once the data structures have been defined and data imported it's time to develop the dashboard outputs on top of the well defined integrated data repository. These dashboards can be developed as a web application that consumes data from the Web API of the data repository in a structured way. Such an approach is scalable (more dashboards can easily

be made in the future reusing the same backend structures/APIs) and makes sure the dashboards are well integrated and built on the same data standards.

After these steps a fully functional integrated data repository and dashboards demonstrating the power of integrated data analysis will be in place. The scope will of course be limited to a few selected dashboards and will need to be gradually developed over time, but should be sufficient to gain attraction in a relatively short time frame. The new system and capacity developed through these 6 months will be a solid foundation for further expansion.

Costed plan for technical assistance to the short term plan (6 months)

The following costed plan outlines the cost of bringing in external expertise from UiO to provide training, guidance and quality assurance to the short term plan and activities described above. This plan assumes that there is available local staff that are allocated to these activities and do most of the work, with guidance from the experts/TA. The TA provided is a combination of on-site TA (approx. 3 weeks) and remote support. It is recommended that a core technical team is appointed ahead of these activities to have dedicated local IT staff managing the integrated data repository and dashboards. The TA will then train and support this team in all activities. This team can e.g. be a mix of IT staff from within department of health and developers from PITB.

Activity	Local staff needed	Timeline	TA days	Cost (USD)
1: Define key dashboards and analytical outputs	Program managers, provincial decision makers. Punjab core team (IT and HIS experts).	Month 1	3	3,024
2: Identify indicators and data points needed for the selected dashboards	Data managers and system developers for the source systems identified. Punjab core team (IT and HIS experts).	Months 2-3	3	3,024
3: Set up the data structures for the integrated data repository	Punjab core team (IT and HIS experts).	Months 2-3	15	15,120
4: Extract data from the sub-systems and populate the integrated data repository	Punjab core team (IT and HIS experts).	Months 4-5	15	15,120
5: Design dashboards on top of the integrated data repository	Punjab core team (IT and HIS experts). Program managers for feedback.	Months 5-6	8	8,064
Total TA costs			44	44,352
Other costs			# (units)	Cost (USD)
International travel (flight, hotel, per diem)			3	12,000
Total cost				56,352

The above budget assumes a daily rate of external UiO experts at 1008 usd, the fixed rate for global implementation experts under the UNICEF LTAS, and an approximate cost of international travel for 1 week in Punjab to 4000 USD.

Longer term (1-2 years)

We are not at this stage outlining a detailed plan for the long term, but outline a few key processes we recommend as possible next steps after the first 6 months.

Gradually build out the integrated data repository and dashboards

Given that the short term objective of gaining attraction among key stakeholders for the integrated approach worked, the natural next step following the first 6 months will be to gradually build out the integrated data repository and dashboards with more analytical outputs and indicators. The steps involved in doing so will be very similar to the short term steps outlined above. Again the WHO recommended dashboards can be a source of inspiration, and even imported directly if desired.

The WHO curriculum for data analysis that comes with these dashboards is a powerful package that can help strengthen data use at all levels in the health system. As the dashboards are developed and ready for use, the next step will be to train managers at all levels in the use of dashboards and on best practices for data analysis.

Harmonisation of data collection and use of common standards across systems and programs

The short term plan does not attempt to change any of the existing systems and data collection processes, but rather suggests a less radical approach of adding a new layer “on top” of these to facilitate data integration and analysis in a structured way.

As outlined in the general guidance on building integrated data repositories the quality of the data in the HIS is determined by the data collection processes at the lowest levels of the health system. The total burden of data collection at a health facility will affect the quality of the data collected, and in order to improve quality it is crucial to look at ways to harmonise data collection across vertical programs and sub-systems.

Our rapid assessment of the situation in Punjab indicates that there is quite a bit of overlap in terms of data collection with multiple systems collecting the same data from the same sites. So a longer term step to improve the quality of the data in the integrated data repository would be to streamline how the data is collected across the many departments and programs.

Another important aspect of harmonising the data collection is to use common standards across sub-systems that are used to collect the same services, but for different parts of the health system, e.g. public vs private or hospitals vs primary level. A process towards more standards-based data collection across the whole health system will be a key step towards improving data quality and will greatly simplify the process of integrating these multiple data sources in a common repository.

The concept outlined in the short term plan step 3 is a first step in towards establishing structured and harmonised data collection tools. The goal should be to develop master lists or registries for indicators, data elements/variables, and for health facilities with a proper

coding scheme and to make these available to all system developers. Software platforms can help with the structures and functionality to store and disseminate these standards, but this is first of all an organisational process where multiple programs that are used to work in isolation need to come together and agree on common standards and on a more streamlined way to collect data without duplication across the health system.

The role of EMRs in the integrated data repository

Given the big focus on developing EMR/patient systems in Punjab, we find it necessary to add our perspective on the role of EMRs and how these related to the objective of integrated data analysis. Questions during the debrief discussion indicated that it was an either or discussion, that our proposal for integrated data analysis would replace the current plans for scaling up the use of EMRs in Punjab.

In short the two objectives are not contradicting, they are completely different in scope, and we think they should both be proceeded in parallel.

Over time most data collection of health service data will move from aggregate data collection to medical records (patient data), which should greatly improve quality and availability for data analysis of health interventions. But moving data collection down to the individual level doesn't remove the need for doing data analysis on aggregate data and indicators, and the need to integrate service indicators with indicators from HR and logistics systems. A solid integrated HIS architecture that is standards-based and enable integrated data analysis bringing together service data with logistics, HR, lab, surveys data etc. will still be just as important. The quality of the service data in the integrated data repository will improve as this data is coming from patient-level systems, but the EMRs will still be just one of many data sources that feeds into the integrated data analysis.

Annex 1 - key systems in place and under development

The following is a selection of the many systems that were presented during our meetings and in some follow-up discussion with PITB after the mission:

DHIS

<http://phispb.com/dhis>

This DHIS system was developed by central government in 2004 and is a Pakistan-developed HMIS software not to be confused by the global/UiO DHIS2 which shares the same name. This system is now fully managed by the Punjab health department.

Key summary of the presentation:

- Monthly summary forms from 4007 health facilities.
- A total of 25 paper forms
- Dashboards providing key analytical outputs per health program.
- Challenges and bottlenecks presented:
 - Fragmentation and many parallel systems by vertical programs
 - Data quality
 - Capacity to do data analysis
 - Lack of formal data sharing between vertical programs
- Identified way forward:
 - Develop an integrated real time data collection system
 - Strengthen capacity on data quality and data analysis
 - Develop better tools for data validation and alerts/notifications

HIMS (Hospital Information Management System)

EMR/HIMS was required for Hepatitis Prevention and Treatment Centre (HPTC) so highly customized solution was developed by PITB covering every aspect of Hospital Management System for example Patient Registration, Medicine Inventory, EMR/Clinical notes, Lab Diagnostics, Disease Surveillance etc. It is currently operating at Tertiary level but plan is underway to make it operational at Primary and Secondary level starting with 33 districts and tehsil headquarter hospitals. System is developed and maintained by PITB.

RMNCH

EMR pilot. Not much detail available.

LHW (Lady Health Worker)

LHW/LHS is a online database for tracking worker in the field with comprehensive Information about their geographic location and visits in the field. System is capable of generating analytical dashboards and LHW monthly reports.

vLMIS

Vaccine Logic Management System has been operational since 2010 at federal and provincial level. System was initially developed as purely for logistic management but later

on it evolved and now it does contain comprehensive demographic information and service indicators. In addition to that, system is fully capable of being used as VPD (Vaccine Preventable Diseases) surveillance. System provides flexibility for integration with external systems using its exposed APIs.

eVaccs

Open source system for real time with real time data about vaccination in punjab. It generates monthly coverage and attendance maps. Those maps can also be converted to Geographical Coverage reports. It include Android apps to digitise fieldwork and monitor attendance and performance. System is developed and maintained by PITB and is fully capable of getting integrated with external system using RESTFul APIs.

Dengue Activity Tracking System

Mobile application for real-time information on larvae prevention, detection and public hygiene activities. With these applications, field officials could take geotagged photographs of designated areas for dengue surveillance. The data stream submitted through the android based mobile application would be plotted on Google maps in real time as the mobile application captured latitude and longitude along with the photographs.

Disease Surveillance System (DSS)

The system has been operational since July 2013. Data for surveillance is being captured from across the Punjab and from all levels of healthcare facilities i.e. primary (RHCs and BHUs), secondary and tertiary (147 hospitals). Dedicated data entry operators, equipped with laptops and internet connectivity, have been tasked to report cases from public hospitals across the province. The BHUs and RHCs also report disease cases via SMS with the help of the disease wheel. Recently, these facilities were provided tablets to ensure that within a relatively short period, the disease wheel would be phased out. It currently focuses on 26 communicable diseases listed by the WHO but the system is being updated to monitor 81 diseases in total on the request of the Primary and Secondary Healthcare Department.

Hospital Watch

Mobile application 'HospitalWatch', is developed by PITB. It offers a framework for monitoring Emergencies, in 21 District Head Quarters (DHQs) and 101 Tehsil Headquarters (THQs) across Punjab. The HospitalWatch application aims at providing quality healthcare to the citizens of the province. Frequent surprise visits are also made to hospitals as a supportive measure to keep a close check on facilities and services rendered to the patients. The application was launched on April 15, 2015 across Punjab and registered 51,699 plus activities till December 03, 2015 with average of 223 per day.

Barbers registration system

A web based system for registration of operating barbers in a specific geographic regions. System ensures that no barbers is in operation without legal permission and in additional making sure they are complying with rules and regulations provided by regulatory authority. This system is developed and maintained by HISDU.