EVM Assessment Pakistan

30th March - 20th April 2014

Findings and Recommendations of the Assessment

Contents

1. Executive summary

With the rising cost of vaccines and the greater storage capacity now required at every level of the cold chain, countries must maintain lower stock levels, reduce wastage, accurately forecast vaccine requirements, and prevent equipment break-downs. This requires a consistently high standard of supply chain management, which can only be achieved if all of the links in the supply chain comply with current good storage and distribution practices. The EVM initiative provides the materials needed to monitor and assess vaccine supply chains and to help countries to improve their supply chain performance. The EVM assessment identifies the key strengths and weaknesses in nine different areas of vaccine management at each level of the vaccine supply chain and makes recommendations to address any gaps.

The nine areas (criteria) of vaccine management are:
E1: Vaccine & commodity arrival procedures
E2: Vaccine storage temperatures
E3: Cold & dry storage capacity
E4: Buildings, CC equipment & transport
E5: Maintenance
E6: Stock management
E7: Effective distribution
E8: Good vaccine management practices
E9: Information systems and supportive management functions

In consultation with the country the site selection was done remotely prior to the assessment using the last updated EVM site selection tool v 1.7 and based on 90% confident level +/-10% precision a total of 151 sites were selected as follow : 1 national store, 28 sub- national stores, 61 lowest distribution levels and 61 service point.

Methodology:

22 teams were used to conduct the assessment in 7 days, each team composed of 3 persons (two assessors and one supervisor) the supervisors were external consultant (9 from WHO / EMRO and 2 from UNICEF / ROSA), WHO and UNICEF country offices staff.
Assessment period agreed for one year (1st March 2013 – 28th February 2014) using Questionnaire, interview, reviewing the records and Observations for the agreed review period.

Before the assessment a three days of intensive training on the EVM questioner was done for the field assessors (68: nationals, WHO & UNICEF country office national staff), then one day pre- test field visit. Then field data collection for 7-8 days.

Data cleaning, entering and data analysis was done using EVM Assessment Tool Version 1.0.9.

The result:

The overall scores of assessment criteria for Pakistan at all levels of the supply chain demonstrates a need for improvement in most areas of the vaccine and supply management system as only one criteria (E1) exceeds the standard required score of 80%. Performance levels of three criteria (E3, E4 and E8) are about 70% however, vaccine distribution, stock management and information management are notably weak with performance in each category less than 50%. Details are shown in the figure below:

Figure 1: overall scores by Criteria

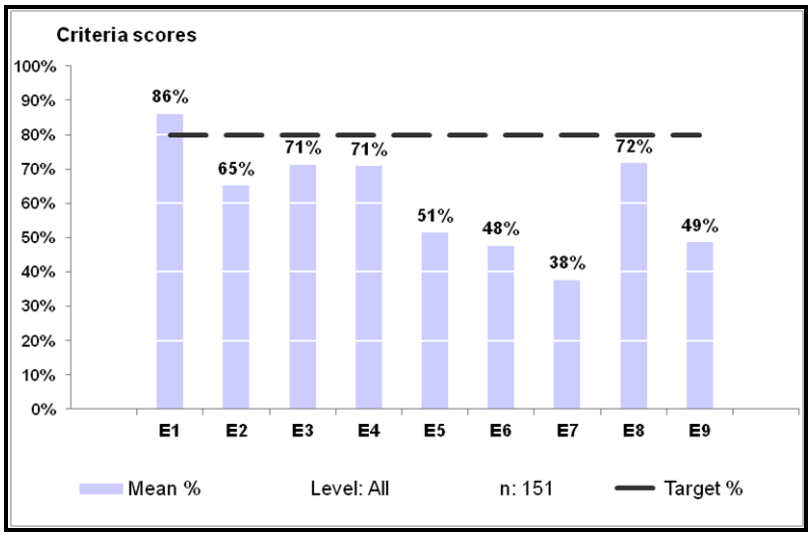
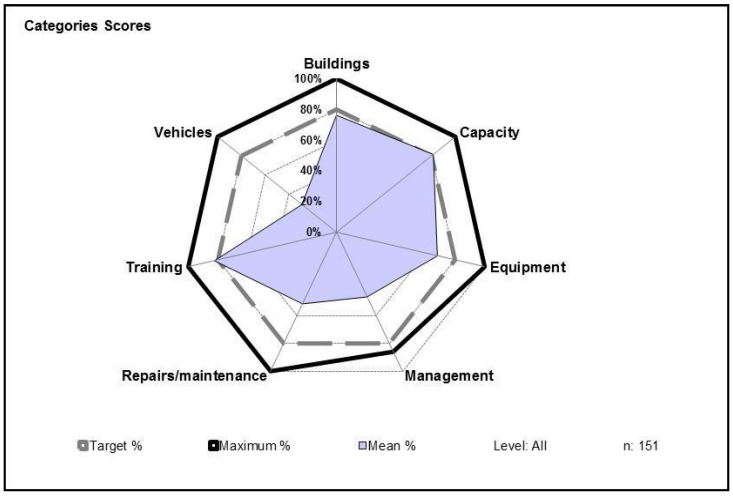


Figure 2: overall scores by Category

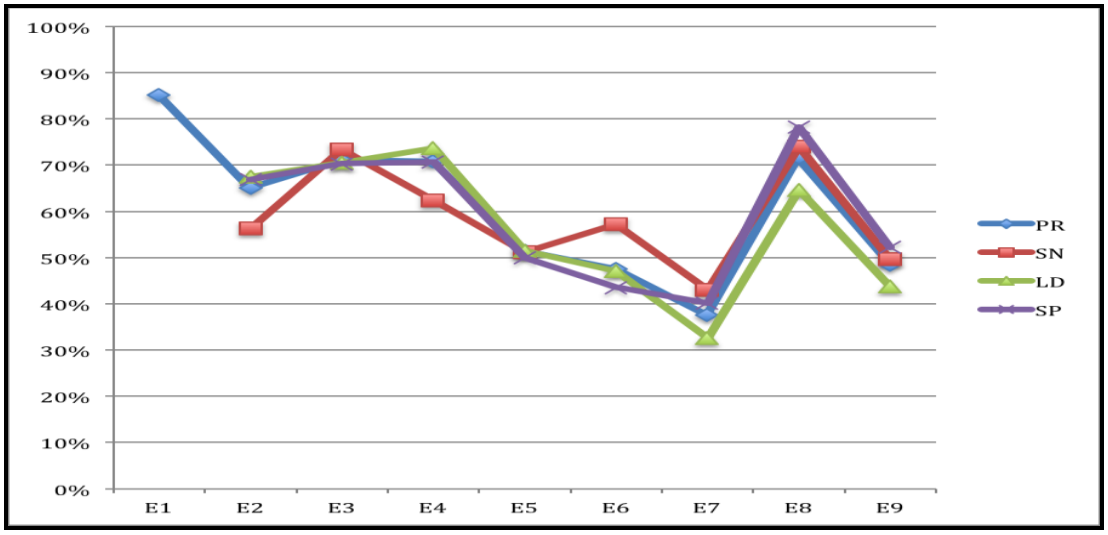


At **Central store** Five out of the nine eligible criteria exceeds the 80% (E1, E3, E4, E5 and E9) and two category reach the 80% required (capacity and training); details in the below report.

At the sub-national level, district and service delivery levels all criteria's were below the 80%;

At all levels of the supply chain the Criteria (E7) Distribution is particularly weak with performance ranging from 32.5 -43%. Maintenance, Stock Management and MIS and Support Functions Criteria (E5, E6 and E9) are also notably weak ranging from 43.5 to 57%.

At all levels of the supply chain the Criteria Vaccine Management practices (E8) is in the range of 72-78% except at LD level, Storage capacity (E3) is at or above 70% as all levels. Specific detail is indicated in Chart below.



EVM Indicator Score Summary by level

Indicator	Primary Store (PR)	Provincial Stores (SN1, SN2, SN3)	Districts (LD)	Health Facilities (SP)	National Average
Vaccine Arrival Process (E1)	86%				86%
Vaccine Storage Temperatures (E2)	67%	56%	67%	67%	65%
Storage Capacity (E3)	100%	74%	70%	70%	71%
Building, CC Equipment and Transport (E4)	80%	65%	74%	71%	71%

Maintenance and Repair (E5)	99%	53%	51%	50%	51%
Stock Management (E6)	75%	56%	47%	44%	48%
Distribution (E7)	32%	43%	33%	40%	38%
Vaccine Management Practices (E8)	64%	73%	65%	78%	72%
Information systems and supportive management functions (E9)	83%	50 %	44%	52%	49%

Finally country should be oriented towards Comprehensive approach for improvement of its vaccine management systems in which this approach will leads to continuous quality improvement and adoption of a system optimization cycle, asset of recommendations were generated to be taken in consideration during planning for the system improvement.

General recommendations:

❖**Temperature monitoring:**

Temperature monitoring system needs to be improved using the new technologies for temperature measuring, data communication technologies and procedures to minimize risk of damage to vaccines, specific measures can include:

- Conduct the temperature mapping study for all cold rooms with good documentation to make sure that Vaccine correctly stored inside the rooms.
- Shift to an event data logger system at the central, sub national and big district stores where cold / freezer rooms are used.
- Use continues electronic temperature data loggers (30 days data logger) in all refrigerators to make sure that vaccine are stored at the proper recommended temperature the whole day even during weekends and official holidays.
- Incorporate temperature alarm data parameters into vLMIS data management system and input data forms
- Use freeze monitoring devices with freeze sensitive vaccines during storage and transport.
- Encourage the senior supervisor to monthly review the temperature recording forms for any out of range of temperature and sign and document the action taken at all levels.

❖**Cold Chain Storage capacity, Building, Equipment and Transport**

Whilst storage capacity would not appear to be major issue (performance is rated at approx. 70%), storage quality of the cold and dry storage are of a major concern regarding introduction of new vaccines we recommend:

- expanded CCEM nationwide and use the results for expansion of cold chain capacity of some locations to accommodate new vaccine introduction as needed.
- Locations where the availability of electricity is not assured with at least 8 hrs/day every day should be provided solar AC hybrid power packs to provide auxiliary power to vaccine refrigerators during periods of load shedding. These power packs should include provision to charge laptop computers./printers
- Future procurement of vaccine refrigerators should be WHO/PQS compliant and should be rated for "hot climate" (43^0 C) performance. 2000 vaccine refrigerators recently supplied through USAID support are rated only for "Temperate Climate" (32^0 C).
- Inssure adequate dry store capacity at lower levels.
- Develop and distribute detailed satisfactory contingency plan per level.

❖**Maintenance**

Improve the maintenance system by :

- Develop a comprehensive multi-year or annual preventive maintenance plan for buildings, coldchain equipment and vehicle;
- Routine maintenance should be carried out regularly with well documentation at all levels.
- Data generated from CCEM should be incorporated in the module of vLMIS and ensure up to date equipment status is available and maintenance performed.

❖**Vaccine And Supply Stock Management**

Improve the vaccine stock management system by :

- Update, standardize /uniform and distribute stock log books to include all the required information about the vaccine and diluents (presentation, batch no., manufacture, expiry date, VVM....etc) and collect data to calculate wastage rate and use it in vaccine forecasting and programme monitoring.
- Alignment of the stock management and reporting forms with the vLMIS nationally to include all prerequisites input and reporting parameters with complete EPI needs inclusive of reports generated from the different WHO management tools.
- Enforce and strengthening the concept of vaccine stock level policy (maximum, minimum, re- order level) to minimize over stock or stock out events.
- Continue the manual system in parallel to the vLMIS until it is fully functioning nationwide.
- Encourage the staff to calculate their annual/ monthly needs of vaccines and safety injection equipment using the standard national method for each level.

❖**Distribution**

Strengthen the distribution system by:

- Develop comprehensive distribution plan for all stores
- Conduct temperature monitoring study for vaccine during transport to make sure that there is no risk of freezing for vaccines during transport using the WHO_IVB_05.01_REV.1.
- Establish a uniform system for ordering, issuing and receiving vaccines and supplies between levels using standardized voucher include all the important information about the vaccine, diluents and the monitoring indicators (VVM and freeze indicator).

❖**Supportive Functions And Information System**

- Conduct continuous training for all health workers on proper vaccine management practices and new practices related to temperature monitoring.
- Print and poste VVM and Shake Test Posters (WHO/PATH model) at all levels of the supply chain.
- Supportive supervision should take place at least once per quarter for higher level and monthly for lower level.

❖**Vaccine Management Improvement Plan**

As a first step in the process comprehensive approach for improvement a planning work shop involving (national, provincial and district concerned staff), all the partners and stakeholders should be arrange to develop the improvement plan process based on the new Joint WHO/UNICEF statement “Achieving Immunization Goals with Effective Vaccine Management” starting with detail review and analysis of their vaccine management system at all levels.

2. Acronyms

EMRO	Eastern Mediterranean Regional Office
BCG	Bacille Calmette-Guérin (tuberculosis vaccine)
CCEM	Cold Chain Equipment Manager
PCV	Pneumococcal vaccine
DTP-Hep.B-Hib	Diphtheria, Tetanus, Pertussis, Hep.B and Hib vaccine
EEFO	Earliest-Expiry-First-Out
EPI	Expanded Programme on Immunisation
EVM	Effective Vaccine Management
cMYP	Comprehensive Multi-Year Plan
VSSM	Vaccination Supplies Stock Management
FIC	Fully Immunized Child
GAVI	Global Alliance for Vaccines and Immunisation
ILR	Ice-lined refrigerator
MR	Measles and Rubella vaccine
MOPH	Ministry Of Public Health and Population
HPV	Human Papilloma vaccine
TT	Tetanus Toxoid
OPV	Oral Polio Vaccine
PCV	Pneumococcal Conjugate Vaccine
PPRA	Public Procurement Regulatory Agency
SOP	Standard Operating Procedure
SP/ HF	Service point (health facility)
UC	Union council
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VAR	Vaccine Arrival Report
MOU	Memorandum of Understanding
vLMIS	Vaccine Logistic Management Information System
VMA	Vaccine Management Assessment
VSSM	Vaccine Stock and Supply Management
VVM	Vaccine Vial Monitor
MDVP	Multi Dose Vial Policy
WHO	World Health Organization

3. Acknowledgements

We would like to thank the National EPI Manager and his team, store keepers and cold chain staff at the National, provincial and district level for their cooperation and patience. The team would like also to thank a.i. WR Pakistan Dr ABID, Nima Saeed and his office for the tremendous efforts in facilitating this huge administrative and logistic work. Our acknowledgment is extended to all the provincial staffs for their tremendous efforts, cooperation and patience. Great thanks for the National assessors for their cooperation and hard work. Finally, special great thanks for Dr. Quamrul Hasan Medical Officer WHO/ CO/ EPI, Dr Kamal Fahmy Medical Officer WHO/ CO/ EPI, Mr Wasiq Khan National Coordinator, WHO/ CO/ EPI, Mr Ghulam Taqi Cold Chain Officer Fed EPI and Dr Saadia Farrukh, Health Specialist (EPI UNICEF CO,) and Dr. Muhammad Tariq Iqbal Health Officer UNICEF /CO / EPI and UNICEF /CO / EPI, for their fabulous support and facilitation was behind the success of this mission.

Terms of reference

The objectives of the EVM assessment were:

1) To identify strengths and areas to improve in the vaccine supply chain management

2) To develop an improvement plan in order to achieve and maintain high quality management of EPI vaccines.

The assessment is based on the 9 EVM criteria.

1. Pre-shipment and arrival procedures ensure that every shipment from the vaccine manufacturer reaches the receiving store in satisfactory condition and with correct paperwork.
2. All vaccines and diluents were stored and distributed within WHO-recommended temperature ranges
3. Cold storage, dry storage and transport capacity is sufficient to accommodate all vaccines and supplies needed for the program.
4. Buildings, cold chain equipment and transport systems enable the vaccine and consumables supply chain to function effectively
5. Maintenance of buildings, cold chain equipment and vehicles is satisfactory
6. Stock management systems and procedures were effective
7. Distribution between each level in the supply chain is effective
8. Appropriate vaccine management policies were adopted and implemented
9. Information systems and supportive management functions were satisfactory.

Related documents

The following spreadsheets and documents were used in the preparation of this report:

EVM assessment tool and associated tools used:

- EVM assessment tool version v.1.0.9.0
- EVM site selection tool v.1.7
- EVM assistant tool V 2. 0

Photographs:

- Photos taken by the assessment teams during the field visits

Excel workbooks:

- EVM-v1.0.9-(primary).xls
- EVM-v1.0.9-(States).xls
- EVM-v1.0.9-(District).xls
- EVM-v1.0.9-(Service point).xls

Assessment team

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National Assessors: (Annex 1)

4. Introduction

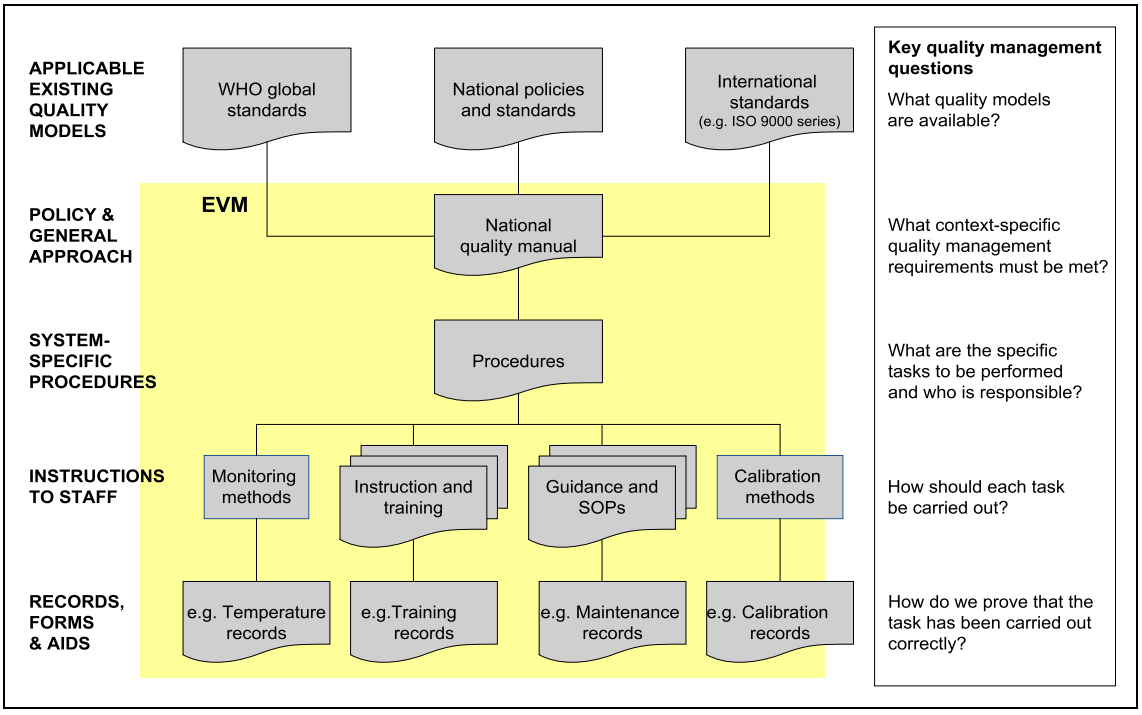
4.1 Introduction to EVM

The EVM process is first and foremost about embedding good storage and distribution practices. The package has been designed so that it can also be used both as an assessment tool for the systematic analysis of strengths and weaknesses across the supply chain but also as a supervisory aid to monitor and support the long-term progress of individual facilities.

Good storage and good distribution practices for temperature-controlled pharmaceuticals and other products were increasingly the focus of national and international legislative and regulatory control in both developed and developing countries. EVM follows the well-established principles of quality management used throughout the industrialized world – for example the ISO 9000 series of quality standards.

EVM is designed to help countries to develop strength-in-depth by building a culture of quality based on a structured approach to supply chain management, monitoring and record-keeping. Figure 3 illustrates the hierarchy of documentation needed to support this approach. EVM covers the yellow shaded area of the diagram.

Figure 3– Quality management documentation



The EVM tool is used to assess the quality and sufficiency of the seven component elements of an effective supply chain: buildings; storage and transport capacity; cold chain equipment; vehicles; repairs and maintenance; training and the management systems needed for the effective operation and control of the system.

An EVM assessment uses a structured questionnaire; this questionnaire is designed to allow evaluation of four distinctly different levels in the supply chain, as follows:

1. The primary (PR - generally national) level store where vaccine is received directly from the vaccine manufacturer or from an international supplier such as UNICEF Supply Division. Typically vaccine is stored in large cold rooms and freezer rooms.
2. The sub-national (SN) level where vaccine is received from the primary store, stored for an agreed period, and then distributed to lower levels stores or to health facilities. These stores may have a cold room and/or a number of vaccine refrigerators and freezers.
3. The lowest delivery level (LD) store where vaccine is received, either from the primary store or from a sub-national store. From this point it is distributed directly to service delivery points.
4. Service delivery points (SP) such as health centers and health posts, where vaccine is stored for a short time before delivery to the target population – usually in a single refrigerator, but also, on a very short-term bases, in vaccine cold boxes or vaccine carriers

The EVM tool is based on nine basic criteria, each of which is divided into a number of requirements and sub-requirements; together these characterize the fundamental qualities of a good vaccine supply chain. Compliance with each of these sub-requirements is tested using a series of tightly focused questions, which were numerically scored.

A single common list of requirements, sub-requirements and questions is used for the entire supply chain. The EVM tool automatically filters this common list to create questionnaires that were specifically directed at each of the four levels described above. These level-specific questionnaires can be further filtered to pick out only the most critical indicators. In this way an assessor can choose to carry out a full EVM assessment at a specific facility or a rapid review assessment.

Full assessments will typically be used by national staff to carry out long-term monitoring of individual facilities to achieve specific, targeted improvements. Review assessments were intended to be used to gain an overall assessment of a carefully selected sample of the supply chain. Generally speaking this type of assessment will be carried out by national or international teams, over a short period of time.

In addition to the overall filtering process, the tool dynamically adjusts the questions offered in response to the assessor's answers to certain country- or level-specific conditions. For example, if refrigerated trucks were used to distribute vaccines, a set of questions is offered covering this type of equipment.

In its current form, the tool summarizes assessment results in two ways:

- The score achieved against each of the criteria that is relevant to the level being assessed1.
- The score achieved against indicators classified in accordance with seven categories of question – those relating principally to: buildings; storage capacity; cold chain equipment; vehicles; repairs and maintenance; training, and management.

4.2 Site selection

The site selection was done remotely prior to the assessment using the last updated EVM site selection tool v 1.7. Out of 324 accessible district and sub district in the country, 61 lowest distribution (LD) points were selected based on 90% confident level ±10% precision. Accordingly 28 sub- national levels was selected, subsequently in each LD one health facility was randomly selected using the same tool. A total of 151 sites including the central store were assessed:

One national store, 28 sub- national stores (SN), 61 lowest distribution level (LD) in which ten LDs were replaced due to security issues by another LD with similar population and geographical nature, 61 service point (SP). The complete list of selected sites is presented in Annex 2.

4.3 Assessment types used

All supply chain levels were assessed with the Full version of the EVM assessment tool.

4.4 Tool version used

The assessment used the EVM Tool Version 1.0.9.0 in the English Language.

5. Country background

Pakistan covers an area of 796,095 km2 and is the 36th largest nation by total area. Ranging from the coastal areas of the south to the glaciated mountains of the north, Pakistan's landscapes vary from plains to deserts, forests, hills and plateaus. It is divided into three major geographic areas:

- The northern highlands contain the Karakoram, Hindu Kush and Pamir mountain ranges with five of the fourteen mountain peaks over 8,000 meters
- The Indus River plain covers the territory from Kashmir region to the Arabian Sea where the Indus River (1,609 km) and its tributaries flow with alluvial plains in Punjab and Sindh
- The Baluchistan Plateau lies in the west bordering with Iran.

[1] For example, the first criterion – vaccine arrivals – is only relevant at the primary level. Other criteria are also filtered out at lower levels. At the service delivery level, only six of the nine criteria apply.

Approximately 26% of land is arable (207,144 km2) with 200,000 km2 of land being irrigated.

The climate varies from tropical to temperate, with arid conditions in the coastal south. There is a monsoon season with frequent flooding due to heavy rainfall and a dry season with significantly less rainfall or none at all. Rainfall varies greatly from year to year, and patterns of alternate flooding and drought are common.

Pakistan overlaps the Indian and Eurasian tectonic plates and is prone to violent earthquakes.

Islamic Republic of Pakistan (Jamhuria Pakistan is federation of four provinces and four administrative territories as shown below (in alphabetic order):

Full name	**Short name**	**Type**
Azad Jammu & Kashmir	AJK	Administrative territory
Balochistan	BAL	Province
Federally Administered Tribal Areas	FATA	Administrative territory
Gilgit Baltistan	GB	Administrative territory
Islamabad Capital Territory	ICT	Administrative territory
Khyber Pakhtunkhwa	KP	Province
Sindh	SIN	Province
Punjab	PUN	Province

Description of provinces by administrative structure and target population (2014)

Provinces	**Districts**	**UC**	**Total Population**	**Birth cohort**	**Surviving infants**
PUN	36	3,520	95,245,517	3,333,593	3,086,907
SIN	23	1,166	40,640,474	1,422,417	1,317,158

KP	25	1,040	27,375,547	958,144	905,446
BAL	30	607	4,359,068	152,567	141,277
FATA	14	416	4,492,211	157,227	145,593
AJK	10	203	4,359,068	152,567	141,277
GB	7	110	1,345,877	47,106	43,855
ICT	2	28	1,436,445	50,275	46,556
Total	**147**	**7,090**	**179,254,208**	**6,273,897**	**5,828,069**

Source: cMYP 2014-2018

The national language of the country is Urdu and the official language is English. The main regional languages are Sindhi, Punjabi, Pashto, Seraiki and Balochi.

5.1 Organization of immunization services

Immunization system in Pakistan represents a complex set of federal and provincial programs due to the recent devolution of healthcare functions. Immunization services are delivered by 6,979 EPI Centers and average population served by an EPI Center amounts to 25,300.

Immunization services are delivered via fixed sites and outreach/mobile approaches: contribution of fixed delivery sites to the immunization service delivery varied between 20%-25% in all provinces and areas. EPI Centers provides immunization services 6 hours per day in average in all provinces.

The federal EPI headed by the national program manager under the administrative control of the federal Ministry of National Health Services and Regulation. -Federal EPI is responsible for policy making and standard setting, planning, co-ordination, information collection and sharing, collaboration with other partners, quality assurance, monitoring and evaluation; financing including identification of long-term funding sources, procurement and distribution of vaccines, injection devices and cold chain equipment to the provinces.

Provincial EPI programs headed by provincial EPI manager are under the administrative control of provincial health department and are responsible for operations and implementation of the program including service delivery, surveillance etc.

5.2 Immunization schedule 2014

Vaccine	immunization schedule (2014)					
	Birth	6 w	10 w	14 w	9 m	15 m
BCG	✓					
OPV	✓	✓	✓	✓		
DTP-HepB-Hib		✓	✓	✓		
PCV10		✓	✓	✓		
Measles					✓	✓

5.3 Planned vaccine introductions

According to the last updated cMYP 2014-2018, the country plan to introduce IPV vaccine in 2015 and Rota Vaccine in 2016 through GAVI window of support for new vaccines.

5.4 Vaccine volume data

It is expected that the vaccines currently used in the national immunization program will remain same in formulation and presentation. The volume data of the vaccines for current and future use were presented in below table:

Vaccine type	**Presentation** (doses/vial)	**Packed volume (cm^3/dose)**
		Vaccine
BCG	20	1.2
OPV	20	1.5
DTP-HepB-Hib	1	12.9
Measles	10	3
PCV-10	2	12
TT	20	2.5
IPV	10	2.5
Rota	1	17

Note: *Packed volumes of vaccines were based on maximum figures from WHO prequalified vaccines.*

Figure 4 & 5 illustrates the trends of net volume required per Fully Immunized Child (FIC) for the current and new vaccines as per the cMYP 2014-2018

Figure 4

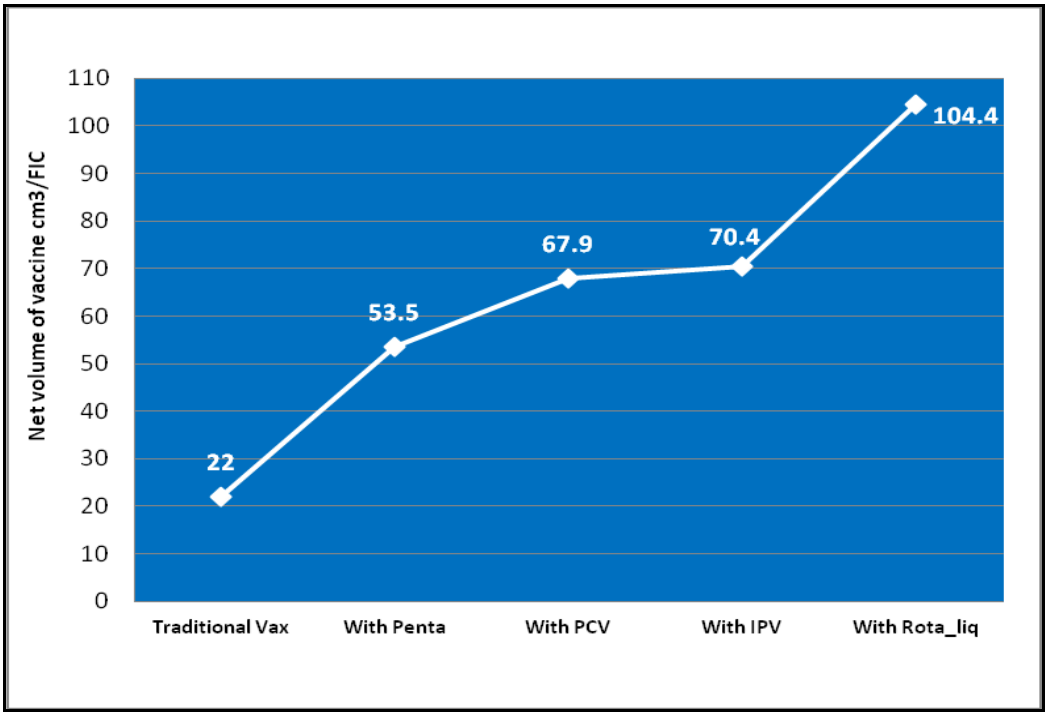
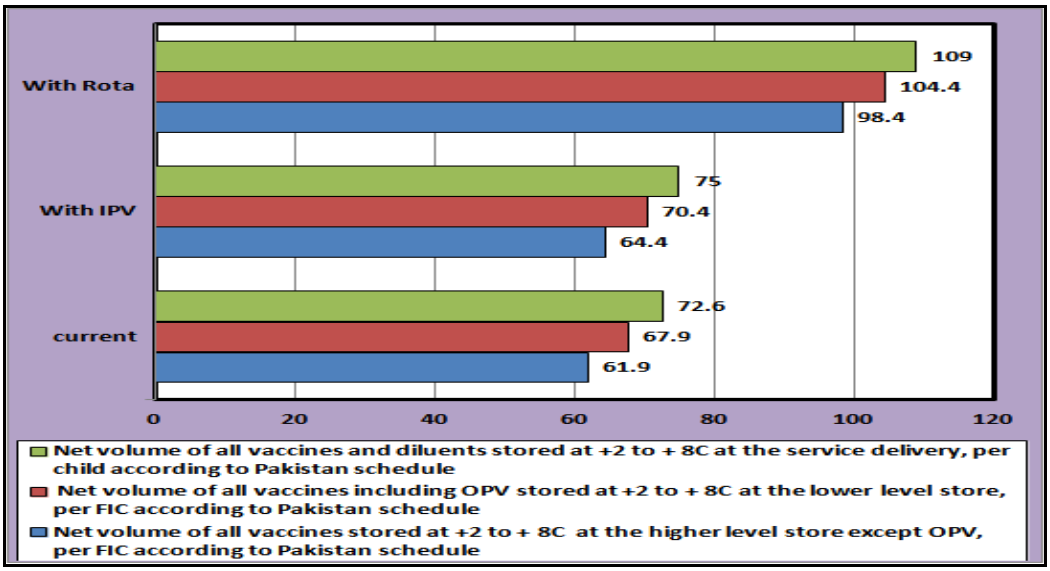


Figure 5



The two figures above represents an illustration of the trend of the net cold storage volume required per FIC at different level of the vaccine supply chain and the trend of the net storage volume (cm^3) required per child according to the Pakistan current and future plan for IPV and Rota introduction.

6. Supply chain overview

75 out of 147 districts (51%) had sufficient number of supervisory or EPI field activity transport in working conditions in 2012, while vaccinators use transportation means for outreach in 5,060

(72%) of UC. The number of UC with adequate number of appropriate and functional cold chain equipment amounted to 5,684 (or 81% of all UCs), out of which ILR was available in 4,892 UCs; Most of provinces experienced 1 or 2 month stock out of Polio and BCG in 2012 (cMYP 2014-2018).

The traditional vaccines procured by the government through local bidding process under the PPRA of Government of Pakistan. There is a MOU between the Ministry of Health and UNICEF for procurement of the country co-financing share of new vaccines and their consumables that are supported by GAVI but the clearance and transportation is the responsibility of the Ministry.

6.1 Logistics structure

The vaccine supply chain in Pakistan is composed of four provinces and four federally administered areas. The federal EPI cell using the push system in vaccine distribution as they are responsible for calculation of the annual needs and summarize the quantities per province in a table. The allocated quantities then distributed to the provinces/areas on quarterly basis for further distribution to the lower stores and health facilities. A notification system using e-mails and/or telephone call / SMS is used for distribution and collections. From the provincial/area stores, the vaccines and logistics are distributed to districts and service points by road, on a monthly basis

There is no distribution plan according to WHO standard to organize the distribution process at all levels, instead each level agrees verbally with the higher one to collect the vaccines and supplies.

6.2 Fixed infrastructure

At the national store, 13 walk-in cold rooms, 2 freezer rooms and 12 freezers used to store vaccines. Details of the characteristics of the refrigeration and freezers were in below table

Central Vaccine Store Cold Chain Capacity for cold rooms

Cold Room Number	Manufacturer	Gross Volume (+2+8) m3	Net Volume (+2+8) m3	Grossing Factor	Estimated Year of Installation	Number of Refrigeration Units	Number of Functioning Refrigeration Units
1	Huurre	16.8	3.7	4.54	1984	2	2
2	Huurre	34.6	7.6	4.55	1984	2	2
3	Huurre	34.6	7.6	4.55	1984	2	2
4*	Huurre	19.8	4.5	4.40	1991	2	0
5	ColdCraft	29.5	7	4.21	2001	2	2
6	ColdCraft	29.5	7	4.21	2001	2	1
7	Huurre	51	10	5.10	2002	2	2
8	Huurre	51	10	5.10	2002	2	2
9	Huurre	50	10.7	4.67	1991	2	2
10	Built In	34.7	8.7	3.99	1981	2	2
11	Built In	41	12.9	3.18	1982	2	2

13	Built In	34.7	8.7	3.99	1982	2	2
15	Huurre	25	6.4	3.91	2009	2	2
17	Huurre	25	6.4	3.91	2009	2	2
19	Huurre	25	6.4	3.91	2009	2	2
21	Huurre	25	6.4	3.91	2009	2	2
22	Huurre	54.6	10.2	5.35	2010	4	4
23	Huurre	54.6	10.2	5.35	2010	4	4
24	Huurre	54.6	10.2	5.35	2010	4	3
25	Huurre	54.6	10.2	5.35	2010	4	4
26	Huurre	54.6	10.2	5.35	2010	4	4
Total		**800.2**	**175**				

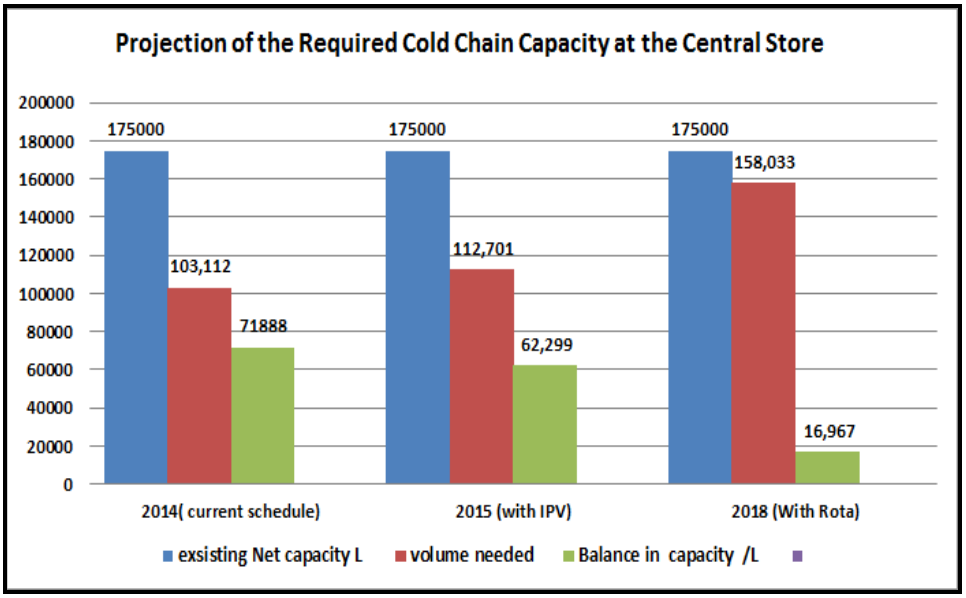
* Will be converted from Freezer Room to cold room

Central Vaccine Store Cold Chain Capacity for freezer rooms

Freezer Room Number	Manufacturer	Gross Volume (-15 -25) m3	Net Volume (-15-25) m3	Grossing Factor	Estimated Year of Installation	Number of Refrigeration Units	Number of Functioning Refrigeration Units
14	Huurre	16.5	4.2	3.93	2009	2	2
16	Huurre	16.5	4.2	3.93	2009	2	2
18	Huurre	16.5	4.2	3.93	2009	2	2
20	Huurre	16.5	4.2	3.93	2009	2	2
27	Huurre	54.6	10.2	5.35	2010	4	4
Total		**120.6**	**27**				

Note: not all are CFC-free

At the central store the current gross cold storage capacity is 800,000 Litter with a net storage of 175,000 Litter which is considered to be quite adequate to accommodate the current vaccines in the immunization schedule according to the current frequency of shipments; also it is adequate to accommodate the future planed IPV introduction in 2015 using the 10 dose vial presentation with quarter shipments as the required volume per supply period for all vaccines to be stored at the cold rooms will be about 11,701 Litter with occupancy rate of about 64%. For the Rota introduction in 2018 the existing capacity at the national store will be also enough to accommodate the Rota vaccine in quarter base shipments as the total required volume per supply period will be about 158,033 Litter with 90 %occupancy rate as shown in the graph below.



At each provincial, district and service level: Walk in Cold rooms are used at all Provinces, and in big district stores. Smaller district and sub-district stores use ILR, Freezer of varying capacity and brand. Health facilities use ILRs and refrigerators of different types, many of which are not in compliance with WHO specifications (CFC free). Some stores have aged cold rooms and in some HF although the refrigerators were WHO pre-qualified but they are aged and not functioning well. Domestic refrigerators and freezers are also being used in some health facilities.

The current cold chain capacity at the provincial level are adequate to accommodate the current vaccine in the schedule but, they are varies in their readiness to introduce new vaccines as most of them had adequate capacity to accommodate the future plans for new vaccine introduction according to cMYP 2014-2018, except Punjab province which had significant shortage in capacity in regard to of IPV and Rota introduction, immediate actions needed to increase their capacity to accommodate the IPV next year and considering Rota in 2018 (see table below for details).

Projection of required cold chain capacity at the Provincial stores 2014-2018:

Punjab			
Capacity/L	**2014(current schedule)**	**2015 (with IPV)**	**2018 (With Rota)**
Existing Net capacity/L	59,000	59,000	59,000
Volume needed/ supply period	59,000	60,456	85,024
Balance/ Gap in capacity/L	**1,973**	**(1,456)**	**(26,024)**
Occupancy rate %	97	102	144
Sindh			
Existing Net capacity/L	70,620	70,620	70,620

Volume needed/ supply period	15,175	18,505	39,965
Balance/ Gap in capacity/L	91,825	52,115	30,655
Occupancy rate %	14	26	57
KP			
Existing Net capacity/L	207,900	207,900	207,900
Volume needed/ supply period	13,507	15,733	24,870
Balance/ Gap in capacity/L	**194,393**	**192,167**	**183,030**
Occupancy rate %	6	8	12
Baluchistan			
Existing Net capacity/L	25,465	25,465	25,465
Volume needed/ supply period	1,215	1,587	2,459
Balance/ Gap in capacity/L	**37,368**	**23,878**	**23,006**
Occupancy rate %	5	6	10
AJK			
Existing Net capacity/L	42,240	42,240	42,240
Volume needed/ supply period	2,240	2,482	3,877
Balance/ Gap in capacity/L	**40,000**	**39,758**	**38,363**
Occupancy rate %	5	6	9
CDA			
Existing Net capacity/L	522	522	522
Volume needed/ supply period	197	211	354
Balance/ Gap in capacity/L	**325**	**311**	**168**
Occupancy rate %	38	40	68

6.3 Transport infrastructure (Central and provincial level)

Federal EPI cell outsource the transportation services to deliver all vaccines and commodities from airport and sea port after custom clearance to the federal warehouse. Supply of vaccine and

commodities to two provinces (Sindh and Baluchistan) is done by air and that's also outsourced under a comprehensive MOU with a transport company. Other provinces and federal administrative areas (except Gilgit Baltistan) collect their vaccines and consumables from the federal warehouse by their own vehicles. Supply is sent by road to Gilgit- Baltistan. All provinces and some big districts have refrigerated van/truck. These are mostly used for vaccine transportation from provincial stores to divisional/district stores. Passive containers are used for vaccine transportation from district store to lower stores and health facilities

6.4 Recording and reporting systems

As there is no unified/ standard recording and reporting system partners are supporting the country to establish a comprehensive system of vaccine and immunization supply stock management.

With WHO/ EMRO assistance, the federal EPI has established a computerized vaccine and logistics management system in the federal store using VSSM software since 2009.

With the support of UNICEF regional office a cold chain inventory system was developed by utilizing Cold Chain Equipment Manager (CCEM). Data for cold chain inventory was gathered from 2076 immunization centers and vaccines store using CCEM 2.0 Pakistan version). This cold chain database will be incorporated into Vaccine Logistic Management Information System (vLMIS) which will give a real time picture on the current status of cold chain equipment in 54 polio high-risk districts of Pakistan.

Vaccine Logistics Management Information System

Deliver Project financed by USAID and implemented by John Snow, Inc, introduced an integrated logistics management information system for health commodities covering areas of family planning, tuberculosis and immunization.

Vaccine logistics management information system (vLMIS) is expected to improve substantially vaccine supply and stock management via:

Enabling EPI teams at all levels to assess real time data to ensure that vaccines and cold chain equipment are always available in sufficient quantities at the service delivery points to meet and-user needs;

Bringing down wastage of vaccines and cold chain equipment

Enabling policy/decision makers to take evidence based decisions with regard to forecasting, quantification, financing and procurement planning.

vLMIS is expected to turn EPI/PEI logistics from Push to Pull system with a visibility across EPI and Polio supply chain. Existing CCEM, VSSM and SDMS functions will be put together on one Government's platform. vLMIS software was developed and tested in November 2013 (Release 1). More functional versions of the software (with 5 functional/user modules and SMS reporting capabilities) will be released in late 2014. The project identified 54 vLMIS priority districts in consultation with the government and partners. TOT was finished for nominated 50 officials in 2013.

In addition, province specific rollout training plans have been developed for training of >900 federal, provincial, district and UC levels officials (5 Provinces/FATA + 54 districts + 423 Lead UCs) on WMS and Vaccine Data Entry in the 1st half of 2014. Orientation of 555 federal, provincial, district and UC levels managers on vLMIS in 2014 is part of the plan. There is an intention to extend vLMIS coverage to remaining 97 districts (in 2014-2015).

7. Previous assessments

EVM was conducted in Pakistan in 2009 as pilot testing for the EVM tool and it was tested on the central store only with set of recommendation.

7.1 Key assessment findings as below table:

Criteria	Score
E1: *Pre-shipment and arrival procedures. Applies to primary store level only*	63%
E2: *Storage within recommended temperature ranges.*	36%
E3: *Cold storage, dry storage and transport capacity. Including NUVI capacity*	67%
E4: *Buildings, cold chain equipment and transport systems*	63%
E5: *Maintenance*	68%
E6: *Stock management*	47%
E7: *Distribution*	60%
E8: *Appropriate vaccine management policies*	73%
E9: *Information systems & supportive management functions*	61%

There is significant improvement in performance between the 2009 EVM assessment and the current assessment for the central store performance.

Vaccine arrival procedures, cold storage capacity, building equipment and transport, maintenance and Information systems have been significantly improved at the Central store, however still other 4 more criteria (E2, E6, E7 and E8) are required to be worked on for improvement.

7.2 Key recommendations for 2009 EVM assessment

(See Annex 3)

8. The current EVM Overall findings

Below figures shows the overall score for the country by criteria and category which demonstrates that immunization supply chains facing many challenges in storage, distribution, handling,

management and stock control of vaccines and supplies at all levels which resulted in frequent stock-outs, inadequate cold chain capacity, and potential administration of compromised vaccines that increasingly threaten coverage, equity, and cost-effectiveness of national immunization programmes .

Figure 6: score by criteria

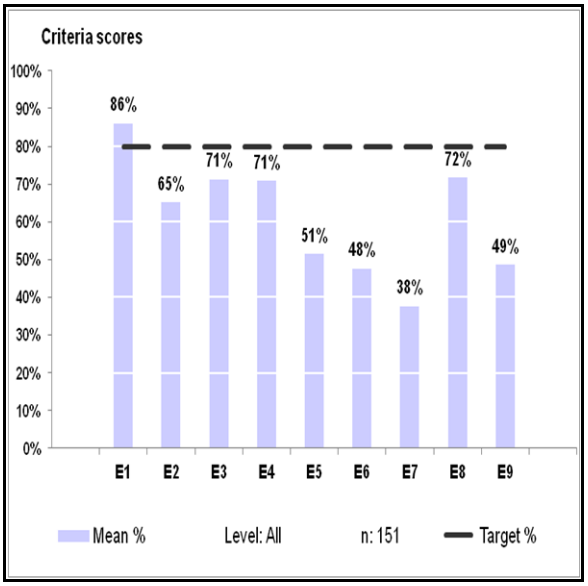
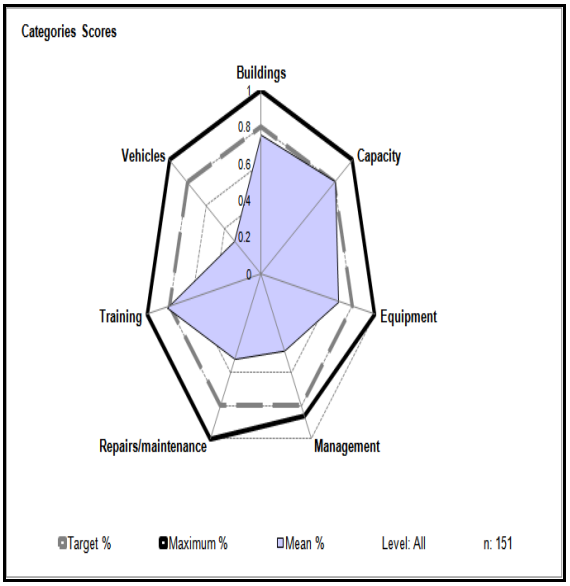


Figure 7: score by category



At all levels of the supply chain vaccine and supplies distribution is particularly weak with performance ranging from 32.5 -43%. Maintenance and repair, Stock Management and Management information system and Support Functions were also notably weak ranging from 43.5 to 57%. Vaccine Management practices was in the range of 72-78% except at LD level, Storage capacity (E3) is at or above 70% at all levels.

Pakistan should increase efforts and oriented towards comprehensive approach for improvement of its immunization supply chain systems, recognising that efficiently designed and optimized immunization supply chains are fundamental to ensuring uninterrupted vaccine availability and critical for safeguarding vaccine potency .

General recommendations that applied for all levels:

Below recommendation should be applied for all levels of the supply chain across the country:

❖**Temperature monitoring:**

Temperature monitoring system needs to be improved using the new technologies for temperature measuring, data communication technologies and procedures to minimize risk of damage to vaccines, specific measures can include:

- Conduct the temperature mapping study for all cold rooms with good documentation to make sure that Vaccine correctly stored inside the rooms.

- Shift to an event data logger system at the central, sub national and big district stores where cold / freezer rooms are used.
- Use continues electronic temperature data loggers (30 days data logger) in all refrigerators to make sure that vaccine are stored at the proper recommended temperature the whole day even during weekends and official holidays.
- Incorporate temperature alarm data parameters into vLMIS data management system and input data forms
- Use freeze monitoring devices with freeze sensitive vaccines during storage and transport.
- Encourage the senior supervisor to monthly review the temperature recording forms for any out of range of temperature and sign and document the action taken at all levels.

❖**Cold Chain Storage capacity, Building, Equipment and Transport**

Whilst storage capacity would not appear to be major issue (performance is rated at approx. 70%), storage quality of the cold and dry storage are of a major concern regarding introduction of new vaccines we recommend:

- expanded CCEM nationwide and use the results for expansion of cold chain capacity of some locations to accommodate new vaccine introduction as needed.
- Locations where the availability of electricity is not assured with at least 8 hrs/day every day should be provided solar AC hybrid power packs to provide auxiliary power to vaccine refrigerators during periods of load shedding. These power packs should include provision to charge laptop computers./printers
- Future procurement of vaccine refrigerators should be WHO/PQS compliant and should be rated for "hot climate" (43^0 C) performance. 2000 vaccine refrigerators recently supplied through USAID support are rated only for "Temperate Climate" (32^0 C).
- Inssure adequate dry store capacity at lower levels.
- Develop and distribute detailed satisfactory contingency plan per level.

❖**Maintenance**

Improve the maintenance system by :

- Develop a comprehensive multi-year or annual preventive maintenance plan for buildings, coldchain equipment and vehicle;
- Routine maintenance should be carried out regularly with well documentation at all levels.
- Data generated from CCEM should be incorporated in the module of vLMIS and ensure up to date equipment status is available and maintenance performed.

❖**Vaccine and Supply Stock Management**

Improve the vaccine stock management system by :

- Update, standardize /uniform and distribute stock log books to include all the required information about the vaccine and diluents (presentation, batch no., manufacture, expiry date, VVM....etc) and collect data to calculate wastage rate and use it in vaccine forecasting and programme monitoring.
- Alignment of the stock management and reporting forms with the vLMIS nationally to include all prerequisites input and reporting parameters with complete EPI needs inclusive of reports generated from the different WHO management tools.
- Enforce and strengthening the concept of vaccine stock level policy (maximum, minimum, re- order level) to minimize over stock or stock out events.
- Continue the manual system in parallel to the vLMIS until it is fully functioning nationwide.
- Encourage the staff to calculate their annual/ monthly needs of vaccines and safety injection equipment using the standard national method for each level.

❖**Distribution**

Strengthen the distribution system by:

- Develop comprehensive distribution plan for all stores
- Conduct temperature monitoring study for vaccine during transport to make sure that there is no risk of freezing for vaccines during transport using the WHO_IVB_05.01_REV.1.
- Establish a uniform system for ordering, issuing and receiving vaccines and supplies between levels using standardized voucher include all the important information about the vaccine, diluents and the monitoring indicators (VVM and freeze indicator).

❖**Supportive Functions And Information System**

- Conduct continuous training for all health workers on proper vaccine management practices and new practices related to temperature monitoring.
- Print and poste VVM and Shake Test Posters (WHO/PATH model) at all levels of the supply chain.
- Supportive supervision should take place at least once per quarter for higher level and monthly for lower level.

❖**Vaccine Management Improvement Plan**

As a first step in the process comprehensive approach for improvement a planning work shop involving (national, provincial and district concerned staff), all the partners and stakeholders should be arrange to develop the improvement plan process based on the new Joint WHO/UNICEF statement “Achieving Immunization Goals with Effective Vaccine Management” starting with detail review and analysis of their vaccine management system at all levels.

The following figures illustrate the findings by the supply chain level:

8.1 National level (Central level)

Figure 8 & 9 illustrate the score for the national level per criteria and category; 5 out of the 9 criteria's were above standard required 80% (E1, E3, E4, E5 and E9). One criterion (E7 distribution) had the lowest score 32% and only three categories reach the satisfied 80% (Building, capacity and maintenance).

Figure 8: score by criteria

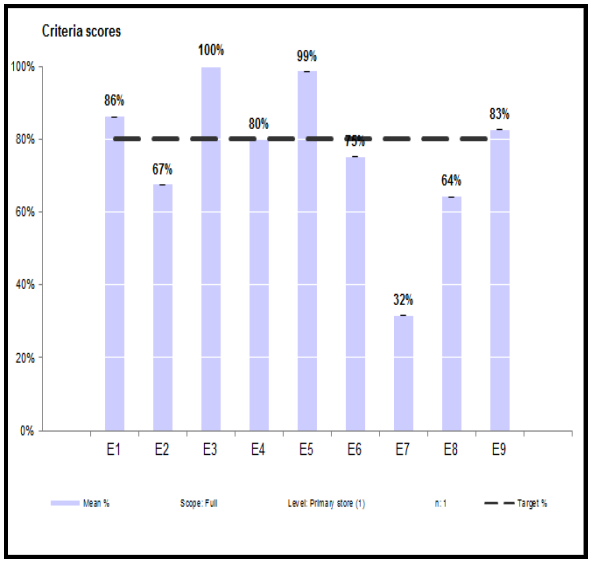
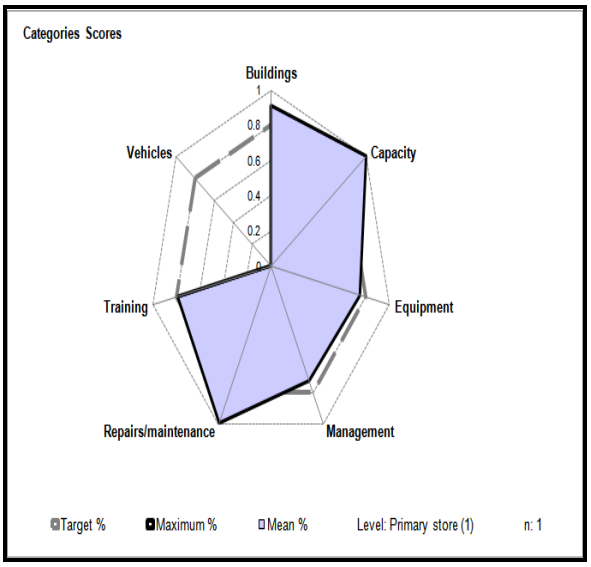


Figure 9: score by category



8.2 Sub national level (States Level)

The score for the sub national level per criteria and category as shown in figure 10 & 11 below demonstrate that no criteria had reached the 80% and distribution (E7) had the lowest score of 43% and only two category reach the satisfied 80% (capacity and training).

Figure 10: score by criteria

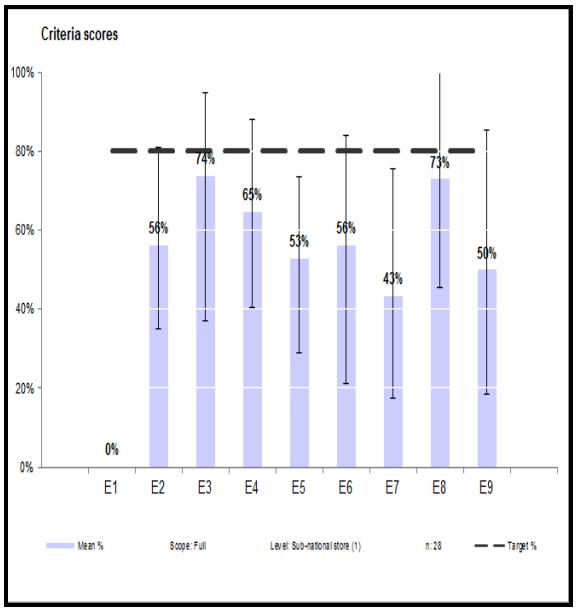
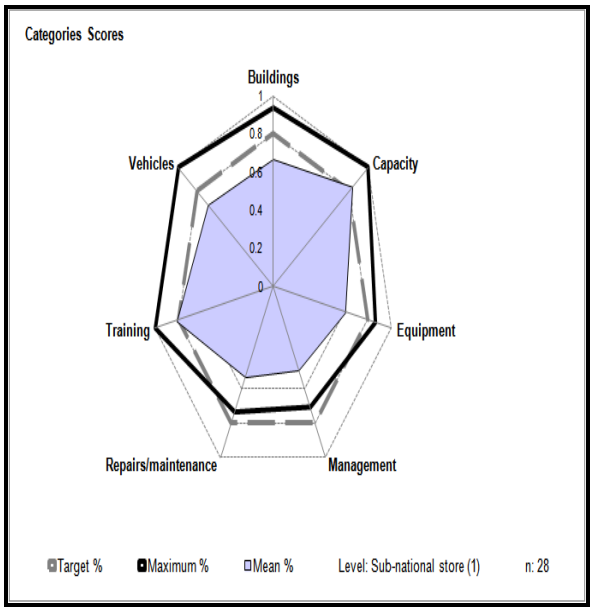


figure 11: score by category



8.3 Lowest Distribution level (District Level):

The score for the lowest distribution level as shown in figure 12 & 13 per criteria and category demonstrate that no criteria had reach the 80% and 4 criteria were below 50 %; only two categories reach the 80% (building and training).

Figure 12: score by criteria

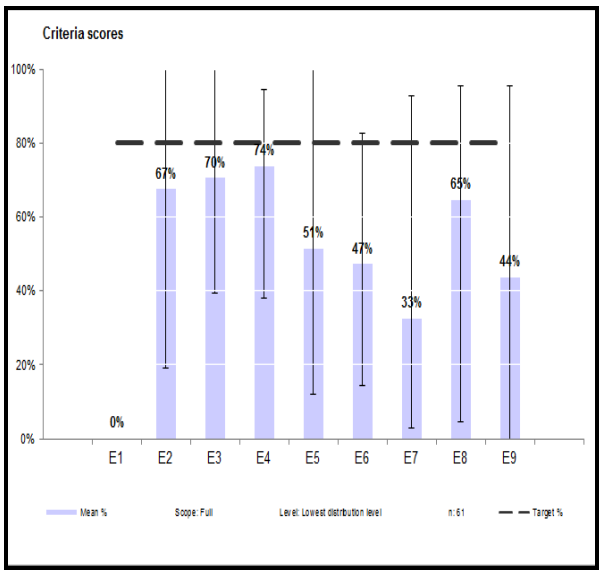
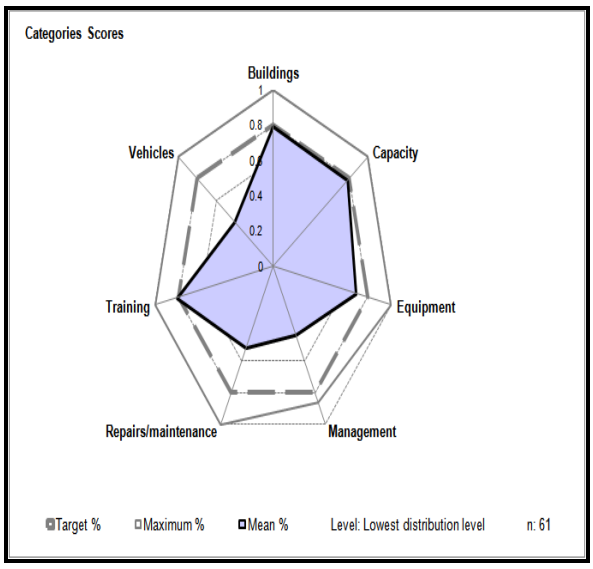


figure 13: score by category



8.4 Service delivery points (health facilities):

The score for the service point level as shown in figure 14 & 15 demonstrate that no criteria had reach the 80% and only two categories that reach the satisfied 80% (capacity and training).

Figure 14: score by criteria

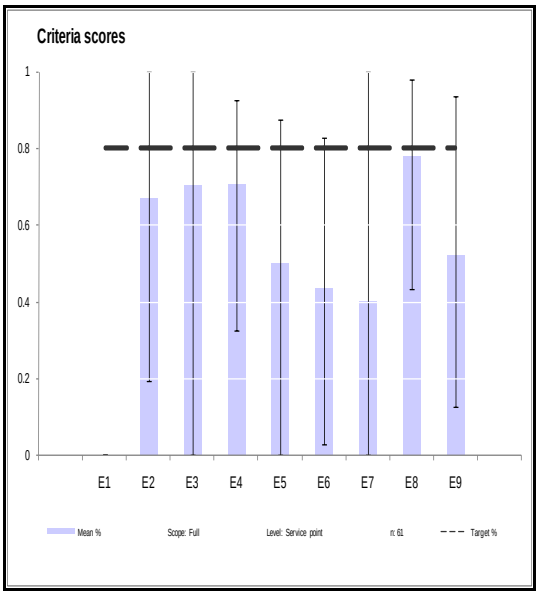
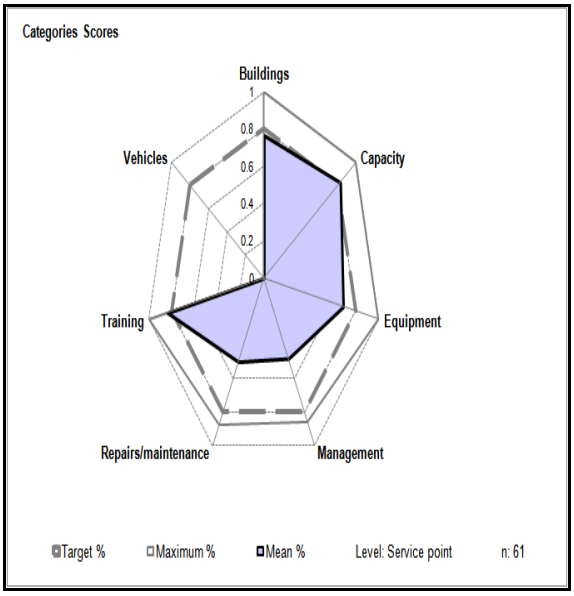


figure 15: score by category



9. The detailed Assessment Findings and Recommendations

This section presents the assessment findings, the analysis of those findings, and the consequent recommendations, on a level-by-level and criterion-by-criterion basis.

9.1 Primary level

E 1: Vaccine arrival procedures

The performance of the arrival criteria was 86%. There is MOU between Pakistan and UNICEF for procurement of vaccines and consumables which include all the requirements, and for the custom clearance to the central store. There is a written contingency plan to be used in case of major breakdown. Upon the arrival of any shipment, they use the UNICEF VAR with a well-documented arrival reports, but there were no documents which accompanies every batch of vaccine i.e. (Invoice, Packing List, Airway Bill, Release Certificate and Shipping Notification).

E 2: Temperature monitoring

The performance of the temperature criteria was 67%. All cold rooms and freezer rooms have manual temperature recording system twice a day / seven days a week. Although the temperature recording forms does not include a space for alarm events but it is reviewed monthly and there was documentary evidence that remedial action has been taken in response to deviations in temperature using another log book. There was good knowledge of all staff regarding the required storage temperature for all vaccines used in the national program. There was no electronic continuous temperature recording or temperature mapping for cold rooms and freezer rooms. Systematic temperature monitoring study has not been carried out within the past five years although this was one of the strongest recommendations from the past 2009 EVM, but they claim that one of the vaccine manufacturer offer them to install a computerized electronic temperature alarming system for all the cold and freezer rooms at the central store.

E 3: Storage and transport capacity

The performance of the storage criteria was 100%. The total gross capacity of the +2°C to + 8°C walking rooms are 800 m3 with a net capacity of 175 m3, and the gross capacity for the -20°C walking rooms are 120.6 m3 with net of 27 m3 which is adequate to meet the maximum vaccine volume for the current and for future plans of new vaccines introduction. Dry store volume is also suitable to accommodate annual consumables needs. Appropriate SOP /(contingency plan) for the major source of risks including power & equipment failure had been prepared, emergency contact phones are posted on the wall and staff knows what to do and whom to contact in such cases.

E 4: Buildings, equipment and transport

The performance of the Buildings, equipment and transport criteria was 80%. The building was well maintained and according to the standard requirements for the vaccine storage with a large space for

packing and conditioning of ice-packs. The buildings were not suitable for the climate where there is no conditioning system in the packing area to keep it as recommended by WHO to be not more than 25°C throughout the year. The dry store is not well organized; there is no enough shelves or pallet standing or pallet racking.

The vehicles can access the store for delivery and collection of vaccines easily and the storekeepers' offices are located in the same site.

All cold / freezer rooms comply with WHO specifications and are fitted with dual refrigeration units, and there was a duty sharing system for the dual units manually. One standby generator exist with large capacity operates the whole building and equipment which is manually operated. All cold and freezer rooms have sufficient shelves but some freeze sensitive vaccines were placed directly infront of the evaporator, which can fall below 0 °C until it mixes well with the room air, therefore exposing the vaccine to the risk of freezing.

E 5: Maintenance

The performance of the maintenance criteria was 99%. They had a preventive maintenance plan for building, equipment and transport and there was evidence that plan followed. The maintenance plan includes the emergency maintenance which is done regularly by a maintenance team of four technicians working in the store.

E 6: Stock management

The performance of the stock management criteria was 75%. Manual and computerized stock control systems are used to manage the vaccine and consumables at the central store. The computerized system is VSSM version 4.6 which is used since 2009 with the support of WHO/EMRO. The VSSM record all the information needed for all vaccines and diluents. There was no up-to-date anti-virus software on the computer.

Although staff had good knowledge about the types and caused of vaccine wastage and stock levels policy (maximum, safety stock and reorder levels), but there is no system to collect data on vaccine and diluent wastage in opened and un-opened vials and no calculation for the vaccine and diluent wastage. The VSSM calculate and set for them the stock level but they don't applied it, sometimes they exceed the maximum and other time they face stock outs. No system to record the damaged vaccines and no internal reviews of the vaccine loss/damage vaccines.

Although physical counts planned to be six times a year, but only one physical count was arried out and document during the 12 month review period

E 7: Distribution

The performance of the distribution criteria was 32% which is the lowest score. This was maily because they don't have proper distribution plan, it is just quantities per province or areas with no specific period for distribution, but they agreed verbally with provinces that distribution will be in quarter bases the dates usually communicated latter on using mobile phones and email for pre-

notification and it is functioning well but without documentation. The request, issuing and receiving voucher system is in place but needs to be improved as they just receive request in a form of a letter requesting vaccines in quantities and they received according to the allowed quantities per quarter. Although the issue voucher which generated from the VSSM system includes all the required detailed information about the vaccines and consumables, in contrarily the request vouchers are deficient in all the required information in the requesting / receiving stores. There is no vaccine arrival or feedback system in place to report for every delivery to the lower levels, yet the program is preparing routine reports on internal vaccine distributions to the EPI manager. Freeze indicator devices were not used with all deliveries because they have shortage.

Staff had good knowledge about how to prevent vaccine freezing during transport.

E 8: Vaccine management

The performance of the vaccine management criteria was 64%. Staff at the central store has knowledge about how to read VVM and have received VM training. There were posted posters in the store for different VM practical issues. Some of the staff do not know how and when to conduct the shake test. The storekeeper can make exceptions to the EEFO rule (e.g. because of VVM status).

Although the VSSM design to calculate vaccine wastage but the system is not functioning. There is no an effective system for disposal of any vaccine damage.

E 9: MIS and supportive functions

The performance of the MIS and supportive functions criteria was 83%. Printed SOPs are available and covers all the key requirements in most EVM criteria and the standard practices in regard to vaccine management but it wasn't distributed to lower levels. They use standard method to estimate annual vaccine needs which are based on target population, vaccine coverage and wastage (WHO stander).They had work plan/budget which covers most of criteria except Health care west management. The contracted-out service is used, but not fully funded. Central store receives frequent supervisory visits from the EPI team as it is located within the EPI premises with documentation.

Central level recommendations

In addition to what was mentioned in the general recommendations the followings are recommended specifically for this level:

- **Vaccine arrival procedures**
  - Insure well documentation and organization of all the required shipments documents and VAR.
- **Cold Chain Storage capacity, Building, Equipment and Transport**
  1. Comply with the recommended way of storing freeze sensitive vaccines inside the cold rooms (I.e. not to put the Freeze sensitive vaccine directly facing the refrigerated unit evaporator

2. Vaccine packing area should be provided with comfortable working temperature between 15°C and 25°C. Shelves for ice pack conditioning should be installed in the room where cold room and freezer room are located. It should be noted that 1-2 meter surface is required for conditioning of approximately 25 ice packs. Shelves should be 75cm above the floor level.

❖ **Stock management and vaccine management**

1. Up-to-date anti-virus software on the computer should be installed.
2. Establish a unified system to collect data on vaccine and diluent to calculate wastage and use it for program management.
3. Develop a national Immunization waste management plan and ensure safe environment friendly disposal of waste and health worker incentives for compliance to be considered.

❖ **Distribution**

1. Document the advanced notification process to advise receiving stores of the time of vaccine delivery.
2. Distribute the SOP to lower level.

❖ **MIS and supportive functions**

- Use freeze indicator devices with freeze sensitive vaccines during storage and distribution.

9.2 Sub National stores:

E 2: Temperature monitoring

56% score was the temperature monitoring criteria for the sub national. 93% of the staff had good Knowledge regarding storage temperatures of each of the vaccines in the schedule.

Although most of the subnational levels had at least one walked-in cold room, however, continuous temperature monitoring devices and freeze indicator devices are not used / available in all stores for cold rooms and refrigerator. All of them use either stem or dial thermometer to monitor temperature and had manual recording system. In 50% of the assessed stores records were complete (twice daily/7 day /week) for throughout the review period and only 39% records were formally reviewed and properly archived for the last 3 years. 96% of Storekeepers demonstrated correct reading of thermometers used in the store and 92% can point the freeze sensitive vaccines which can be damaged by zero/ sub-zero temperature. .

The temperature forms have no space to comment on alarming events or actions taken in such cases and usually, not reviewed in regular bases for alarming events or signed by senior supervisor. Lack of a complete set of temperature recorder discs and/or temperature logger printouts for cold room and refrigerated van throughout the review period and temperature mapping studies are not carried out for cold rooms.

E 3: Storage and transport capacity

The score of the storage capacity criteria for the sub national levels (province and sub province stores) was 74%. Currently, 12 of the 28 stores had sufficient storage capacity to accommodate vaccines needs for the current immunization schedule. With the introduction of IPV and Rota vaccine all provinces should use the CCEM result to determine the real need for additional storage capacity.

The main provincial stores had their own refrigerated vehicles for transport with adequate capacity, other sub provincial stores didn't have adequate transport capacity and some of them depend on the direct delivery by the main provincial store. All stores have been provided with passive containers but not all of them comply with the WHO specification, as some of the stores re use the same carton that come from the manufacture to the central store. Just three stores observe to have adequate passive container capacity. 7% Stores have an SOP / contingency plan for equipment failure and emergencies, contact details were not posted in 13 %of stores.

E 4: Buildings, equipment and transport

The score of the buildings, equipment and transport criteria for the sub national was 65%. Unfortunately 89% of stores didn't not achieve the required standard 80% score as they didn't comply with the minimum WHO standards as all of them were very old and narrow and needs urgent rehabilitation (e.g. Dadu and Jamshoro district stores and Karachi provincial store) and they didn't fit with fire extinguisher, the office of cold chain staff in most of the store located inside the cold store within the equipment which is create uncomfortable and un healthy working environment for the staff looking after the vaccine store.

93% of stores had functioning standby generators for power back-up, but only 50% of them were secured or fitted with an auto start system. Although 64 % of sites had problem with voltage fluctuations but just 57% of stores were fitted with functioning voltage stabilizer.

Most of the dry stores had no shelving, pallet standing or pallet racking and were not well organized. 39% of the ILR used were not comply with the WHO specification or not fitted with the correct storage baskets. All of the stores didn't use electronic continuous temperature recording as they use either stem or dial thermometer.

Protective clothing was not provided for staff working in cold rooms and staff not trained in safe working practices. 36% of the sites telecommunication links were not sufficient.

E5: Maintenance

The maintenance criteria score for the sub national level was 53%. In all of the SN stores, the cold chain equipment were fully operational at the time of inspection (except in Punjab provincial store where most of the cold rooms were not functioning and they are very old and some of them no more

suitable for vaccine storage). 82% of stores have evidence that refrigerators and freezers are being defrosted and one staff was assigned to carry out routine maintenance but without documentation. In other stores maintenance plans and services was assured by the Buildings Department. However, none of the SNs has a planned preventive maintenance programme for buildings, equipment and transport, and there was no documentary evidence that maintenance is done. Some of the non-functional cold chain equipment was out of use for more than 4 weeks (e.g. refrigeration equipment in Punjab Provincial stores, 2 freezers in Sukkur Divisional Store…).

E6: Stock management

The stock management criteria score for the sub national level was 56%. In all stores, all vaccine arrivals and vaccine dispatches were recorded and stock balances were updated within one working day. In 60% of the stores physical count of the sampled vaccine matches the diluent count and the stock record as well. A pre- delivery/ pre-collection notification system is followed using mobile calls.

82% of the stores do not have a computerized stock control system, although all were trained on the new vLMIS system, but it's still non-functional pending provision of the required equipment by SAID'S Although the current vaccine stock registration book not deigned to register all the important information about the vaccine and diluents (vaccine and diluents presentation, batch no., manufacturer, expiry date, VVM status....etc.) however some of the store staff were keen and create extra row to register some of the missed information for vaccine only (batch no. and expiry date) and 89% of the stores registered what is required in the original log book only.

The stock control system is not designed to collect data about vaccine and diluent wastage (opened and unopened vials), there was no registration/ system for the damaged vaccine and diluents (lost, expire, heat or freeze exposure….etc.), and the disposal procedures for damaged stock are not always in accordance with standard procedures and WHO guidelines where some stores assume that there is no need for such facilities since wastage is only on the SP level.

Also, the stock level principles' (maximum, re-order and safety stock) were not implemented, and 68% of the staff cannot explain it correctly. Forecasting for the annual needed vaccine and safety injection equipment usually done at national level, so the staff didn't know their annual needs.

75% of stores had an issue vouchers for every delivery sent out during the review period with the quantities recorded in the vouchers matching that in the stock record, but these vouchers does not include all the essential information needed, it only records quantity of vaccine distributed. Although all the stores claims that physical inventory is carried out at least monthly, but there was no documentation. In some stores, vaccine was not correctly stored (no baskets in ILR, no enough shelves in cold rooms, vaccine stored directly on the ground …). 79% of the cold chain equipment's were not fitted with outdoor contents labels indicating vaccine type, quantities, expiry date and lot no. 46% of dry stores the dry goods were not properly stored on pallets and in EEFO order.

E7: Distribution

The distribution criteria had the lowest score for the sub national which is 43 %. The reasons were as follow:

All stores don't have comprehensive distribution plan, they just receive table from the national level with the calculated quarter quantities, then they make the same table for the lower levels for monthly distribution, and no monitor system in place for this distribution program (shipments dispatched vs. planned) or for vaccines damage during distribution in all stores.

Although refrigerated vehicles are used for vaccine collection and distribution, but there was no SOP for packing.

Sometimes distribution takes place upon the availability of vaccine in the primary store, not according to a planned program. They don't use freeze indicator to packed with the freeze-sensitive vaccines during delivery. Ice-pack conditioning preparation was not a common practice in 32% of the stores where some are using frozen ice-packs. There is no written transport contingency plan which describes how to deal with emergencies during distribution but drivers are aware of contingency practices and have mobile phone.

E 8: Vaccine management

Vaccine management criteria for the sub national scored 73 %. All the stores staff had good knowledge about the principles of VVM and used it in vaccine management purposes, 57% of the storekeepers /health workers can explain the main types of unopened vial wastage. In 64% of storekeepers / health workers does not know how to conduct the shake test and no visual posters/ pamphlets for VVM or shake test in the stores. In 50% of the stores the knowledge about the types and calculation of vaccine wastage was poor and no complete set of wastage data to be used for wastage calculation.

E9: MIS and supportive functions

The MIS and supportive functions criteria for the sub national had a score of 50% which is the second low criteria. All SNs stores claimed that a standard method is used at the national level to estimate annual vaccine and safe injection equipment demand but not including evidence- based coverage data. Regular supportive supervision takes place in 68% of the SNs without documentation. Almost all SN stores don't have an SOP manual nor vaccine management guidelines. No cold chain inventory and no annual plan with budget were available in all SN stores. 50% of the staff working in the SN stores did not receive any kind of training during the review period.

Sub national level Recommendations:

In addition to what was mentioned in the general recommendations the followings are recommended specifically for this level:

- **Cold Chain Storage capacity, Building, Equipment and Transport**

1. Recalculate storage capacity for all sub national stores, passive containers and vehicles in consideration for the new vaccine introduction and adjust accordingly better to use the CCEM result.
2. Provide all dry stores with shelves, pallet standing or pallet racking to make EEFO easier and insure proper warehouse handling.
3. Provide voltage stabilizers and Fire extinguishers for locations not already equipped.
4. Provide more adequate space for vaccine packing.
5. Provide health workers with warm clothes and conduct training for them on how to work safely in cold stores.

❖**Maintenance**

1. Urgent rehabilitation of the subnational cold store buildings is highly needed.

❖**Vaccine and Supply Stock Management**

1. Customize vLMIS to reflect EVM requirements to all SN stores and provide them with the essential logistic needs (computers, training…etc.)
2. The storekeepers should be encouraged to conduct physical inventory on quarterly basis with documentation.
3. Proper vaccine and dry goods storage by :
    a. Fit outdoor labels on cold rooms and ILR indicating important information on the inside vaccines,
    b. Fit all ILR with proper baskets and cold rooms with proper shelves
    c. Fit dry stores with proper pallets and consider the EEFO order policy for both vaccines and consumables whenever receiving more than one batch and expiry date.

❖**Supportive Functions and Information System**

- Make sure that the cold store annual plan with budget is included in the EPI annual plans

9.3 The Lowest Distribution Level (District):

E 2: Temperature Monitoring

The score of this criterion was 67%, ranging from a minimum of 19% to a max of 100%.
Most vaccine storekeepers (92%) know the correct storage temperature ranges for each of the vaccines on the national schedule. In particular, they know which vaccines can be damaged by freezing. Majority of storekeepers (92%) demonstrated correct reading of the thermometers they used in their facilities (mostly dial and stem thermometer). 37 out of 61 (61%) stores had the manual temperature records complete (twice daily, every day) for each and every cold room, vaccine refrigerator and vaccine freezer throughout the review period. However, there is no temperature

recording during the weekends and national holidays. Only 41% of stores have kept temperature records in a safe place for at least 3 years and the majority of the stores (82%) did not show evidence of internal review of their temperature records.

E 3: Storage and Transport Capacity

The score of this criterion is 70%, ranging from a minimum of 39% to a max of 100%.
About half of the assessed stores (52%) have sufficient positive (+2 to +8 °C) cold storage capacity for the current vaccine schedule. The capacity of the dry store was sufficient over a one-year cycle in (95%) of LD stores. Half (50%) of LD stores directly operating vaccine transport had sufficient net volume of the delivery vehicles.

89% confirmed use of conditioned icepacks for packing vaccine in passive containers. Cool packs not used. 25% stores do not to have sufficient ice-pack freezing capacity. Majority of the stores (74%) have sufficient passive container capacity. In most of the sites 93%, there are no SOPs setting out contingency plans in the event of equipment failure or other emergencies and very few stores (20%) have emergency contact details posted in the store. However, majority of store keepers (82%) know what to do in an emergency.

E 4: Buildings, Equipment and Transport

The score of this criterion was 74%, ranging from a minimum of 38% to a max of 94%.
80% of the stores (49 stores) were both secured and with loading area reachable by the delivery vehicles. In general, buildings were in good condition with few exceptions. Only one of the vaccine stores' buildings (2%) out of total 61 assessed fully meets all of the minimum safety and security standards. 96% of buildings are assessed as being suitable for the climate; only 2 buildings were classified as climatically inappropriate. 70% of roofs finish were in good condition with no internal evidence of leaks, 80% of buildings external walls were free of severe cracks or other major damage. Windows and external doors were in good condition and secure (grilles and/or locks in 87%. Floors were dry and reasonably level in 93%. Fire extinguishers were available and have they been tested in the past 12 months only in 6% of assessed LD stores. 81% of sores had satisfactory electrical system. 76% of stores had both rainwater and foul drainage system working. Only 5% had air-conditioning system working. Heating system installed in 3 out of 3 locations, there it required for cold climate.

Almost all stores (98%) had the storekeeper's office close to the vaccine storage area, packing area and loading bay and with the room large enough. 78% of stores had all vaccine freezers and 86% of stores had all vaccine refrigerators comply with the WHO specifications that were in force at date of purchase, including correct climate zone Only 45% of all ice-lined refrigerators were fitted with the correct vaccine storage baskets. 98% stores claimed to have sufficient daily hours of electricity for the installed equipment throughout the year.

In most of the sites 84% (51 stores), the refrigeration equipment used are CFC-free. In 82% of stores generator was required. 68% of the stores had generators installed and connected to the refrigeration equipment. Only 59% of stores had all refrigerating equipment attached to functioning voltage regulators. None of the stores visited have continuous temperature recorders, refrigerator loggers in their refrigerators.

Only 82% of the visited stores (49 stores) had a working thermometer stored with the vaccine.
84% of stores did have adequate telecommunications links. 37 out of 61 LD stores directly operated own vehicles. 84% of vehicles, for which the programme is responsible, were in good mechanical condition. 70% of vehicles, for which the programme is responsible, had its own user logbook. 35% of vehicles, for which the programme is responsible, had an up to date maintenance and service record (including a record of refrigeration unit servicing where applicable). 78% of locations had a fuel available throughout the year. 96% of LD stores had a WHO prequalified passive containers

E 5: Maintenance

The score of this criterion was 51%, ranging from a minimum of 12% to a max of 100%.
In most of the sites, there was no preventive maintenance planned (PPM) program neither for the buildings nor for refrigeration equipment. Only 2 (3%) of assessed locations had a written planned preventive maintenance (PPM) programme for buildings and refrigeration equipment.

Although 3% of LD stores had documentary evidence that the programme is being followed, 39% of stores had visual evidence that maintenance is taking place. In 38% of assessed sites staff was assigned to carry out routing maintenance. Evidence what cold rooms, refrigerators or freezers were recently cleaned or defrosted were present in 61% of stores. Solar refrigerators were used in 4 locations.

In 3 out of 4 locations, all solar panels were clean and completely un-shaded by buildings, trees and overhead cables. None of the If battery powered solar refrigerators had an evidence that the battery electrolyte has been checked recently. In 39 stores vaccine transport was directly operated by this store. 49% claimed what vehicles serviced in accordance with the manufacturer's service manual. 50% locations had documentary evidence that the service manual is being followed. Only 2 locations reported what there a written planned preventive maintenance programme. Only 1 location had documentary evidence that the programme is being followed. 75% of vaccines' freezers and refrigerators were fully functional at the time of assessment. 92% of the non-functional vaccines' freezers and refrigerators have been out of use for more than four weeks. 95% of dedicated ice-pack freezers were fully operational at the time of inspection. 3 out of 3 non-functional dedicated ice-pack freezers have been out of use for more than four weeks. During the review period, only 1% of planned vaccine collections, distributions and outreach immunization sessions were cancelled because of mechanical failure in the vehicle fleet.

E 6: Stock management

The score of this criterion was 47%, ranging from a minimum of 14% to a max of 82%.
Computerized stock control system not fully implemented at this level. Only one store reported to have computerized system in use. Program is implementing vLMIS (vaccine Logistics, Management, Information System). In most of the sites (87%), vaccine arrivals and dispatches recorded and stock balances updated within one working day of each transaction.

100% recorded type of vaccine. 75% of locations were recording vaccine quantity received in doses and 25% were recording number of vials.

The stock record forms do not provide some of the necessary information about the vaccine (25% recorded vaccine presentation (vial size), 60% expiry date, 56% vaccine manufacturer, 56% batch, and lot number, 13% VVM status) and it does not provide any information about the diluents. 67% of the stores are using a standard requisition form for ordering vaccines and other consumables. In most of the sites, feedback system (arrival vouchers) between the different levels is not implemented. 45% reported there is a formal advanced notification process to advise receiving stores of the time of vaccine delivery/collection and 42% what it is actually followed. 77% of stock records and/or stock in hand demonstrated that vaccine is issued according to the 'earliest-expiry-first-out' (EEFO) principle. 84% of storekeepers can make exceptions to the EEFO rule (e.g. because of VVM status).

51% of stores have a completed arrival voucher from the receiving store for every delivery which took place during the review period. 46% of a representative sample of completed arrival vouchers indicates that arrival checks were carried out correctly by the receiving store. The stock record forms were not designed to record vaccine and diluents wastage in unopened vials due to expiry, freezing or heat-exposure. Only 15% reported opposite. 56% of staff know that expired and damaged vaccine should be clearly labelled and stored out of the cold chain until final disposal. Only 49% of disposal facilities and procedures were in accordance with WHO and/or national norm. Only in 10% of facilities records of discarded vaccine been kept for at least three years, or, if for a lesser period, since the immunization programme adopted the EVSM or EVM. Only 7% internal reviews of the vaccine wastage were conducted during the review period in most of the sites. In the majority (85%) of sites, the stock level principles' (maximum, re-order and safety stock) were not implemented and only 19% of the storekeepers were able to explain these concepts.

In most of the sites, physical count of vaccine stock is either not done in the recommended frequency (monthly) or not documented. No vaccines with VVM at discard point were found at this level. Stock count and records match exactly AND vaccine and diluents quantities were within 1% of one another in 18% of stores, consumables matched in 57%. The vaccine stock was secure in 98%. Contents labels were fixed to all cold chain equipment indicating vaccine type, lot no. and expiry date in 36%. Vaccines were correctly stored in 61%. Vaccine was laid out in EEFO order, by type and by lot number in 72%. The vaccine store was clean, dry and pest-free in 85%. Dry goods were secure in 80%. Dry goods were correctly stored in 39%. Dry goods were laid out in an orderly fashion and in

EEFO order where applicable in 59%. The dry store was clean, dry and pest-free in 84%. The records were secure in 84% of locations.

E 7: Distribution

The score was 33%, ranging from a minimum of 3% to a max of 93%. During the review period, only 31% of stores have a formally communicated vaccine distribution system in place. In the majority of the sites, there is no formally communicated distribution system in place. Verbal agreement between the issuing and the receiving stores accompanied by a flexible schedule for receipt is the common scenario in most of the stores. 36% of LD stores had short shipments issued in the review period and 55% of short shipments which were corrected before the arrival of the next scheduled delivery. In most of the sites, conditioned ice packs used to transport freeze sensitive vaccines. However, ice packs conditioning and packing are not done in accordance with WHO guidelines in 28% and in 40% respectively. In locations with cold climate staff, know how to prevent vaccine freezing during transport in 3 out of 5 stores (38%). Although freeze indicators are recommended to be packed with deliveries of freeze sensitive vaccines, freeze indicators are not available to be used. Only 2% reported use of freeze indicators. 49% of arrival sections of the sampled issue vouchers have been returned to the issuing store. 8% of the returned arrival sections record VVM status. 31% of LD stores reported having written outreach program. 91% of planned outreach activities took place.

E 8: Vaccine Management

The score of this criterion was 65%, ranging from a minimum of 5% to a max of 95%.
Only 38% of the storekeepers know how to conduct the shake test and 65% know when it is needed. 4 storekeepers reported what they conducted shake test during last 12 months.

Written instructions on the use of VVMs, such as posters and stickers, were available to storekeepers and health workers in 33%. 100% of storekeepers know how to read VVMs. 90% of store keepers/health workers use VVM status for vaccine management purposes. Only in 49% of locations immunization reports and/or other standard reporting forms contained data that can be used to calculate the vaccine wastage at the facility. Only 33% of storekeepers know how to calculate wastage rate.

25% had a complete set of wastage rate data that can be used for calculating wastage rates.

E9: MIS and Supportive Functions

The score of this criterion was 44%, ranging from a minimum of 0% to a max of 95%.
Only 10% reported to have a Standard Operating Procedures (SOP) manual.
In 84% of the sites, a standard method is used to estimate annual vaccines and consumables needs. Evidence-based target population data used in the calculation 69%. Evidence-based coverage data used in the calculation 8%. Evidence-based vaccine wastage data was used in the calculation in 43%. As forecasting for the annual vaccine and safety injection equipment's need is done at higher

level, majority of the staff didn't know their annual needs. Cold chain equipment's inventory conducted in 46% of stores and the recommended frequency of update is used in 25%. Work plan/budget exist for the review period in 16% of LDs. Cold chain equipment was reflected in 90% of plans, Vehicles in 70%, Healthcare waste management in 30%, Maintenance issues in 90%, Staff resources in 50%, Staff training in 30%. However, the annual plan is developed by the higher level. Only 48% of storekeepers/health workers received training on vaccine management during the review period. Records of training were available in 48%. Majority of the sites 67% reported having received supportive supervisory visits during the review period. 34% provided records of supportive supervision.

Lowest distribution level Recommendations:

In addition to what was mentioned in the general recommendations the followings are recommended specifically for this level:

- **Cold Chain Storage capacity, Building, Equipment and Transport**

1. Keep storage capacity sufficient to accommodate maximum stock levels of vaccines and related consumables
2. The quality of the vaccine store buildings must meet minimum requirements. Carry out necessary works at facilities needed: roof, wall, windows and external doors, floors, air conditioning, electrical connections, drainage and heating system repairs. Provide necessary fire extinguishers and test them annually.
3. All stores with generators should have adequate fuel supply for at least 72 hours continuous running. If electrical supply stable, fuel volume for one hour running should be provided on the weekly basis to run generators check-up.
4. Provide voltage regulators for all refrigeration equipment wherever voltage fluctuations exceed +/- 15% of rated voltage (or the refrigeration equipment manufacturer's voltage tolerance, whichever is lower).

- **Vaccine and Supply Stock Management**

1. Explore possibility of introducing computerized stock management system to vaccine's stores.
2. Transport contingency plan should be developed describing how to deal with emergencies during distribution.
3. The storekeepers should be encouraged to conduct equipment inventory on monthly basis with documentation.

- **Supportive Functions and Information System**

• Encourage storekeepers to document every supportive supervisory visit to the service delivery points and use standard checklists.

9.4 Service Delivery Points (health facilities):

E 2: Temperature monitoring

The performance of the temperature criteria for the 61 service delivery points assessed was 67%, ranging from a minimum of 19% to a max of 100%. Staff knowledge of vaccine storage temperatures is generally very good with 92% of storekeepers being aware of the correct storage temperatures for each antigen, and 85% being aware of the vaccines which are freeze sensitive, and the majority (86%) read thermometers correctly.

Temperature is recorded manually twice daily at 90% of the stores assessed but only 69% records are complete. Furthermore no more than 43% of records are safely stored for a period of three years or more. Only 18% of records are formally reviewed and only 3 sites were able to demonstrate documentary evidence of this practice.

Temperatures are measured either with dial type bimetal thermometers or alcohol thermometers. Dial thermometers are no longer WHO/PQS prequalified and are prone to losing calibration. They are no longer recommended for monitoring vaccine refrigerator temperatures. WHO strongly recommends the use of continuous temperature monitoring devices in all vaccine refrigerators? A number of appropriate products are WHO/PQS prequalified. These products monitor temperatures continuously and maintain a history of temperature for up to 60 days, displaying days when the temperature exceeds $+8^0$ C or decreases below 0^0 C. The option also exists to download and visualize graphically the temperature history via a USB port. No software is required.

E 3: Storage and transport capacity

The performance of the storage capacity criteria for the 61 service delivery points assessed was 70%, ranging from a minimum of 0% to a max of 100%.

39 of the 41 facilities indicating availability of refrigerators for storing vaccines indicate sufficient storage capacity is available to accommodate vaccines. With the introduction of IPV and Rota vaccine 25% of these facilities will require additional storage capacity.

49 facilities indicate the availability of passive containers. 10 of these 49 do not have sufficient containers to meet maximum daily demand.

89% of health workers claim to use conditioned icepacks in cold boxes and vaccine carriers when freeze sensitive vaccines are transported. Cool packs are not used.

Only 10% locations have an SOP which sets out a contingency plan in the event of equipment failure or other emergency. A mere 19% of immunization locations have emergency contact details posted, but 78% of store keepers/vaccinators know what to do in the event of an emergency.

E 4: Buildings, equipment and transport

The performance of the buildings, equipment and transport criteria for the 61 service delivery points assessed was 71%, ranging from a minimum of 32% to a max of 92%.

There are relatively few major problems with the condition of buildings. 84% of buildings are assessed as being suitable for the climate; only 2 buildings were classified as climatically

inappropriate. Responses were not provided for 8 buildings. 66% of roofs are in good condition with no leaks, 74% of buildings have no severe cracks or major damage. Doors and windows are good in 85% and floors in 84%.

Only 6% are equipped with fire extinguishers and 63% have adequate and safe electrical systems. 16% are considered to have drainage issues.

85% of facilities are equipped with WHO/PQS or WHO/PIS compliant freezers and 90% with refrigerators. Only 8 locations were using refrigerators designed for baskets without baskets.

59 of the 61 service deliver points are recorded as having refrigerators only 17% are assessed to require generators although 77% of sites are prone to voltage fluctuations. These figures may be grossly under estimated however. Only 4 locations are equipped with working standby generators.

98% of locations have thermometers. The accuracy is unknown however since the assessment did not verify the accuracy of temperature measuring devices. Most but not all vaccine storage appliances are connected to a functioning voltage stabilizer.

66% of facilities have adequate communication links. Most are likely to have access to mobile phone networks.

E 5: Maintenance

The performance of the maintenance criteria for the 61-service delivery points assessed was 51%, ranging from a minimum of 0% to a max of 98%.

From a sample of 53 sites, 21 displayed evidence of a facility maintenance program, however there are no written plans or maintenance record except for perhaps 1 isolated case. A similar situation exists for refrigerator maintenance except that 18 facilities have designated responsible persons. Regardless of this apparently inadequate maintenance framework, refrigeration equipment was functional at almost all service delivery facilities and more than 50% of systems were recently defrosted and cleaned.

Functional refrigeration equipment was identified at 59 facilities; status of equipment at the other 2 service delivery facilities is unknown and 29 facilities have icepack freezers all of which function.

In some situations maintenance is not managed directly by EPI hence procedures, manuals, records etc are not maintained at service delivery facilities.

E 6: Stock management

The performance of the stock management criteria for the 61 service delivery points assessed was 44%, ranging from a minimum of 3% to a max of 83%.

71% of vaccine stock arrivals and dispatches are recorded in stock registers and stock balances maintained. There are several shortcomings with the content of stock records however. 92% of records indicate stock type received and 77% are designated in doses rather than vials. Other stock related parameters are not recorded for 80-100% of the time. This includes vaccine presentation,

source of manufacture, batch numbers and VVM status. Diluent records are only maintained in 20% of cases assessed, and details of diluents are rarely registered.

Only 60% of assessed facilities could produce requisition and receiving forms, 46% show evidence of advance notification of arrivals and wastage is also poorly reported.

Less than 10% of facilities maintain any records of discarded vaccines. Max, min and safety stock levels are not set in more than 65% of facilities. Even the few locations (10) where stock levels were defined, actuals stocks did not remain within the prescribed limits for 40% of the locations.

No correlation could realistically be made between forecasted supply and actual supplies since forecasts are not communicated to service delivery points. Supplies are based upon monthly requisitions from the service delivery point to the lowest distribution points, and for the most part are supplied at requested levels.

Stock counts and stock comparison with vaccine and dry stock registers was made at more than 65% of facilities assessed. A 100% correlation exists at 75% of locations were counts were conducted and near correlation at a further 25% locations. Only 2 sites returned poor results.

These issues above relate primarily to the design of the stock control system rather than negligence on the part of health workers at the service delivery points. There is consistently strong evidence of health worker commitment.

E 7: Distribution

The performance of the distribution criteria for the 61 service delivery points assessed was 40%, ranging from a minimum of 0% to a max of 100%.

Icepack conditioning prior to insertion of ice packs into vaccine carriers and cold boxes occurs in 72% of the 53 facilities reporting and packing is consistent with WHO recommended practices in 57% of those locations. Freeze indicators are rarely used to transport freeze sensitive vaccines and only 2 of 51 sites adhered to this practice.

Data collected on outreach activity indicates that 60% facilities (36) have a written program and data from 31 locations indicate that 75% of planned outreach was achieved over the review period and that an average of 12 outreach sessions/month were conducted.

E 8: Vaccine management

The performance of the vaccine management criteria for the 61 service delivery points assessed was 53%, ranging from a minimum of 13% to a max of 94%.

65% of a sample of 51 health worker know when to conduct a shake test, only 36% however know how to conduct it, and only 1 isolated example claims to have conducted a shake test during the 12 month review period.

Diluents from the same manufacturer as the vaccine are always used and 88% of health workers in 52 facilities kept diluents in the vaccine refrigerator prior to use.

92% of health workers discard open vials of reconstituted vaccines within the WHO recommended period of 6 hrs or at the end of the immunisation session if erlier.

98% health worker correctly interpret VVM's and use tend to prioritise use of VVMs at stage 2 over expiry date but written instructions indicating VVM stages of exposure are posted in only 15 out of 52 facilities. Only 3 cases of VVM's displaying "Do no Use" indicators were recorded in the 51 cases observed. It would appear unlikely that assessors visited 51 facilities holding vaccination sessions; the validity of the responses are thus questioned.

The MDVP is widely adopted with only 10% of responses indicating otherwise and 15% responses unclear on how to apply the MDVP. Adoption is further confirmed as open vials were found in 47% of facilities. Only 36% of open vials were marked however.

62% of immunisation reports include data that can be used to determine vaccine wastage. Most health workers (75%) are able to explain the main types of unopened wastage, but only 21% recipients knew how to calculate wastage and only 38% of facilities have raw data to calculate wastage.

There are always adequate supplies of safety boxes and they are used with rare exceptions. Wastage is disposed at the facilities generally by burn and bury in a pit and 77% of sites are free from scattered used syringes. Incinerators are not used with possibly 1 exception.

E 9: MIS and supportive functions

The performance of the MIS and supportive functions criteria for the 61 service delivery points assessed was 71%, ranging from a minimum of 32% to a max of 92%.

A standard method of estimated annual need for vaccines based on target population is used in almost 90% of facilities. Only 16% of facilities consider actual coverage in this determination and 46% of 48 facilities include actual wastage data. Syringes and other dry goods supplies are bundled with vaccine supply and distributed accordingly.

39% of health workers from 54 facilities received formal or on the job training within the review period and documentary evidence supports this in 90% of the cases.

A total of 1259 supervisory visits are recorded within the 61 facilities assessed during the review period. This suggests 1.7 visits/per month per facility.

Service Point level Recommendations:

In addition to what was mentioned in the general recommendations the followings are recommended specifically for this level:

- **Cold Chain Storage capacity, Building, Equipment and Transport**

1. Reconsider provision of additional equipment to increase vaccine storage capacity should be made as needed prior to the introduction of new vaccines.

2. Service delivery points not having sufficient passive containers to satisfy maximum daily demand should be provided with addition passive containers.
3. Locations where the availability of electricity is not assured with at least 8 hours /day every day should be provided solar AC hybrid power packs to provide auxiliary power to vaccine refrigerators during periods of load shedding. These power packs include provision to charge laptop computers./printers
4. Future procurement of vaccine refrigerators should be WHO/PQS compliant and should be rated for "hot climate" (43^0 C) performance. 2000 vaccine refrigerators recently supplied through USAID support are rated only for "Temperate Climate" (32^0 C).
5. Install appropriate voltage stabilizers at all locations not already equipped
6. Improve the standards of electrical distribution in buildings and ensure equipment is adequately grounded.
7. Reduce fire risk in buildings by installing fire extinguishers or keeping buckets of sand adjacent to any electrical or other equipment prone to fire risk. All firefighting equipment should be clearly labeled and periodically checks as per SOPs.

❖ **Supportive Functions and Information System**

1. Staff at the service point levels should be involved in forecasting for their annual/ monthly need according to the standard method for their level (target population, monthly consumption or session size can be where session data is well documented).
2. All outreach plan and outreach achievement should be included in the vLMIS data management system.
3. Instructions on effective waste segregation and safe disposal of used vaccine vials and syringes should be provided to all health facilities.

10. Annex 1: National Assessor Team

Team Leaders:

1. Dr. Keith Feldon, Operations Officer, WHO
2. Mr. Ghulam Taqi, National Vaccine Management & Cold Chain Logistics Coordinator
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9. Dr. Mazhar Qureshi, Provincial EPI Officer, WHO, Punjab
10. Dr. Tariq Iqbal, UNICEF
11. Mr. Wasiq Ahmed Khan, National Coordination Officer – EPI, WHO

Team Members

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8. Dr Tauqeer Nawaz (DDOH, Hafizabad)
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12. Dr. Sarfaraz Sheikh, Medical Officer
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31. Dr, Kifayat, Dist Epidemiologist, Khyber Pakhtunkhwa
32. Dr. Jawad Ahmed Dar, MO, Jhelum
33. Dr. Khalid Parvez, DOH, MB Din
34. Ms. Fehmeeda Malik, SHNS, Rawalpindi
35. Dr. Ehsan Ghani, DOH, Rawalpindi
36. Dr. Aleem Danish, DOH, Chakwal
37. Dr. M. Mohsin, SMO (EPI), DGHS, Punjab
38. Dr. Asim Altaf, MO, Gujrat
39. Dr. Shahid Bukhari, DOH, Multan
40. Mr. Qaisar Abbas, SO, Multan
41. Dr. Iqbal Hussain, DDOH, Nankana Shahib
42. Dr. M. Farooq, MO, Pakpattan
43. Dr. Irfan, MO, Multan
44. Dr. Faisal Malik, MO, Lahore
45. Dr. Bashir Ahmed, APMO (EPI), DGHS, Punjab
46. Dr. Shafiq ur Rahman, EPI FP, DG Khan
47. Dr. M. Siddique, DDOH, Rajanpur
48. Dr. Munir Ahmed, DOH, Chiniot
49. Dr. M. Usaid Khan, DHDC, Multan
50. Dr. Asif, MO, Lahore
51. Dr. Muhammad Danish Salman, MO Bahawalpur
52. Mr. Asif Nawaz, VMO, DGHS, Punjab
53. Mr. Ayaz Abbasi, Provincial EPI office, AJK
54. Mr. Sarwar Hussain, Provincial EPI office, AJK
55. Ms. Anahitta Shirzad, UNICEF

11. Annex 2: complete list of EVM Pakistan selected sites

Sub-National 1	Sub-National 2	Sub-National 3	Lowest Distribution Point	Service Point
Sindh Provincial Store, Karachi	Hyderabad Divisional Store		Badin District store	BHU Abdullah Shah
		Dadu District Store	Mehar Taluka Store	EPI Center, But Serai
		Jamshero District Store	Sehwan Taluka Store	EPI Center, Bhan
		Sanghar District Store	Khipro Taluka Store	BHU Hathungo
			S. Benazirabad (Nawabshah) District Store	Police line dispensary
			T M Khan District Store	BHU Nango Shah
	Sukkur Divisional Store	Ghotki District Stoe	Mirpur Mathelo, Taluka Hospital, Daharki	BHU Gh. H. Leghari
		Kambar District Store	Shahdatkot Taluka Store	MCH Shahdatkot
		Khairpur District Store	Kingri Taluka Store	BHU S. Ji Bhatyoon
		Larkana District Store	Ratodero Taluka Store	RHC Neudero
			Shikarpur District Store	Dr Parvez Clinic
	Thatta District Store		Jati Taluka Store	BHU Begna Mori
			Gulshan-e-Iqbal Town Store	UHU Ghousia Colony
			Jamsheed Town Store	UHU Azam Basti
			Kamari Town Store	PHC Sultanabad
			Sadar Town Store	Bantva Memon Hospital
Balochistan Provincial Store, Quetta			Quetta District Store	BHU Killi Kabir
			Killa Saifullah District Store	BHU Nali Sar
			Loralai District Store	CD Mekhtar
Punjab Provincial Store, Lahore			Rawalpindi District EPI Store	RHC Khyaban-e-Sir Syed
			Kotli Satian Tehsil EPI Store	BHU Karor
	Chakwal District EPI Store		Choa Saiden Shah Tehsil EPI Store	BHU Basharat
			Gujranwala District EPI Store	BHU Bhatti Bhungo
			Kamoke Tehsil EPI Store	BHU Mandiala Yaiza
	Gujrat District EPI Store		Kharian Tehsil EPI Store	BHU Seekerwali
	Sialkot District EPI Store		Sialkot Tehsil EPI Store	BHU Bounkan
	Narowal District		Narowal Tehsil EPI	BHU Rupo Chak

	EPI Store		Store	
	Lahore District EPI Store		Lahore Cantt. EPI Store	Fouji Foundation Hospital
			Nishter Town EPI Store	BHU Ladhe Ke Uchay
			Wahga Town EPI Store	BHU Ghawind
			Sheikhupura District EPI Store	BHU Dhamkay
			Kasur District EPI Store	BHU Attari Verik
			Okara District EPI Store	BHU Nehranwala
	Sahiwal District EPI Store		Chichawatni Tehsil EPI Store	BHU Chak No. 16/14 L
			Multan District EPI Store	BHU Muhammadpur
			Jalalpur Pirwala Tehsil EPI Store	BHU Norija Bhutta
	Vehari District EPI Store		Burewala Tehsil EPI Store	BHU Chak No. 267 EB
			Khanewal District EPI Store	BHU 121/15 L
			Faisalabad District EPI Store	Aziz Fatima Hospital
			Samundri Tehsil EPI Store	RHC Pindi Sheikh Musa
	T-T-Singh District EPI Store		Kamalia Tehsil EPI Store	BHU 714 GB
	Chiniot District EPI Store		Chiniot Tehsil EPI Store	BHU Chak No. 143 JB
	Sargodha District EPI Store		Sillanwali Tehsil EPI Store	BHU Chak No. 147/148 NB
			Bhakkar District EPI Store	BHU Kachchi Shahani
			D.G.Khan District EPI Store	BHU Ghous Abad
			Muzaffargarh District EPI Store	BHU Diwala
			Kot Addu Tehsil EPI Store	BHU Pirhar Saraqi
	Bahawalpur District EPI Store		Ahmedpur East Tehsil EPI Store	BHU Kotla Musa Khan
	Bahawalnagar District EPI Store		Chishtian Tehsil EPI Store	RHC Shaher Farid
	Rahimyar Khan District EPI Store		Sadiqabad Tehsil EPI Store	RHC Jamal Din Wali
KP Provincial Store, Peshawar			Kohat District Store	RHC Billi Tang
			Haripur District Store	CH Rehana
			DI Khan District Store	BHU Pota
			Swabi District Store	BHU Parmulai
			Mansehra District	EPI Center, Belian

			Store	
			Batagram District Store	BHU Bathkool
			Peshawar District Store	EPI Center, Sikandar Town
			Charsadda District Store	BHU Agra
			Mardan District Store	Naray Mian Killi
CDA District Store, Islamabad				Simly Dam
Sudhnoti Dist Store, AJK			CD Killlan	BHU Pothi Mir Khan

12. Annex 3: Key Recommendations Of EVM 2009:

- Adopt the UNICEF VAR with the guideline printed on the back for all vaccines received in the country
- Written contingency plan in case of unexpected arrival delay (2 months)
- All documents organized in one box file i.e. (Invoice, Packing List, Airway Bill, Release Certificate and Shipping Notification)
- Box file for UNICEF Record
- Local Manufacturer Record
- External/International Manufacturer Record
- Conduct a temperature monitoring study following WHO protocol
- Install wireless continuous temperature monitoring system for all cold storage facilities
- Continue manual temperature monitoring system
- Temperature records for different cold chain facilities to be kept in different folders and to be reviewed monthly
- Calibration of temperature monitoring devices to be done on annual basis
- Make a plan for replacement of all obsolete cold rooms and freezer rooms
- Draw a plan for expansion of the present cold facilities for storage of vaccines for supplementary activities and introduction of new vaccines
- Plan vaccine shipment according to the available cold chain capacity
- Train staff on safety of working in cold chain facilities (on-the-job) with provision of required standard safety/protective equipments
- Provide voltage regulator for the new EPI compound
- Provide shelves for the dry stores
- Provide automatic starting system for the four new generators to be installed in the new EPI building
- Prepare a written plan and record for maintenance of all cold/freezer
- Prepare cold chain spare parts inventory system and update regularly (2 months)
- Use of VSSM for stock management of all vaccines, diluents and equipments MUST be continued
- Update VSSM with cold chain spare parts, equipments and vitamin A (2 weeks)
- Store officer and store keeper needs to be trained on the job on VSSM by those staff who're already trained (2 months)
- Manual stock registration of supplies to be continued at least for one year

- Assign an IT personnel at least for one year for regular maintenance of the VSSM software and trouble shooting
- Summary report of all stocks and supplies generated by VSSM to be shared with NPM and a signed copy to be kept in file for future reference
- Contents menu to be fixed on every cold room and freezer room which to be updated using VSSM and monitored regularly
- Vaccines to be laid and labeled in store according to batch number and expiry
- Arrival, dispatch and movement between stores of all supplies MUST be guided by VSSM following FEFO principle
- No supply leaves store without a signed voucher generated by VSSM
- Update and ensure consistent use of a standard requisition forms for obtaining supplies from the store
- Develop and ensure to use a pre-delivery notification and pre-collection forms
- A standard arrival report for vaccines to be developed and ensure use of that by all recipient stores which to be signed and sent by the recipient to the federal store for record
- Procurement of vaccines to be followed by maximum and minimum level according to VSSM
- Develop a SOP for discarding expired and damaged vaccines according to existing government policy and record and report all such incidences
- Make annual physical inventory of all items in the store and reconcile stock in VSSM
- Establish and use or Bin Card system
- Prepare an annual plan for distribution/collection of vaccines and injection equipment, communicate with province and adhere to it
- Use freeze indicators (e.g. freeze tag) for transportation of freeze sensitive vaccines
- Archive issue voucher/receive confirmation with status of freeze indicator (if applicable) in separate file/section by province
- Written contingency plan and SOP to deal with emergencies during distribution and make all relevant staff aware of the SOP
- Regular supportive supervision plan to be developed, implemented and documented for future reference
- Essential SOPs to be developed and approved
- Existing SOPs to be modified, updated and approved
- Staff to be oriented about the new and updated SOPs and ensure practice with regular monitoring and supervision
- Approved SOPs to be communicated to all staff and to be accessible by all staff. Hard copies of relevant SOPs should be available in respective office/facilities
- All SOPs to be reviewed and updated on annual basis

- Regular and frequent supervisory visits to the Store by the senior management should continue and recorded using a standardized formatted supervision book in every storage facility
- Vacant positions in the store to be filled (at least 2 additional storekeepers)
- Reports generated by VSSM should be used for forecasting, procurement and planning purposes
- Evidence based wastage data to be gathered regularly and to be used
- Separate standard inventory of cold chain equipments, spare parts and vehicles to be maintained, updated regularly and reviewed by physical verification annually

13. Annex 4: EVM criteria Score by Provinces/ Sub Province

Provincial and sub provincialStore	E2	E3	E4	E5	E6	E7	E8	E9
Sindh Provincial Store	60%	72%	57%	34%	84%	41%	100%	79%
Hyderabad Divisional Store	55%	64%	59%	60%	66%	32%	84%	19%
Dadu District Store	49%	43%	50%	50%	56%	43%	78%	45%
Jamshero District Store	81%	60%	75%	50%	72%	32%	77%	45%
Sanghar District Store	39%	67%	70%	41%	37%	60%	63%	68%
Sukkur Divisional Store	39%	75%	44%	37%	59%	39%	51%	60%
Ghotki District Store	81%	83%	80%	57%	70%	53%	84%	81%
Kambar District Store	63%	61%	64%	63%	38%	51%	59%	46%
Khairpur District Store	35%	83%	70%	64%	59%	49%	72%	40%
Larkana District Store	63%	76%	76%	52%	68%	39%	80%	57%
Thatta District Store	81%	90%	66%	64%	57%	68%	92%	85%
Punjab Provincial Store	47%	37%	44%	29%	52%	17%	63%	26%
Chakwal District Store	58%	94%	76%	70%	42%	39%	50%	29%
Gujrat District Store	68%	83%	59%	38%	80%	50%	82%	59%
Sialkot District Store	35%	83%	42%	41%	57%	24%	50%	45%
Narowal District Store	55%	70%	78%	52%	58%	28%	45%	49%
Lahore District Store	49%	42%	55%	52%	50%	28%	80%	49%
Shahiwal District Store	36%	83%	62%	46%	44%	28%	80%	22%
Vehari District Store	53%	83%	71%	71%	31%	39%	94%	34%
TT Singh District Store	58%	66%	68%	44%	21%	39%	83%	27%
Chiniot District Store	77%	77%	78%	62%	43%	64%	60%	79%
Sargodha District Store	50%	89%	65%	73%	66%	56%	77%	65%
Bahawalpur District Store	77%	69%	88%	69%	67%	75%	77%	61%
Bahawalnagar District Store	58%	70%	86%	56%	64%	43%	51%	46%
Rahim Yar Khan District Store	47%	75%	68%	43%	59%	47%	89%	72%
Khyber Pakhtunkhwa Provincial Store	52%	90%	66%	63%	46%	32%	78%	31%
Balochistan Provincial Store	41%	95%	51%	61%	61%	30%	72%	47%
Sudhnoti District Store	67%	80%	40%	33%	62%	44%	68%	32%

14. Annex 5: EVM criteria Score by District / Division

Lowest distribution level	E2	E3	E4	E5	E6	E7	E8	E9
Islamabad CDA District Store	71%	55%	76%	70%	72%	46%	68%	69%
Gulshan-e-Iqbal Town Store	58%	57%	71%	55%	38%	18%	66%	54%
Jamsheed Town Store	58%	54%	85%	54%	58%	32%	94%	48%
Kamari Town Store	62%	56%	66%	46%	35%	18%	66%	37%
Sadar Town Store	58%	43%	70%	46%	17%	18%	77%	26%
Badin District Store	90%	89%	65%	50%	65%	32%	94%	45%
TM Khan District Store	52%	76%	75%	58%	51%	32%	38%	42%
Mehar	77%	63%	77%	50%	70%	70%	80%	45%
Shehwan	81%	71%	92%	50%	75%	46%	84%	45%
Khipro	81%	59%	84%	76%	49%	26%	65%	49%
Nawabshah	58%	81%	79%	41%	32%	39%	64%	59%
Shikarpur District Store	81%	85%	62%	58%	52%	18%	80%	49%
Mirpur Mathelo	42%	62%	77%	50%	30%	13%	63%	28%
Shahdatkot	96%	66%	38%	54%	60%	25%	68%	69%
Kingri	58%	76%	62%	52%	53%	45%	63%	34%
Ratodero	100%	72%	68%	41%	54%	57%	66%	56%
Jati	90%	80%	63%	56%	66%	47%	94%	40%
Rawalpindi District Store	67%	78%	94%	61%	54%	18%	23%	56%
Kotli Satian Tehsil Store	67%	92%	89%	63%	45%	21%	66%	56%
Gujranwala District Store	52%	100%	90%	83%	74%	75%	81%	95%
Kamoke Tehsil Store	81%	82%	94%	100%	82%	93%	94%	90%
Sheikhpura District Store	58%	83%	73%	39%	39%	16%	77%	40%
Kasur District Store	77%	67%	71%	50%	30%	32%	67%	40%
Okara District Store	77%	77%	70%	58%	22%	32%	73%	45%
Multan District Store	81%	75%	66%	45%	49%	43%	39%	43%
Jalalpur Pirwala Tehsil EPI Store	71%	89%	73%	65%	56%	63%	84%	34%
Khanewal District Store	81%	64%	67%	52%	38%	32%	74%	40%
Faisalabad District Store	58%	83%	76%	42%	36%	3%	55%	50%
Samundri Tehsil EPI Store	58%	78%	81%	33%	35%	5%	73%	45%
Bhakkar District Store	58%	62%	69%	55%	52%	55%	5%	38%
DG Khan District Store	71%	87%	81%	58%	65%	57%	95%	52%
Muzaffargarh District Store	71%	83%	74%	55%	58%	50%	80%	49%
Kot Addu Tehsil EPI Store	71%	52%	84%	71%	56%	32%	84%	49%
Choa Saiden Shah Tehsil Store	77%	65%	73%	61%	31%	18%	68%	14%
Kharian Tehsil Store	19%	54%	86%	61%	66%	57%	59%	63%
Sialkot Tehsil Store	62%	58%	65%	52%	56%	7%	50%	49%
Naroawal Tehsil Store	100%	74%	76%	46%	55%	36%	28%	32%
Lahore Cant. EPI Store	58%	67%	70%	53%	45%	7%	68%	35%
Nishtar Town EPI Store	96%	54%	70%	42%	42%	7%	73%	63%

Wagha Town EPI Store	87%	70%	64%	50%	41%	7%	57%	54%
Chichawanti Tehsil EPI Store	58%	60%	80%	39%	43%	32%	78%	31%
Burewala Tehsil EPI Store	77%	71%	85%	71%	47%	63%	78%	40%
Kamalia Tehsil EPI Store	58%	64%	89%	61%	26%	5%	67%	9%
Chiniot Tehsil EPI Store	77%	94%	75%	69%	43%	86%	77%	65%
Sillanwali Tehsil EPI Store	58%	93%	88%	65%	47%	32%	61%	56%
Ahmedpur East Tehsil EPI Store	87%	49%	85%	64%	70%	63%	73%	66%
Chishtian Tehsil EPI Store	100%	74%	75%	56%	55%	26%	63%	52%
Sadiqabad Tehsil EPI Store	58%	40%	81%	12%	44%	78%	77%	38%
Kohat District Store	58%	77%	82%	42%	20%	13%	56%	16%
DI Khan District Store	58%	82%	72%	56%	30%	13%	50%	51%
Haripur District Store	38%	64%	67%	27%	57%	21%	45%	0%
Manshera Dirstrict Store	52%	89%	78%	41%	40%	37%	45%	22%
Batagram District Store	48%	69%	81%	35%	14%	25%	45%	0%
Peshawar District Store	81%	39%	81%	53%	43%	7%	45%	63%
Charsadda District Store	48%	67%	67%	38%	67%	5%	53%	42%
Swabi District Store	58%	68%	71%	38%	42%	32%	61%	45%
Mardan District Store	58%	73%	48%	23%	40%	32%	63%	59%
Quetta District Store	52%	57%	56%	25%	42%	15%	64%	22%
Killa Saifullah District Store	67%	50%	64%	64%	26%	15%	45%	25%
Loralai District Store	58%	83%	49%	30%	20%	5%	45%	0%
CD Killan	62%	93%	55%	33%	58%	35%	45%	37%

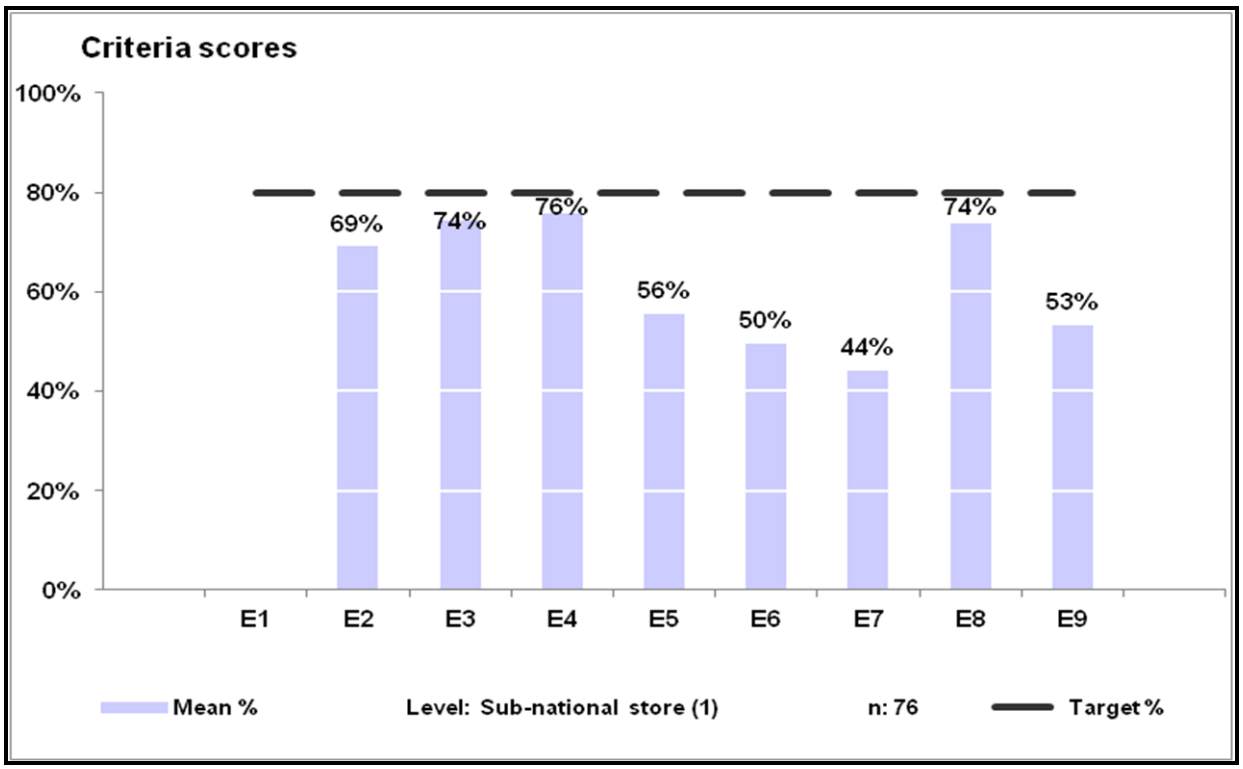
15. Annex 6: EVM criteria Score by Health facility

Health Facility	E2	E3	E4	E5	E6	E7	E8	E9
Simli Dam Medical Center	58%	83%	63%	53%	71%	50%	83%	25%
UHU Ghousia Colony	42%	68%	55%	53%	23%	0%	68%	35%
UHU Azam Basti	58%	27%	58%	33%	35%	25%	68%	60%
PHC Sultanabad	58%	22%	80%	33%	21%	25%	85%	60%
Bantva Memon Hospital	19%	62%	60%	44%	13%	0%	76%	35%
BHU Abdullah Shah	71%	63%	76%	50%	39%	50%	85%	13%
BHU Nango Shah	33%	78%	77%	33%	41%	5%	66%	42%
EPI Center But Serai	58%	69%	50%	33%	30%	0%	57%	60%
Bhan	77%	41%	82%	33%	68%	54%	77%	60%
BHU Hathungo	62%	78%	54%	50%	39%	31%	72%	54%
Police Line Dispensary	67%	77%	84%	71%	46%	50%	89%	54%
Dr Parvez Clinic	81%	74%	78%	56%	68%	52%	91%	67%
BHU Gh. H. Leghari	81%	83%	59%	50%	59%	51%	79%	38%
MCH Shahdatkot	81%	83%	55%	42%	26%	25%	73%	50%
BHU S. Ji. Bhatyoon	38%	62%	43%	56%	34%	3%	69%	48%
RHC Naudero	100%	83%	58%	58%	53%	32%	81%	69%
BHU Begna Mori	19%	78%	53%	33%	48%	9%	43%	19%
RHC Khayabad-e-Sir Syed	42%	58%	87%	40%	40%	50%	92%	44%
BHU Karor	67%	89%	72%	38%	42%	4%	65%	54%
BHU Bhatti Bhungo	81%	100%	89%	71%	83%	99%	98%	94%
BHU Mandiala Yaiza	100%	100%	67%	71%	72%	100%	88%	94%
BHU Dhamkey	77%	67%	75%	33%	32%	50%	83%	60%
BHU Attari Verik	96%	54%	84%	65%	43%	50%	68%	54%
BHU Nehran Wala	58%	71%	58%	50%	32%	50%	74%	48%
BHU Muhammadpur	42%	78%	86%	61%	46%	13%	74%	52%
BHU Norija Bhutta	67%	60%	84%	50%	40%	97%	93%	75%
BHU 121-15	81%	53%	84%	42%	50%	50%	92%	54%
Aziz Fatima Hospital	58%	83%	83%	56%	47%	23%	81%	29%
RHC Pindi Sheikh Musa	77%	58%	65%	42%	42%	23%	81%	42%
BHU Kachi Shahani	81%	92%	65%	83%	32%	55%	88%	69%
BHU Ghous Abad	67%	85%	89%	88%	56%	52%	88%	65%
BHU Diwala	67%	60%	71%	56%	50%	51%	75%	54%
BHU Pirhar Sharqi	81%	84%	86%	42%	56%	55%	88%	79%
BHU Basharat	87%	92%	84%	58%	38%	52%	98%	69%
BHU Sheekarwali	100%	100%	85%	71%	68%	29%	96%	73%
BHU Bounkan	67%	87%	63%	50%	48%	30%	78%	67%
BHU Rupo Chak	81%	63%	62%	42%	46%	6%	77%	42%
Fouji Foundation Hospital	62%	83%	73%	53%	43%	25%	79%	60%
BHU Ladhe Ke Uchay	77%	75%	84%	65%	52%	53%	88%	73%

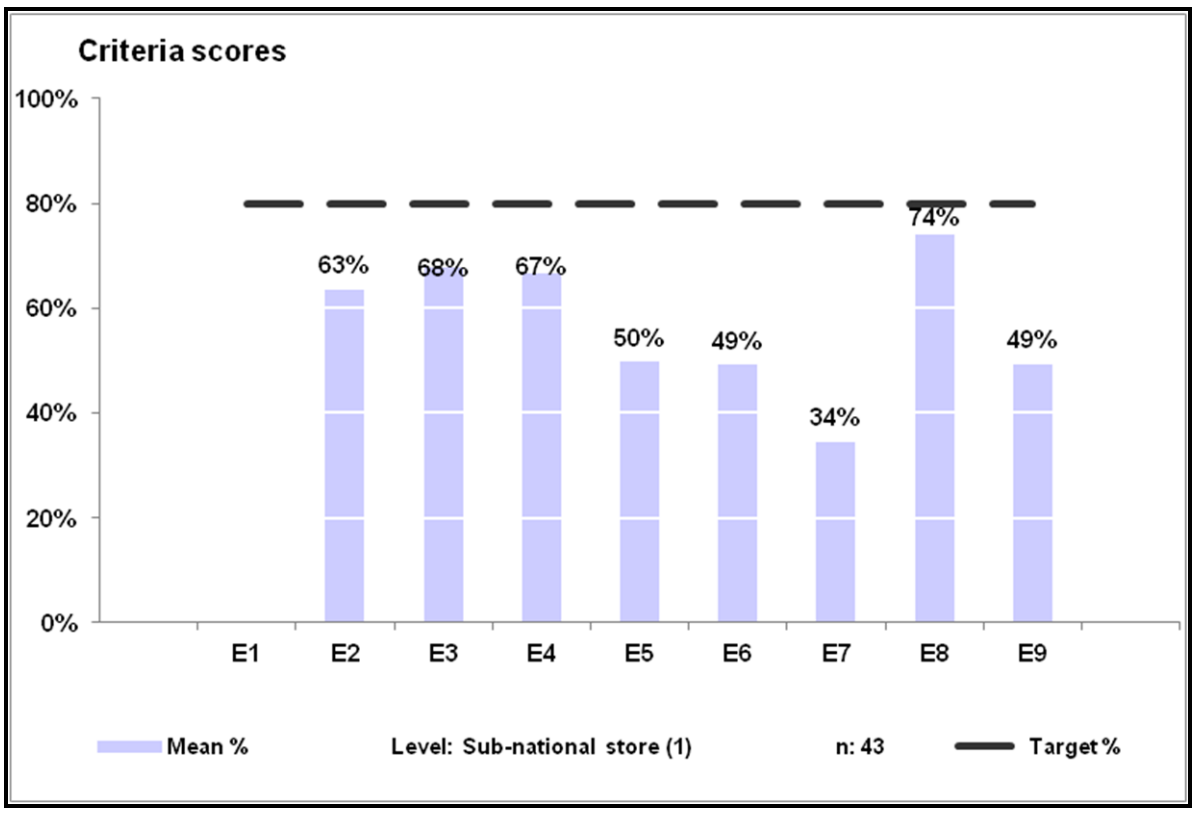
BHU Ghawind	71%	78%	86%	40%	47%	50%	84%	60%
BHU Chak No. 16-14	77%	50%	84%	53%	68%	55%	91%	29%
BHU Chak No. 267 EB	100%	58%	79%	61%	46%	45%	98%	48%
BHU 714 GB	81%	50%	84%	50%	40%	50%	84%	42%
BHU Chak No. 143 JB	96%	92%	65%	71%	49%	55%	78%	81%
BHU Chak No. 147-148 NB	81%	92%	65%	71%	62%	55%	94%	94%
BHU Kotla Musa Khan	81%	83%	86%	63%	52%	100%	89%	67%
RHC Shaher Farid	58%	100%	86%	63%	50%	100%	56%	79%
RHC Jamaldin Wali	58%	83%	79%	56%	61%	100%	63%	38%
RHC Billitang	77%	75%	71%	40%	55%	25%	63%	48%
BHU Pota	58%	75%	71%	56%	32%	50%	84%	25%
CH Rehana	81%	53%	89%	53%	66%	52%	86%	50%
Belian	33%	50%	92%	33%	43%	17%	60%	35%
BHU Bathkool	81%	66%	86%	58%	68%	52%	87%	44%
Sikandar Town EPI Center	71%	68%	39%	33%	32%	25%	65%	60%
BHU Agra	38%	59%	82%	0%	25%	25%	72%	60%
BHU Parmulai	67%	0%	39%	0%	9%	25%	64%	35%
Naray Mian Killi	71%	78%	45%	33%	50%	50%	64%	35%
BHU Killi Kabir	38%	35%	38%	42%	3%	0%	56%	13%
BHU Nali Sar	38%	66%	62%	71%	6%	17%	72%	13%
CD Mekhtar	58%	78%	69%	63%	15%	0%	86%	19%
BHU Pothi Mir Khan	52%	75%	32%	33%	3%	22%	65%	69%

16. Annex 7: Over all EVM criteria by Province

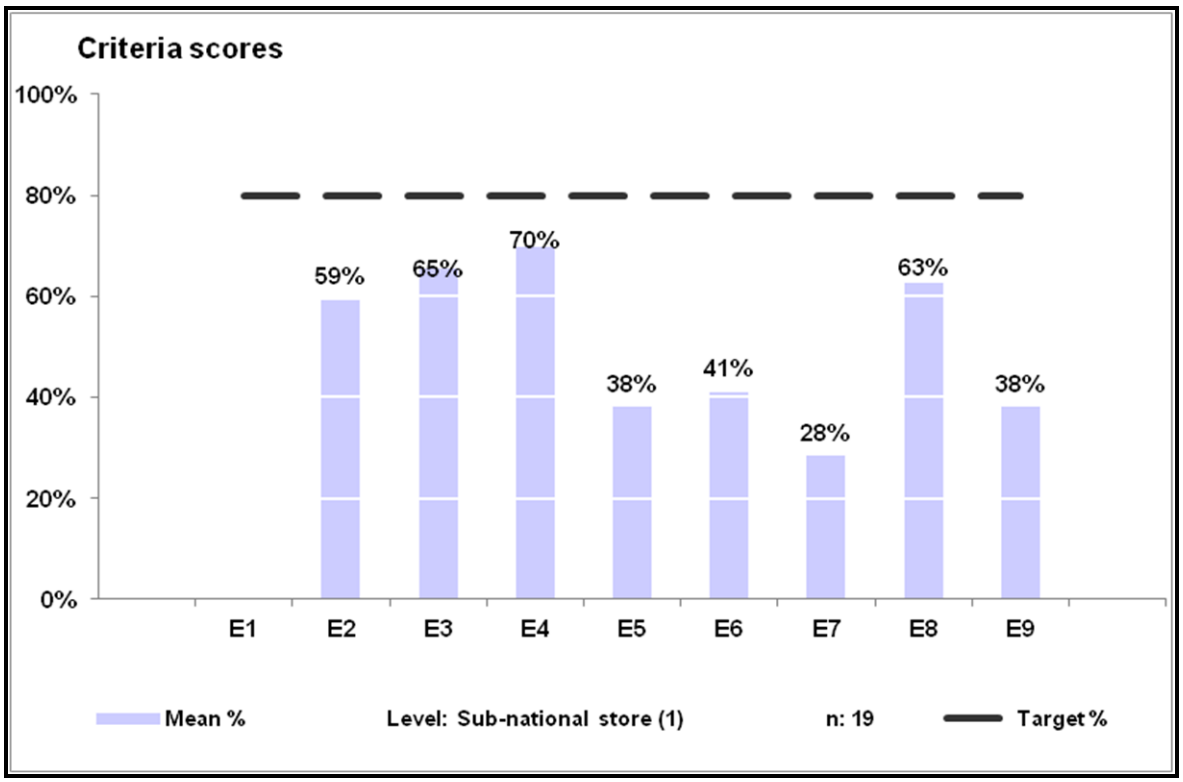
Punjab



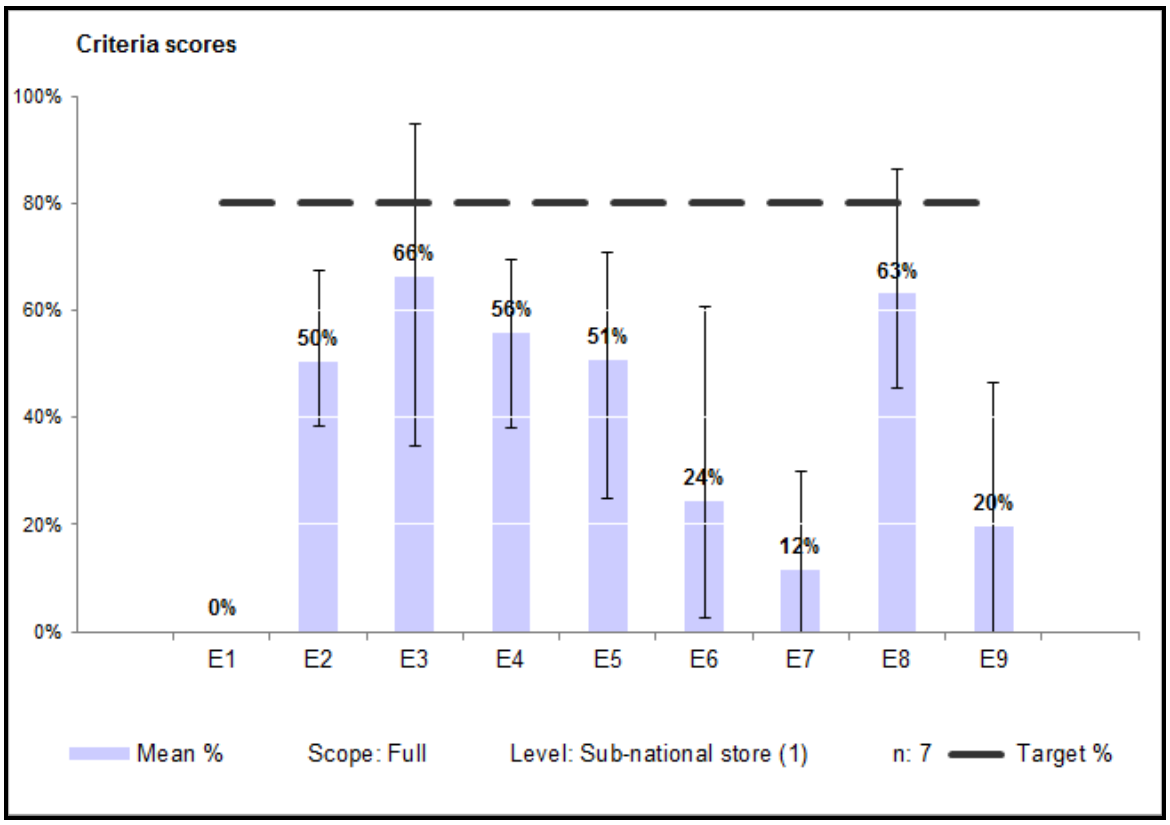
Sindh



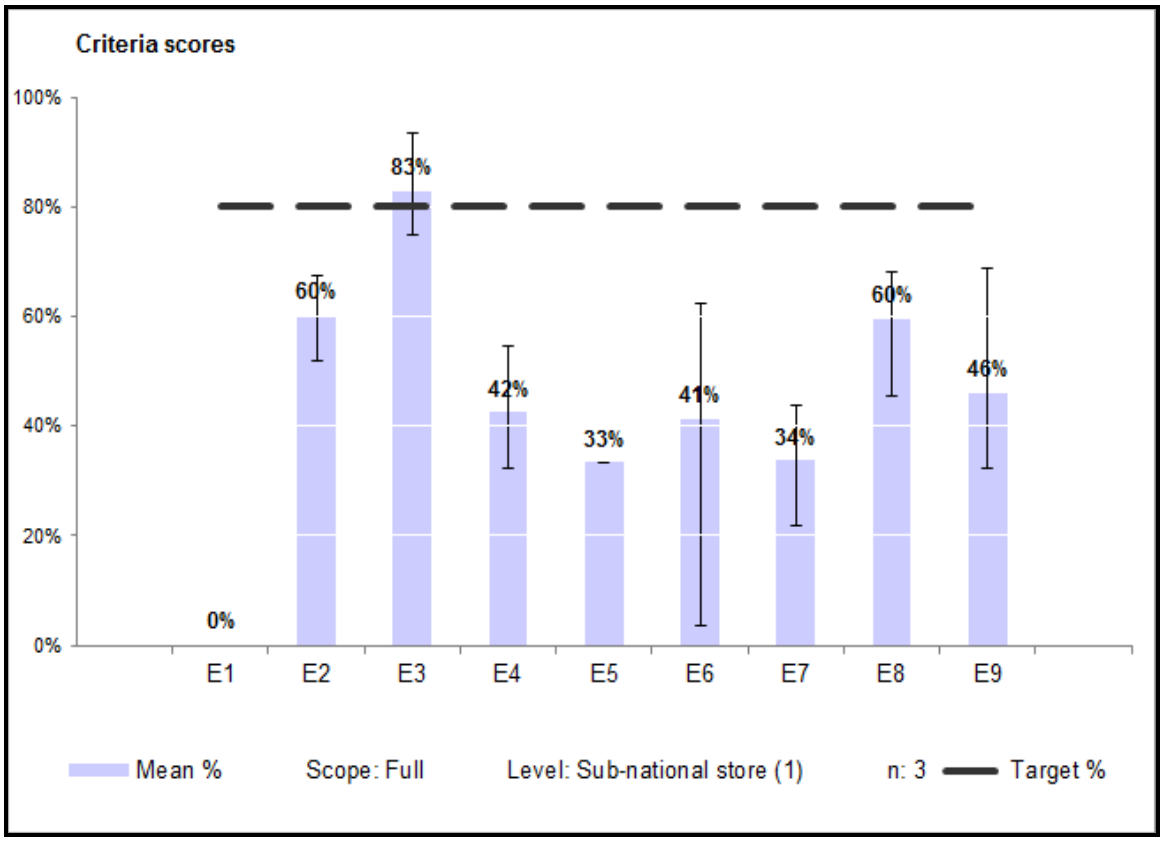
KP



Baluchistan



AJK


Criteria scores
100%
80%
60%
40%
20%
0%
0%
60%
83%
42%
33%
41%
34%
60%
46%
E1
E2
E3
E4
E5
E6
E7
E8
E9
Mean %
Scope: Full
Level: Sub-national store (1)
n: 3
Target %