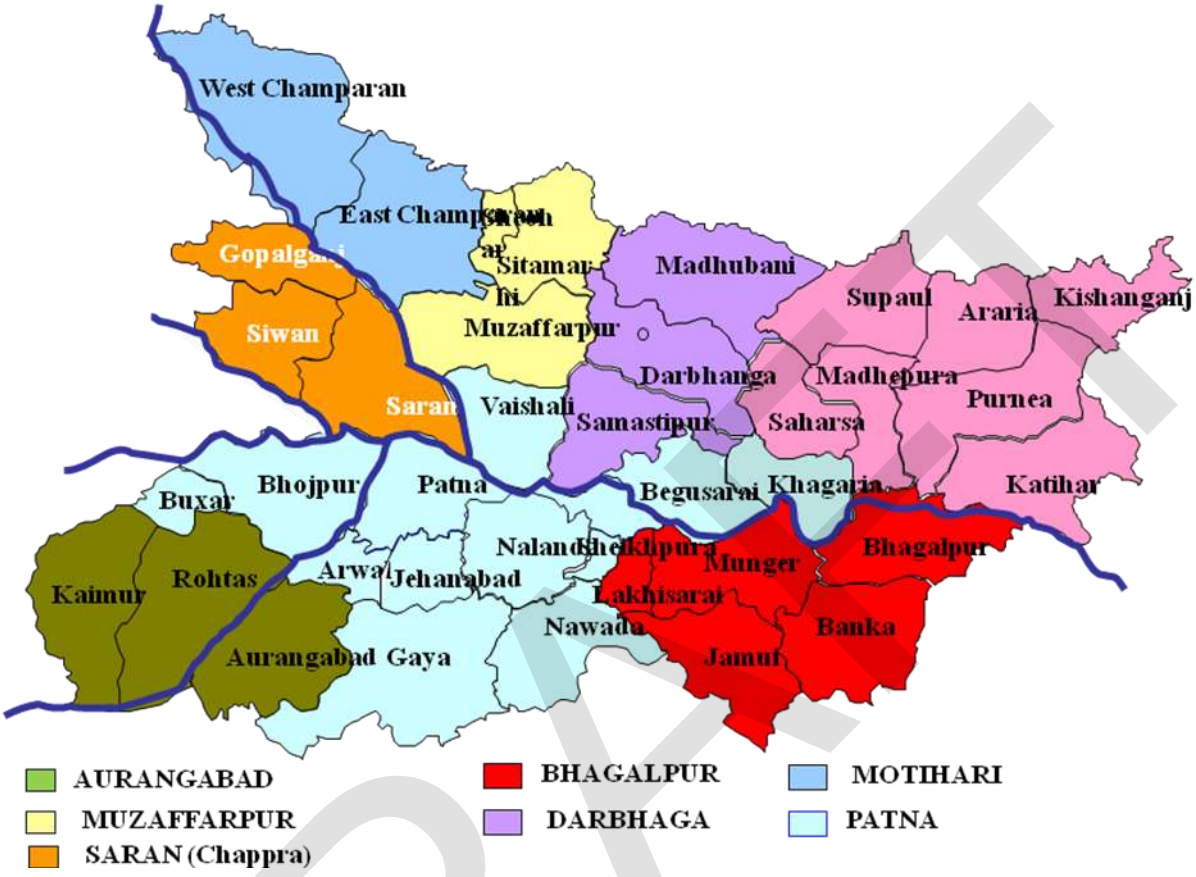
Training on Vaccine Management Assessment and Assessment of Cold Chain & Vaccine Management status in BIHAR using WHO/UNICEF Vaccine Management Assessment Tool (VMAT)



April 2008

Assignment REPORT

Table of Contents

1. Introduction ***5***

2. Objectives of Vaccine Management Assessment ***6***

3. The Tool ***6***

4. Implementation ***8***

5. Data consolidation ***9***

6. Findings and Results of the Assessment ***11***

6.1 Pre-shipment and arrival procedures 11

6.2 Temperature Monitoring 12

6.3 Cold storage capacity 13

6.4 Status of Building, Equipment and Transport 16

6.5 Maintenance of Building, Equipment and Transport 18

6.6 Stock Management 19

6.7 Effective Vaccine delivery 20

6.8 Correct diluents use for freeze dried vaccine 21

6.9 Effective VVM use 22

6.10 Multi Dose Vial Policy 22

6.11 Vaccine wastage control 23

7. Summary of Recommendations ***24***

I. Core: 24

II. Technical: 24

III. Logistic: 25

IV. Capacity building: 26

V. Practices to be implemented: 26

Acknowledgement 27

ANNEXURES

A – Schedule of the induction programme ***28***

B – Plan and groups for field exercise ***30***

C – List of Participants and Facilitators ***31***

D – Summary of Evaluation Results ***32***

E - Team formations for Field Assessment and Target Locations ***33***

F1 - AURANGABAD Region ***34***

F2 - BHAGALPUR Region ***35***

F3 – CHAPPRA Region ***36***

F4 - DARBHANGA Region ***37***

F5 - E. C-MOTIHARI Region ***38***

F6 - MUZAFFARPUR Region ***39***

G - Indicator scores for all Regional and their respective District and PHC level vaccine stores ***41***

H - Details of WIC and WIF at PHI and RVS ***43***

I - Annual Vaccine Requirement for 2008-09 (vials) ***44***

J - Storage capacity in terms of requirement at PHI and RVS' ***45***

K - Example of Service log sheet for WIF and WIC ***49***

L - Vaccine Batch Card (New for each batch of Vaccine) ***53***

M - Example of Indenting Form ***55***

Abbreviations and Glossary

ADMO	Assistant District Medical Officer
BMC	Block Mobilization Coordinators
BPL	Below Poverty Line
°C	degree Celsius
CCM	Cold Chain Monitor
CCO	Cold Chain Officer
CDMO	Chief District Medical Officer
CFC	Chlorofluorocarbon (ozone depleting substance)
CHC	Child Health Centre
CS	Civil Surgeon
CSC	Child Survival Coordinator
CI	Critical Indicator (in EVSM and VMAT)
DIO	District Immunization Officer
EEFO	Earliest Expiry First Out
EPI	Expanded Programme on Immunization
EVSM	(WHO-UNICEF) Effective Vaccine Store Management initiative
GTN	Global Training Network
IMNCI	Integral Management of Neonatal & Child Illnesses
MI	Medical Institution
MO	Medical Officer
MOH	Ministry of Health
MQP	Model Quality Plan (module 2 of EVSM)
PHC	Primary Health Centre
OPV	Oral Polio Vaccine
PO	Project Officer
RVS	Regional vaccine store
SIO	State Immunization Officer
SOP	Standard Operating Procedure
SVS	State Vaccine Store (at Patna)
UNICEF	United Nations Children's Fund
VAR	vaccine Arrival Report
VM	Vaccine Management
VMAT	(WHO-UNICEF) Vaccine Management Assessment Tool
VVM	Vaccine Vial Monitor

1. Introduction

Bihar is the fifth most populated state of India with 89.5% rural population. According to 2001 census its population was close to 90 million. Considering an annual growth rate of 2.8%, today its population is estimated to be 100 million with a density of almost 900 persons per Sq km. The target population less than 5 years old is today estimated to be 2.7 million.

Over the years the state has been striving to increase its coverage for the Routine immunization which currently stands at 37.7 % with a DPT3 to DPT1 drop-out rate of 7 %. The coverage scenario for fully immunized child over the past few years is given in the table below:

NFHS 2 (98-99)	CES 2002	CES 2005	RCES 2006	NFHS 3 2006	CES 2006-07
11.8	11.6	18.6	26.1	32.8	37.7

Bihar is a state that is marked with the persistence of the polio wild virus against which campaign rounds are being conducted at the rate of almost once every month. There have been a total of 12 round of pulse polio in 2007 and 3 rounds in the first quarter of 2008. Efforts are constantly ongoing to enhance coverage and eradicate Polio from the state.

In this, the State Health Society (SHS) of the Govt. of Bihar has been closely supported by UNICEF in all its routine and campaign immunization activities throughout the state. UNICEF has put in place 10 Child Survival Coordinators who have been actively supporting implementation of several child health related programmes of the State Health Society in the field. These include Integral Management of Neonatal & Child Illnesses, Maternal Health, micro plan and training. UNICEF has also put in place a social mobilization network consisting of 200 Block Mobile Coordinators (BMCs) to increase coverage during the pulse polio rounds.

In view of further increasing the impetus that is much needed to the immunization programme, the SHS has launched a new initiative since 11th October 2007 – MUSKAN - a Campaign. This initiative targets 100% immunization of all children and pregnant women, as well as 100% institutional deliveries. To achieve this the programme has interwoven involvement of social organizations and health workers at all levels with additional financial incentives for performances that contribute to increasing coverage.

While such initiatives are very important and very much needed, the success of all immunization programme much depends on the proper delivery of potent vaccines at the right place at the right time in the required quantities. In fact any shortage of vaccines or, even worse, supply of impotent vaccines would compromise the programme totally. In fact, the latter could even backfire on the credibility of the programme in case an epidemic of the same disease or an Adverse Effect Following Immunization (AEFIs) emerges subsequent to use of impotent vaccines.

A sturdy cold chain with well trained staff, along with proper logistic planning for demand and supply of vaccines which is implemented through safe transport system is what is needed to guarantee the success of all the efforts put in by the immunization programmes.

As an additional measure to enhance their support to the SHS and the immunization programmes, UNICEF took the initiative for the current mission. The mission had for its objective to induct the UNICEF CSCs and some health staff in the WHO-UNICEF Vaccine Management Assessment Tool, and then to conduct the assessment in some of the regions to assess the status of the cold chain and vaccine logistics. The aim was to build in-house capacity to carry out such self-assessments in future review the progress of the system.

2. Objectives of Vaccine Management Assessment

Objective of such an assessment is to identify the following aspects:

- Strengths & good practices
- Major knowledge gaps
- Major performance gaps
- Resource & Training needs
- Develop internal capacity of the system to conduct similar self assessment periodically .
- Strengthen Future Planning & prepared the system for storage space and management of future vaccines like Hep B, Hib, or Pentavalent vaccines.

To achieve this objective, the first step is to train a certain number of health department staff in the use of the VMAT so as to apply it periodically through self-assessment. This needs to be followed with a partial assessment to get a feel of the current status. The analysis of the result will help define the future course of action to improve and ensure good level of vaccine logistics.

Keeping the above in mind, the current assignment was organized by UNICEF from 6 to 22 April 2008. This document reports on the entire activity starting from the induction training till the final outcome of the analysis with recommendations.

3. The Tool

The Vaccine Management Assessment Tool (VMAT) is developed by the Vaccine Management Training Network (VMTN) team to help countries to improve the quality of their vaccine management down to the service delivery level. The modules complement the package of guidance, assessment and training materials developed for the initiative for Effective Vaccine Store Management (EVSM), which focus on vaccine management at national primary stores.

For Bihar state, the national primary store (Govt. Medical depot store - Kolkata) supplies vaccines to the state vaccine store (SVS), which supplies vaccines to 7 regional stores, which in turn supply to the 38 districts and from there the vaccines are supplied to 425 PHCs. The latter supply them to 124,519 outreach sessions every month apart from conducting immunization at their own locations.

The purpose of VMAT is to investigate vaccine management knowledge and practices amongst health staff operating at national or state level, sub-national (RVS or DVS) or intermediate and service delivery levels (PHCs). It bases itself on the data and practices over the last 6 months. The tool helps assessors to identify and document the areas of strengths and good practices. It also helps identify major knowledge and performance gaps in a consistent format. Targeted support and training can then be provided to overcome these deficiencies.

The tool is based upon **eleven global criteria listed below.** Of these the first seven have been derived directly from Effective Vaccine Store Management (EVSM) initiative. Criteria 8, 9 & 11 are implicitly part of EVSM but have been identified as separate indicators for assessment at periphery levels.

A criterion 10 on Multi-Dose Vial Policy (MDVP) has been added. Note that criterion 10 is not applicable in India and so also to Orissa.

1. Vaccine arrival procedures	5. Stock management
1. Vaccine storage temperatures	6. Effective vaccine delivery
2. Cold storage capacity	7. Correct diluents use for freeze dried vaccines
3. Buildings, cold chain equipment and transport	8. Effective VVM use
4. Maintenance of cold chain equipment and transport	9. Multi-Dose Vial Policy (MDVP)
	10. Vaccine wastage control

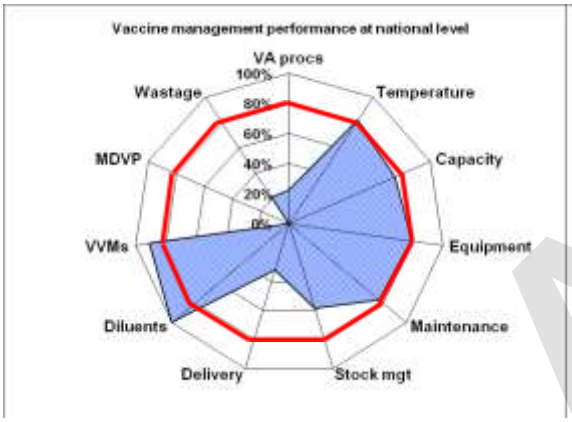
Grouped under each criterion there are a set of specific questions which are applied to the different levels of vaccine supply chain within the health system (SVS or RVS, DVS and BVS) and to which one attributes a mark corresponding to the answer: 0 (no), 1 (yes) or n/a (not applicable). The sum of these

marks is then normalized to give an overall score for each criterion on a scale of 0 to 100 %.

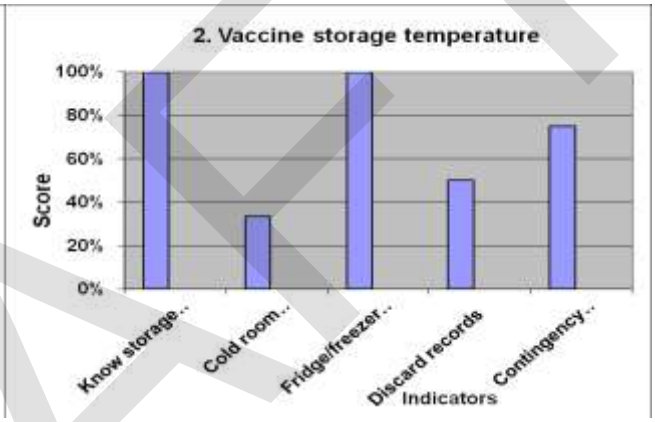
These scores are then used to depict graphically on a spider web the strengths and weaknesses of a country's vaccine management systems. The graph below shows the result of the assessment at SVS. A minimum of 80% score is recommended for each criterion as shown by the red polygon in the graph. In summary one can see that the performance of some criteria are above 80% while those that are below 80% are a cause for concern and need to be addressed.

The individual criteria are also plotted in bar graphs in terms of status of specific indicators. An example of one bar graph for the indicators of criterion 2 corresponding to the spider chart is shown alongside the spider graph. This graph depicts the status of performance for the 5 core indicators verified under this criterion.

It can be seen that the score is good only for the knowledge of the store keeper and the temperature monitoring of ILR and DF. The score for the other 3 indicators is poor. Note that the weightage of the different indicator being different, the total score corresponds to about 80% as shown on the spider chart on the left.



Typical Spider graph result



Corresponding Bar chart result for criteria no. 2

NB. Criteria 1 - Vaccine arrival procedures applies more to a national store receiving vaccines from overseas or directly from the manufacturer. Govt. of India has not adopted MDVP (criteria 10). Hence criteria 1 and 10 are not assessed while conducting a state assessment.

The programme of the first three days was a combination of debriefing through presentation group works and role plays and presentations by participants. Annexure A provides the detailed agenda.

The field training was carried out by dividing the entire group into 5 teams and conducting visits to 5 vaccine store (the central state vaccine store – PHI, Patna, District Vaccine Store - Patna and 3 PHCs and respond to the questions of the tool and bring back the answers. Annexure B gives the details.

On each day only 3 out of 11 global criteria and their detailed questions were presented, discussed ad used for the assessment. After the field visit the data was consolidated. The experience of the participants and the results were discussed the next day in detail and complemented with the observations of the consultant.

Different objectives were targeted through the induction phase:

1. Familiarising the participant with the tool,
2. Training the health staff to use the tool to assess a specific facility (central, sub-national or periphery),
3. Collect data from the different facilities visited,
4. Consolidate the data and analyse the same
5. Guide the participants in better data collection
6. Draw major conclusions on the preliminary data.

4. Implementation

The induction programme was successfully completed within the given time frame. A total of 22 participants attended the training. Annexure C gives list of the participants. They all worked every enthusiastically from 9 am to 6 pm all four days. Their active involvement contributed immensely to enhanced their level of confidence in the use of the tool each day.

Training and analysis session

On receiving and analysing the data collected each day, the consultant could guide the participants on improving the quality of data collection and safeguarding against reporting incomplete or incorrect data. Some of the important aspects stressed were:

1. To take the store managers into confidence,
2. To report factual information based on what is seen. This is important to avoid misinterpretation of results.
3. To provide sufficient comments to support the score given to a question – especially if it is zero,
4. To try and verify all information as much as possible based on documented records,
5. Not to disturb or correct any existing practice unless one is sure of it and it is drastically incorrect (eg. conditioning of ice packs)
6. Not to tamper with any equipment (thermostats) unless one is the authorised technician,

At the end of the first phase, the consultant circulated an evaluation form for the participants to assess the training programme. It included three aspects delivery of the trainer, the relevance of the programme and last but not least the confidence of the participants in using the tool. Annexure D gives the results.

In the second phase, 6 teams were formed to cover 6 RVS, their respective 2 DVS and to the extent possible 4 PHCs under these DVSs. Details of the teams and locations visited are given in Annexure E. The assessment at Purnia could not be covered due to its distance.

5. Data consolidation

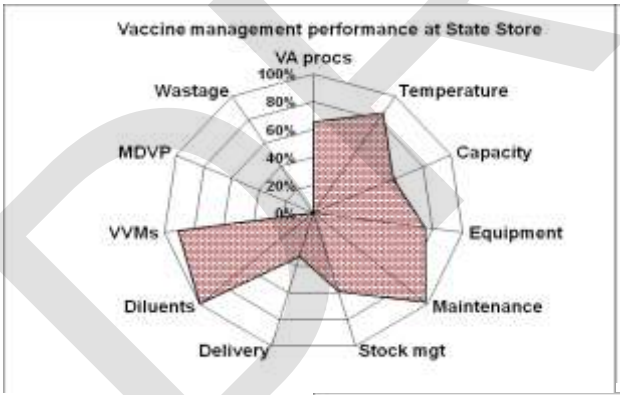
The State vaccine store at PHI-Patna, DVS of Patna and 3 PHCs were assessed during the training phase. The data collected by the five teams were consolidated into a single file. The resulting score is given in the table 1 below for each global criteria at respective site that were assessed. Scores **less than 70% are marked in red** and those **above 90% in green**. .

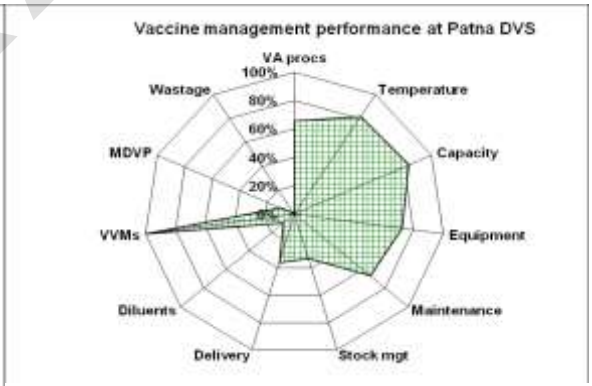
Table 1: Consolidated result of State Vaccine store, 1 DVS and 3 PHCs in Patna region.

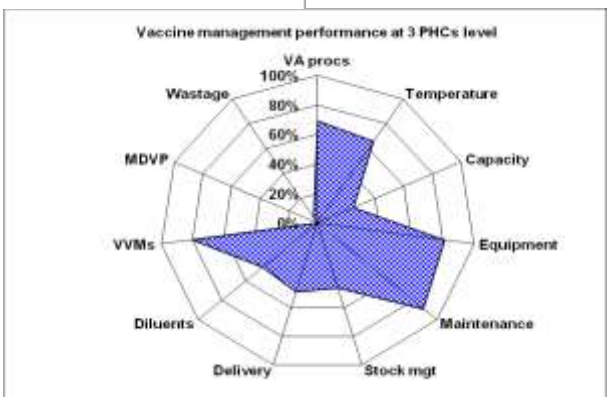
		State	DVS	PHC			
Code	**Facility►** **Criterion▼**	**PHI-Patna**	**DVS-Patna**	Rajbanshi Sadar H	Danapur	Phulbari Sharif	**Average**
1	Pre-shipment and arrival procedures	**65%**	**NA**	NA	NA	NA	NA
2	Vaccine storage temperature	**86%**	**81%**	73%	43%	80%	**66%**
3	Cold store capacity	**58%**	**83%**	0%	0%	75%	**25%**
4	Building, cold chain equipment and transport	**71%**	**72%**	64%	85%	85%	78%
5	Maintenance of cold chain equipment and transport	**105%**	**67%**	79%	71%	86%	79%
6	Stock management	**59%**	**33%**	43%	30%	64%	**46%**
7	Effective vaccine delivery	**35%**	**39%**	64%	41%	41%	**48%**
8	Correct diluents use for freeze dried vaccines	**100%**	**10%**	63%	25%	50%	**46%**
9	Effective VVM use	**91%**	**100%**	78%	100%	63%	**80%**
11	Wastage	**0%**	**0%**	0%	14%	0%	**5%**

The consolidated results for State Vaccine Store, 1 DVS and 3 PHCs is given in Table 1. The resulting spider graphs for each level is given below.

Results of VMAT for three levels in Patna







Following the field visits, the 11 CSCs, WHO - SIO and one state refrigeration technician submitted their assessment results. Based on the detailed scores, the team reviewed the scores for each of the criterion from each region and its respective levels. The discussion was aimed at walking through the essential conclusions and there after derive the essential practicable recommendations through consensus.

The findings are given in the next section. Based on the detailed analysis of the results, the team members have been requested to prepare a report with the findings and conclusions specific to the region assessed by them along with recommendation. The resulting graphic representation for each of the RVS and their respective DVS and PHCs is given in Annexure F1 to F6 for respective regions.

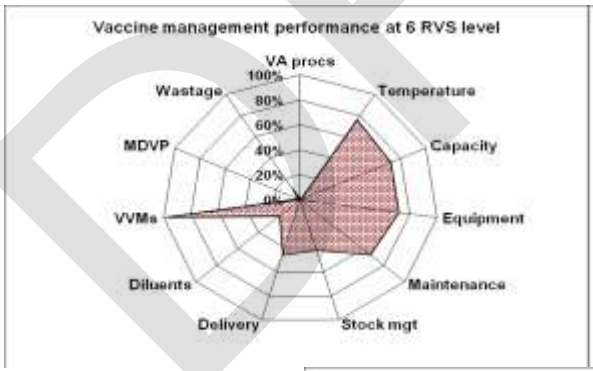
The consolidated table with detailed scores is given in Annexure G along with the averages resulting at each level. The summary of the consolidation is given in the table 2 below. Scores **less than 70% are marked in red** and those **above 90% in green**. .

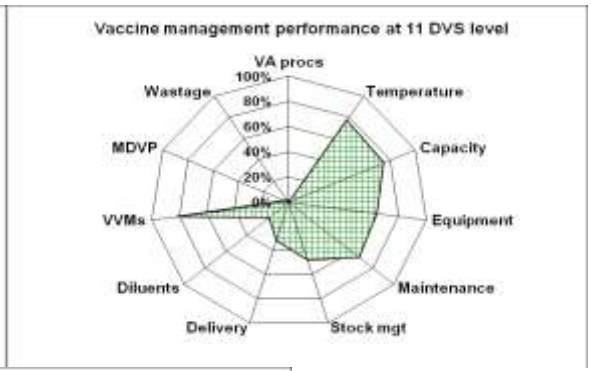
Table 2: Summary of Consolidated VMAT score for BIHAR

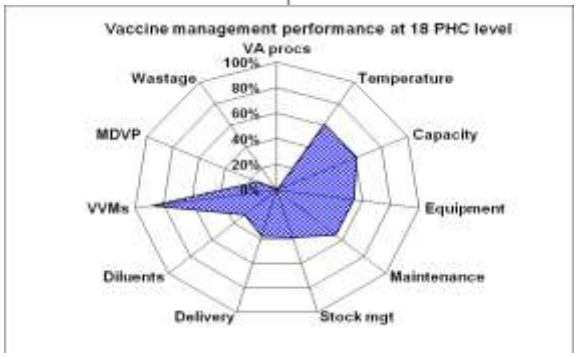
			AVERAGE of		
No.	**Criterion▼ Facility►**	**SVS**	**6 RVS**	**11 DVS**	**18 PHC**
1	Pre-shipment and arrival procedures	~~65~~	NA	NA	NA
2	Vaccine storage temperature	*86*	*76*	*78*	~~60~~
3	Cold store capacity	~~58~~	*72*	*75*	~~61~~
4	Building, cold chain equipment and transport	*75*	*72*	~~65~~	~~56~~
5	Maintenance of cold chain equipment and transport	**98**	~~67~~	~~68~~	~~55~~
6	Stock management	~~59~~	~~50~~	~~48~~	~~38~~
7	Effective vaccine delivery	~~33~~	~~46~~	~~35~~	~~39~~
8	Correct diluents use for freeze dried vaccines	**100**	~~21~~	~~22~~	~~30~~
9	Effective VVM use	**91**	**98**	*83*	*88*
10	Multi-Dose Vial Policy	~~0~~	~~0~~	~~3~~	~~15~~
11	Vaccine wastage control	~~0~~	~~11~~	~~2~~	~~1~~

Likewise, the resulting consolidated spider graphs for the 6 regional, 11 district level and 18 PHC level vaccine stores are given below for each level.

Results of VMAT for RVS, DVS ad PHC level







The findings are discussed below on the basis of the assesment, the spider graphs and the bar graphs obtained for each of the global criteria at the different vaccine store levels. Findings and Results of the Assessment

6. Findings and Results of the Assessment

In this secton the findings for each global criteria is presented and nalysed. First a general intorduction on what that creiteria is about is given in a greyed box. Then the performace score obtained from VMAT for different level is given. Then the strengths are listed followed by the weaknesses that need redressal. This is followed by specific recommendations for improving the performance, these are noted in smaler bold font preceded by arrow- bullet. Priority recommendations have been highlighted in blue.

6.1 Pre-shipment and arrival procedures

This indicator assesses the process of vaccine arrival from the manufacturer to the primary store. It verifies the proper receipt and recording of all pre-advice and arrival documents through the Vaccine Arrival Reports; the smooth clearing at the customs and adequate functioning by a clearing agent if engaged in the process.

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	~~65~~	*NA*	*NA*	*NA*

This criteria is applicable actually to national primary stores. In the case of Bihar it has used to assess the state vaccine store (SVS) at Patna. However, it should be noted that the SVS does not need to clear the vaccines through the customs, and hence it also does not use any service of a clearing agent. Therefore, in order to avoid loss of score due to these two aspects that are not applicable, the total score have been given for the customs clearance and "not applicable" (n/a) option has been exercised for the clearing agent. The final performance score is **65%.**

The shortfall is due to the incomplete records of the Vaccine Arrival Reports (VAR). Out of 74 lots of vaccines that arrived, only 28 lots of mOPV had complete VARs. The practice of filling VARs for each and every lot is missing. Since the mOPV supply contained VAR forms with instruction for filling them, these have been filled.

It is also worth noting that there have been a total of 74 lots that have in 6 months- equivalent to more than 12 lots each month. This imposes a significant load on the stock management and logistics.

Recommendations:

- **In order to ensure proper traceability of each lot of vaccine arriving in the state, it is recommended to fill up the VAR for and every type and lot of vaccine. The VAR should be verified by a supervisor and a copy should be sent to GOI or UNICEF as required for further record and follow ups.**
- **To reduce work load and support the store manager in better management the state should request GOI to supply large quantities of vaccines in each batch instead of several lots having small quantities.**

As this criterion is not applicable at RVS, DVS and PHCs it is not discussed at these levels.

6.2 Temperature Monitoring

All vaccines are sensitive biological substances. The higher the temperature to which the vaccine is exposed, the quicker is the loss of potency. Some vaccines are also sensitive to freezing, and this can cause irreversible damage.

The only way that it is possible to ensure that vaccines have been stored at the correct temperature at all times is by having adequate temperature recording at all stores having vaccines. In case of any danger, the vaccines can be saved using an adequate and ready contingency plan.

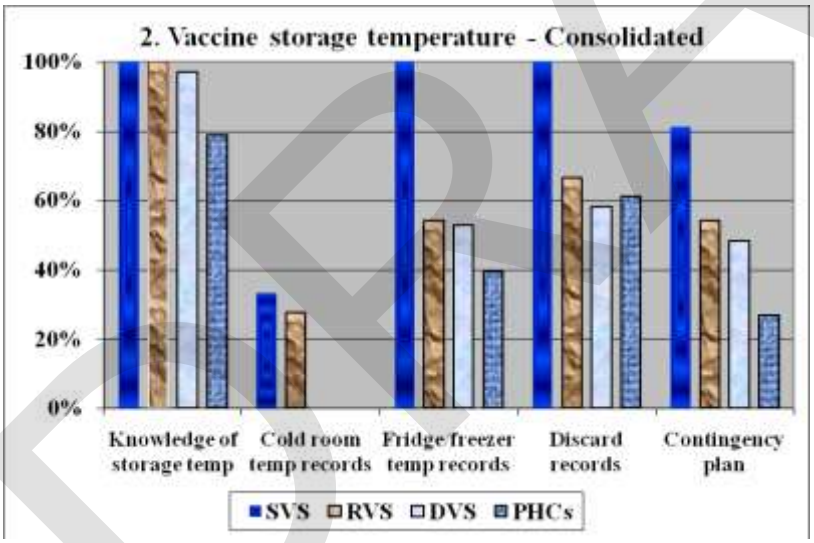
The following aspects are assessed here:

- Knowledge of the store keeper with regard to the storing temperature for the different vaccines and their sensitivity to freezing
- Continuous temperature records of the cold rooms and freezers rooms
- Twice daily manual temperature recording for all equipment storing vaccines
- Are these temperature records inspected regularly and retained for auditing purposes
- Whether the quantum of damaged vaccines due to improper storage is no more than 1%.
- Status of existence and implementation of contingency plan in case of any emergency.

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	*86*	*76*	*77*	~~61~~

The bar graph of the consolidated outcome for this global criterion at SVS, RVS, SVS and PHCs is given below.



Most of the staff knows the correct storage temperature of vaccines and their freeze sensitivity. The vaccines are taken good care based on this knowledge in most places. Some exceptions prevail at the PHC level due to frequent transfers and insufficient training. The staff are not familiar with the correct storage temperature of all antigens; in particular, the storage temperature of JE vaccines (which should be kept below 8°C, but may be frozen) has been misinterpreted.

7 day chart recorder

At SVS and all RVSs, the 7 day continuous temperature chart recorders attached to the WIFs and WICs have not been in operation since a long time – some since the time they have been installed several years ago –at Bhagalpur RVS since 1986, and at Aurangabad RVS since 3 years. Many of the acoustic alarms connected to WICs are also not functioning. At Saran RVS, manual recording of temperature is not carried out for any of the equipment. These are serious shortfalls since large quantities of vaccines are stored at these levels in the WICs and WIFs. These may be exposed to inappropriate temperatures and would go unnoticed if proper continuous recording is not carried out and warning of exposure to unsafe temperature range is not provided early enough.

- **Most of the chart recorders are outdated and cannot be repaired, or their accessories are no longer available. Hence the more practical solution would be to procure good quality chart recorders from local market for all the WICs with sufficient supply of accessories (paper and pens). This would**

also reduce the administrative load of ordering and procuring such items from Copenhagen.

Below SVS, complete manual records have been missing for many ILRs and DFs at all levels. At some places records have not been maintained at all or are missing for some of the equipment (e.g. Patna DVS); at Sheohar DVS records have been started only since April 2008; at Bettiya DVS record keeping was discontinued due to lack of recording notebook. There are also regular gaps in the records in other places on weekends and public holidays. At many locations the records have not been maintained for each and every equipment containing vaccine, whereas they have been maintained for DFs having ice packs. There have also been instances where the recorded temperature does not match with the actual temperature of the unit (mechanical noting of temperature without reading). At PHC level there are several instances where proper working thermometers are missing in every working equipment storing vaccine (e.g. Dehri PHC,). At Mehsi PHCs temperatures were not recorded, but the ILR was at minus 2^{o}C during the visit.

- **In order to ensure safe storage of vaccines, there is a need to maintain proper and complete temperature records of all equipment containing vaccines. The staff, particularly at PHC level, need to be trained in proper reading and recording of temperature.**
- **There should be sufficient supply of temperature recording notebooks and properly functioning thermometers at all levels.**

Records do not show any wastage of vaccines, which, if correct is a strength to be sustained. However, in reality, this is not always the case since many staff avoid noting wastage as this calls for long explanations and may result in some consequences.

JE Vaccines were kept out of the cold chain in one PHCs (E-Champaran) and in the benefit of doubt, were to be considered as wastage. In some PHCs, the T series vaccines were also found at ILRs having sub-zero temperature.

JE out of the cold chain

- **The staff need to be trained in noting of wastage at all levels with adequate documented proof.**

Most of the staff has some idea on how to handle emergencies. Many would resort to procuring ice from nearby facility and keep the vaccine in the Cold Boxes (CBs), even when considering large quantities. There is no written standard operating procedure for contingency, nor has there been any mock exercise. The emergency numbers are also missing at vital positions.

Emergency numbers at the entrance of Muzzafarpur vaccine store

- **Written contingency plans are needed at every level. This should include the safe hold over time of the equipment beyond which the action should be considered. It should also include periodic check of generator and fuel status. The staff should be trained in its implementation through mock exercise.**

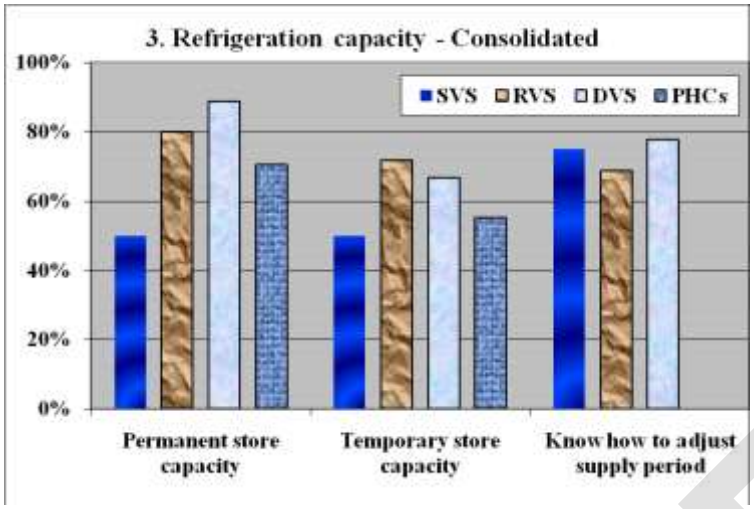
6.3 Cold storage capacity

Storage capacity should be adequate for routine as well as campaign vaccines. Hence the following issues are assessed:

- Sufficient storage capacity to accommodate peak level stock requirements including safety stocks, for the routine immunization schedule.
- Satisfactory arrangements need to be made to ensure that vaccine supplied for NIDs and campaigns can be temporarily accommodated if necessary in other storage facilities that meet WHO standards.
- The store keeper is knowledgeable how to adapt vaccine supply schedule to accommodate space requirements

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	~~58~~	*72*	*75*	~~61~~



The bar chart result at all 4 levels is given in the adjacent graph for the different criteria. The scores and the bar chart reflect insufficiency of storage capacity at all levels.

At the SVS there are 3 WICs and 2 WIFs. At each of the RVS there is one WIC, except at Purnia where there is an additional WIF. Annexure H gives the details of the equipment dimensions, gross and net storage volumes. The summary of the net storage capacity in the WICs and WIFs is provided in the table below.

Table 3 – total storage capacity at PHI and RVS'

Location	Patna		Aurangabad	Bhagalpur	Darbhanga	Motihari	Muzzafarpur	Purnia		Saran
WIC / WIF	*WIF*	WIC	WIC	WIC	WIC	WIC	WIC	WIC	*WIF*	WIC
Net Capacity (Litres)	*19,441*	46,399	12,827	9,633	18,729	18,729	9,633	9,633	*12,327*	12,827

Upon intimation of vaccine arrivals, the SVS store manager prepares to send off most of the vaccines to the RVS level. This has permitted to handle peak stocks, although on one instance the excess stock had to be sent back to the point of origin. This last instance raises questions regarding the sufficiency of storage space at SVS.

Annnexure I gives the details of the vaccine requirement for each region and district for the year 2008-09. Based on this, the total space required at SVS and RVS has been calculated. Details are given in Annexure J for the SVS and each of the RVS. The tables also show along with the space needed for the routine OPV, what was required for one typical polio campaign in 2007; the quantity shown is the average of the 10 full campaigns (the complete data of 2 other campaigns were missing). In short the campaign quantity approximately equals to the annual requirement for each level, which should also be accommodated.

The first table in Annexure J give the annual requirements for the whole state for each antigen along with the space needed to store 50% and 25% of this stock. If all the antigens except OPV are to be kept in the WIC, 25% of the annual requirement would occupy 50,746 litres of space where as only 46,400 litres is available in the 3 WICs. Clearly there is insufficient space to store even 25% of the requirement.

On the other hand there is just sufficient space in the WIF (19,441 Ltrs) to store 50% of routine OPV (6,362 Ltrs) and the quantum of one campaign (12,833 Ltrs). Obviously one does not expect all this load to be present at one go, however, the state store should be ready for such a peak situation.

Ideally, the state primary vaccine stores should have sufficient space to store 6 months of safety stock apart from the required working stocks of all antigens. Even considering 3 months of safety stock and 3 months of working stock one would need WIC storage space to be more than 102,000 ltrs.

- **There is clearly a need to enhance the capacity of the SVS further for 2-8^{o}C to ensure storage of at least 3 months of safety stock and 3 months of working stock of all antigens except OPV. It is**

however advised to enhance the capacity to store more than 3 months of safety stock.

Similar exercise can be carried out for the annual requirement for each RVS. The other tables in Annexure J give the details of the regional requirement of each antigen. The table below gives the summary of the net capacity available at each RVS along with the space that would be need to store 3 months of safety stock and 3 months of the working stock of all antigens except OPV.

	Location	WIC / WIF	Make	Net Capacity	Space required
				Ltrs	Ltrs
1	Aurangabad	WIC	Hurre	**12,827**	7,831
2	Bhagalpur	WIC	Foster	**9,633**	9,088
3	Darbhanga	WIC	Hurre	**18,729**	12,436
4	Motihari	WIC	Hurre	**18,729**	8,412
5	Muzzafarpur	WIC	Foster	**9,633**	8,491
6	Purnia	WIC	Foster	**9,633**	**16,043**
		WIF	Hurre	**12,327**	1,009
7	Saran	WIC	Hurre	**12,827**	8,324

There is sufficient space at all RVS except Purnia in the WICs to store a total of 6 months of vaccine stock. At Purnia, there is additional WIF space. One could use the WIF space to store the 6 months stock of Measles (4,450 Ltrs) and BCG (2,831 Ltrs). This would then reduce the WIC requirement to 10,762 Ltrs. This is still greater than the total net available space of the WIC. Clearly there is a shortage of WIC space at Purnia.

At RVS-Motihari the new cold room is not utilized adequately. The vaccine is still largely stored in ILRs.

Underutilized new cold room at Motihari

Due to the persistence of Polio virus in the state, the polio campaigns have been sufficiently frequent so as to be considered as an additional routine requirement. Currently during campaigns the vaccine store capacity is overloaded by the campaign stocks as the campaign OPV is stored in DFs at the RVS level. One could make use of WIC space in this case. However, figures show that the WIC total space at Bhagalpur and Muzzafarpur is not sufficient to store total routine and campaign requirements. The excess stock during campaigns also cause disturbance in indenting and procuring pattern due to the limited time and space available to care for the routine vaccines.

There is need to address this situation in a manner that both the routine and campaign immunizations can be conducted with ease.

- **At all RVS level, additional WICs should be installed to ensure sufficiency of storage space for routine and campaign vaccines. This will ease out the periodic load caused by the Polio campaigns and also provide safety for routine vaccines in case of equipment failure, since many of the RVS WICs are old. It will also provide space for the introduction of new vaccines in future.**

Note that when stored at 5°C OPV can remain potent for 225 days. Campaign vaccines would normally be used within two consecutive campaigns – at most in 6 months. Hence the choice to have an additional WIC, which would also be useful to store the other vaccines in future.

The campaigns also overload the DVS and PHCs. Besides, at these levels some of the cold chain capacity is also occupied with vaccines for Rabies, Kalazar etc.

- **There is a need to ensure adequate cold chain capacity at all DVS and PHCs considering other vaccines. It would be still better to have a separate refrigerator for storing the other vaccines and drugs which do not belong to the immunization programme.**

Most staff have some idea on how to handle excess stock. Campaign vaccine is pushed down immediately on arrival. At lower levels the idea of storing excess stock in CB or local facilities is feasible, the same would however not work at RVS level where the CBs or IP would not suffice.

- **Staff need to be trained in handling of excess stocks based on available space in the local private facilities and that at lower levels.**

6.4 Status of Building, Equipment and Transport

The good operating conditions of the building housing the vaccine store, the equipment storing the vaccines and the vehicles are important aspects to ensure safety of the vaccines.

The elements that are assessed here are :

- The quality of building keeping the appliances and equipment,
- The space available for working,
- Correct operation of all equipment (WIF, WIC, DF and ILRs) for maintaining correct temperature
- Working acoustic alarm and 7 day graphic chart recorder
- Proper working condition of the stand-by generator and sufficiency of fuel,
- Good operation of all transport vehicles.
- Sufficient number of cold boxes, vaccine carriers and Ice packs.

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	*75*	*72*	~~64~~	~~54~~

The scores and the summary table below reflect the status of the equipment and building.

Summary of status at SVS and RVS'

RVS (Store Location)	PHI-Patna	Aurangabad	Bhagalpur	Chappra	Darbhanga	Motihari	Muzaffarpur
Store keeper	1	1	1	1	1	2	2
100% Duty	Yes	Yes	Yes	Yes	Yes	Yes	Yes
no. of Techni-cians	3	0	1	0	1	0	0
Is facility suitable	Y	X	X	Y	Y	X	X
Dry space	Y	X	X	X	X	X	X
WIC/ WIF	3 WIC 2 WIF	1 WIC	1 WIC	1 WIC	1 WIC	1 WIC	1 WIC
Servo-stabillizer working	Y	Y	Y	Y	Y	Y	Y
Chart recorder working	X	X	X	X	X	X	X
Manual temp records ok	Y	Y	Y	Y	Y	Y	Y
Accoustic alarm working	Y	X	X	X	Y	Y	X
Generator Status	4-Old 1 New	Hired	Old	Old	New	New	Old
Generator Autostart fuctionning	Y	X	X	X	X	Y	X
Fuel for generator available	Y	Y	Y	Y	Y	Y	Y

All aspects that are in order and positive are marked in green. Those that are unacceptable or of concern are marked in red. The strengths emerging from the assessment and the table are :

1. All WICs and the WIF have twin working refrigeration units,
2. The equipment are maintaining correct temperatures,
3. All units have their servo-stabilizer in working condition,
4. The back-up generators are present and working,
5. Transports of vaccines have taken place without problems.

On the other hand the areas of concern are :

1. 4 out of 6 RVS have inadequate facility in terms of total space, packing area and office.
2. All dry space at each RVS is filled with clutter of old disposable materials.

3. All continuous temperature recorders and most acoustic alarms are out of order (as already mentioned earlier)
4. Poor ventilation at many vaccine stores (eg. Motihari RVS),
5. Several generators are old and would need to be replaced in next couple of years,
6. The old generators do not have auto-start mechanism,
7. The general electrical wiring at most places is rather of poor quality, a potential source of equipment failure,
8. During the **visit to a total of 34 sites** (6 RVS, 11 DVS and 18 PHCS) a total of **27 cold chain equipment (16 DFs and 11 ILRs) were found to be out of service** and awaiting repair since several weeks if not months. This is an unacceptable proportion of non-functioning equipment and reflects the poor quality of repair service provided by the service provider. Several other ILRs were not functioning correctly, either cooling too much or not enough.
9. Response time of the service provider is long. The quality of repair service provided in several places has been poor. Initials visits have been conducted rapidly to put the rapid response on record. However, the visit has not yielded much result and the follow up thereafter has been rather poor and the repairs unsustainable as seen from 27 equipment that were found out of order.
10. There is shortage of CBs and VCs at many places.
11. Transport funds for collecting vaccines is uniform at each level. This causes financial constraints on vaccine stores that are more distant than others,

Old materials occupying usable space in several vaccine stores

As a general observation, at most places lot of old marerial is cluttering the stores. This includes old documents and stationnary, glass wares, broken VCs and CBs and condemned ILRs and DFs. Even the RVS (e.g. Muzzafarpur, Motihari and Darbhanga) are no exception to this. All this not only occupies space that could be better utilised as dry or working space but also creates a disorderly environment. Besides this clutter several stores are having inadequate space for dry space and packing area.

Even at the SVS, the store manager's office is dark, poorly ventillated and cluttered with lots of old material. The old store space is also poorly organised. On the other hand the large new hall is spacious, but the sapce is not used optimally.

- **There is an urgent need to define policy on how to dispose off all unusable items (right from extra packing carton to condemned equipment) and implement the same in order to optimise use of all usable space. Some measures towards this is already being done,**
- **At all levels, the immunization programme should have proper dedicated space with adequate spaces as the office for the immunization officer and the store keeper.**
- **The old stationary and records can be better stored in metal boxes which will look neat and protect the archives from rodents.**
- **Ventilation in the SVS and some RVS need to be improved**
- **All repairable cold chain equipment, including stabilizers, needs to be put into operation with priority,**
- **The service provider needs to shorten its response time.**

- **Electrical wiring needs to be improved in most places. In particular proper earthing needs to be provided to all equipment.**
- **Provide sufficient CB and VC at each level where there is shortage**
- **Funding for transport should be commensurate with the distance from the upper level.**

6.5 Maintenance of Building, Equipment and Transport

For ensuring a sustainable safety of the vaccines, the building, equipment and transport vehicles need to be maintained and upgraded periodically. Hence it is important to ensure that:

- **A replacement plan is in place for all outdated equipment and vehicles, and the same is being implemented,**
- **A periodic preventive maintenance plan for equipment and vehicles is also in place and being implemented,**
- **All equipment or vehicle failure is attended rapidly and that such failures have not caused damage to any vaccine,**
- **None of the equipment or vehicles have been out of service for more than 7 days due to lack of spares.**

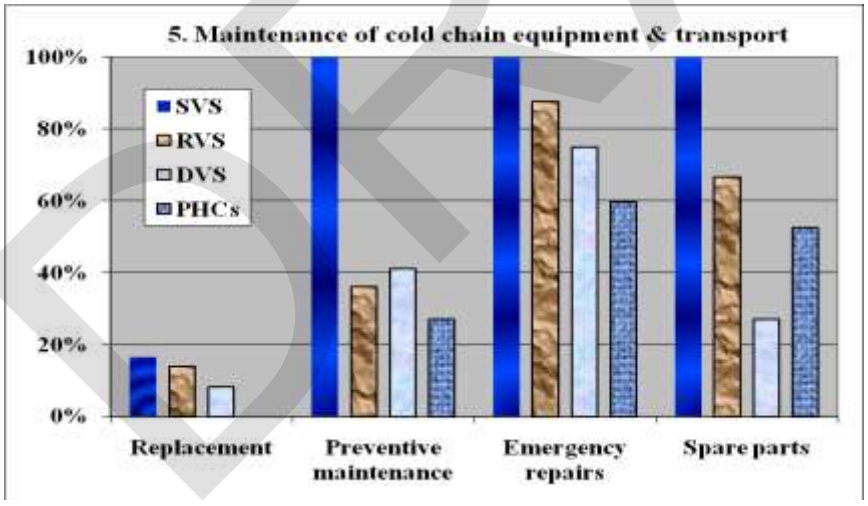
Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	98	~~67~~	~~67~~	~~54~~

The score above and the bar graph reflect the areas of strengths and weaknesses. Only at SVS the score is good. At all other levels it is rather of concern.

At the SVS, the technical staff have been intervening for repair and service rapidly and spares have been avialable for intervention to equipment.

However, there is no proper repacement plan for old equipment at any level. The maintenance and repair service provided by Voltas is very dissatisfactory.



Hence in order to redress these issues the following recommendations need to be implemented:

- **A comprehensive plan for upgrading and strengthening of CC equipment at all levels needs to be drawn, taking into account the storage needs at each level as discussed in the earlier section and condition of the current equipment.**
- **The replacement plan should also include the replacement for old generators, as well as equipping of 129 new PHCs,**
- **The new generators should have working auto-start mechanisms**
- **The preventive maintenance should be integrated in the contract with the service provider. There should be an appropriate log sheet to keep a service and repair history of each equipment. A sample of log sheet for WIC / WIF is enclosed in Annexure K.**
- **In order to ensure sustainable operation, there is an imperative need to monitoring all repair and maintenance services provided by the contracted agency.**

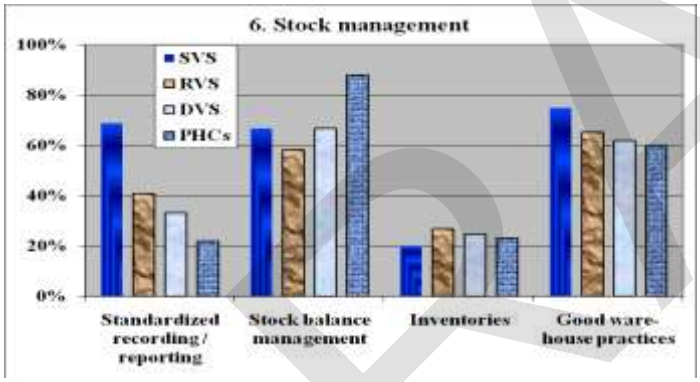
6.6 Stock Management

In order to maintain the quality of vaccines throughout the cold chain, it is essential to keep complete and accurate records of all stock transactions. A stock control system comprises of three steps, each of which must be performed regularly, accurately and completely. The three steps are checking and recording details of vaccine consignments or stocks when: 1. they arrive, 2. during their storage and 3. they leave the storage point. Here the following issues are assessed:

- **All lots of vaccines and diluents have been recorded along with all their salient parameters,**
- **Proper requisition and receipt forms are in place,**
- **Stocks are maintained between safety and maximum stock levels,**
- **Stocks are well laid out with contents list**
- **Deliveries are made following Early Expiry First Out (EEFO),**
- **Store keepers know when to over ride EEFO based on VVM status,**
- **Periodic physical verification are carried out and**
- **Stocks and records are safe.**

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	~~59~~	~~42~~	~~48~~	~~39~~



For this and next criteria the performance at all levels drops significantly and is a cause of concern.

The two strengths are that the vaccines stocks and their records are in safe environment, almost at all levels.

Considering the score and related bar graph the following weaknesses are identified:

1. At all levels there are gaps in the record keeping. Except at SVS, most of the salient parameters of the diluents are missing.
   a. The batch numbers, expiry date and quantities of diluent is not noted,
   b. The vial size for vaccine and diluent is not noted,
2. The status of VVM on receipt and despatch of vaccines is not noted, not even for OPV.
3. There is not proper requisition form, blank sheet is used to indent vaccine requirement.
4. There is no notion of minimum and maximum stocks. Most often the lower level request for supplies when they are running out or the upper level informs them of new supplies that have arrived from the still higher level.
5. Due to the lack of concept and practice of safety stock there have been stock outs of several antigens at different levels. Even at SVS, TT is out of stock since last couple of months.
6. Very few stores have been conducting physical verification of stocks. In most places the actual stock of BCG or Measles do not match with the register. Where diluent quantities have been noted, these also do not match. In particular the mismatch for diluent is significant in certain cases due to breakage of diluent. This leads to the temptation of using saline water or even distilled water which is against the rule and a hazardous practice.
7. In many stores, due to the unwanted clutter of non-usable material and stationary, there is poor warehouse practice.

With these serious shortcomings it is necessary to redress the concerns and enhance the performance

with the help of the following recommendations:

- **The stock register has provision to note the status of VVM. There is a need to train health staff and institutionalize the practice of noting VVM status on receipt and despatch,**
- **Standardized stock register to include diluent parameters,**
- **Impart training on use of stock register at all levels with all salient parameters,**
- **Define safety stock and working stock based on requirement based on target beneficiaries & cold chain capacity. In earlier sections the estimate of 3 months of safety stock and working stock was given for SVS and RVS level. At DVS and PHC level, it is recommended to keep respectively 2 months and 1 month of safety stock besides the working stock,**
- **RIMS implementation should be prioritized, this will allow routine assessment of some of the basic parameters of the vaccine logistics,**
- **Stock should be verified periodically, and consequently the stock book should be updated as required.**
- **It is also recommended to make use of batch cards. A sample is provided in Annexure L.**
- **Policy & training on proper management of Vaccine or diluent when either is broken should be imparted.**

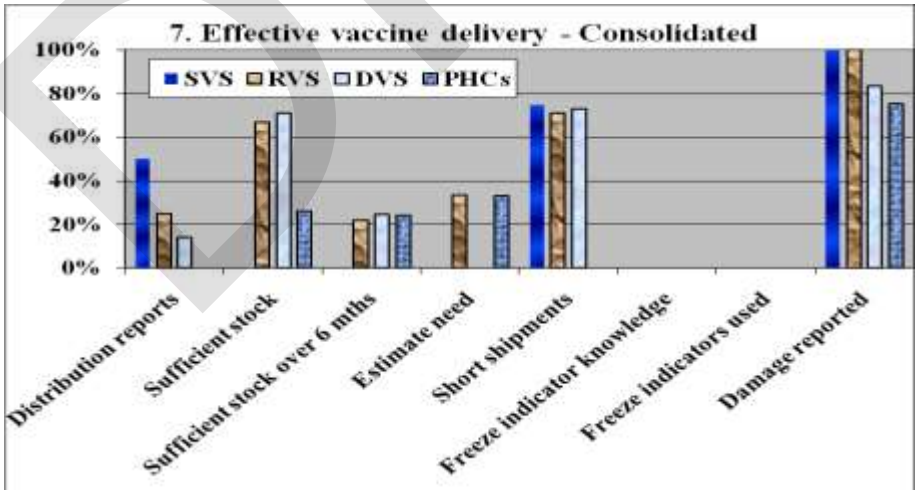
6.7 Effective Vaccine delivery

For an effective immunization programme timely deliveries and sufficiency of stocks are necessary. The parameters assessed to ensure the effectiveness of delivery are:

- **The vaccine distribution system is planned and implemented in timely fashion,**
- **Sufficient stocks of vaccines and diluents are available for supplies to the lower level stores,**
- **There is sufficient stock until next delivery,**
- **Staff is knowledgeable on how to estimate the vaccine requirements,**
- **A system is in place for managing the short supplies if it occurs, and**
- **Freeze indicators are correctly used in all deliveries.**

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	~~33~~	~~46~~	~~32~~	~~38~~



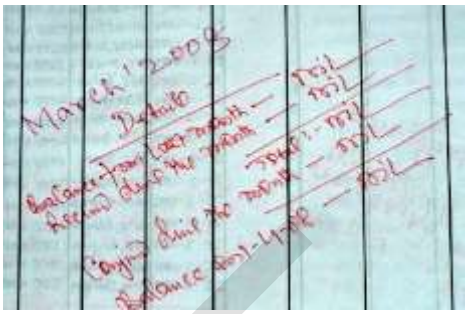
Here again, except for the last criterion on reporting of damage during transport, all other criteria is performing poorly at all levels.

Once again, looking at the spider graph and the related adjacent bar graph the following weaknesses can be mentioned:

1. At the SVS, there have been 74 lots of vaccines including 28 lots of campaign OPV which have arrived in the last 6 months. These arrival have been irregular,
2. As a result, though there is a delivery plan from SVS, it has not been possible to always follow

the plan.

3. Since there is no concept of safety stock, there have been instances of stock outs of vaccines at many places right from the SVS jeopardizing the immunization programme. Typical examples are tOPV, DT and DPT at Darbhanga RVS, and DPT and TT at SVS,
4. Request to GoI for supplies of TT and DPT have not been responded in time resulting in stock-outs. TT was out of stock since February 2008,
5. Finally, at most levels frozen IP are used without conditioning and sent along with T series vaccines, putting the vaccines to serious risk of freezing. Even at SVS, despatch to Purnia was found to be prepared in this manner during the assessment visit,
6. The system is not using any freezer indicator to monitor temperature / status of freeze sensitive vaccines during transport, especially considering that frozen IP are used during transport of T series vaccines.



Stock-out info of TT in SVS register

Thus, these issues are seriously compromising the immunization programme severely by damaging the at several points of delivery, None of the damage is ever noted, as in many cased it is not even recognised. Worse still, the vaccines are being used as if "Potent" with a very serious risk of jeopardizing the very immunization programme in case the same vaccine preventable disease occurs in any of these areas.

There is a need to address the above issues with urgency. The suggestions for its redressal as given under urgent training requirements hereunder:

- **Define a comprehensive indent and distribution plan – at all levels starting from GoI down to PHC based on safety stocks requirements, working stocks and available storing space**
- **Define safety and working stocks for all levels and implement them,**
- **Define a comprehensive indent & supply form which also includes the details of quantities used and balance in stock. An example of such an indent form is given in Annexure M**
- **Training on proper icepack conditioning & vaccine packing needs to be reimparted at all levels**
- **Provide and implement use of freeze indicators at all levels for use during transport of freeze sensitive vaccine**
- **Monitor some dispatch & storage of vaccine using freeze indicator**

6.8 Correct diluents use for freeze dried vaccine

For the freeze dried vaccines the following parameters are assessed:

- **The freeze dried vaccines and their corresponding diluents are correctly ordered, received, stored and distributed,**
- **The vaccines are always used with their corresponding diluents,**
- **Diluents are maintained at 2-6 C, same as the vaccine before reconstitution.**

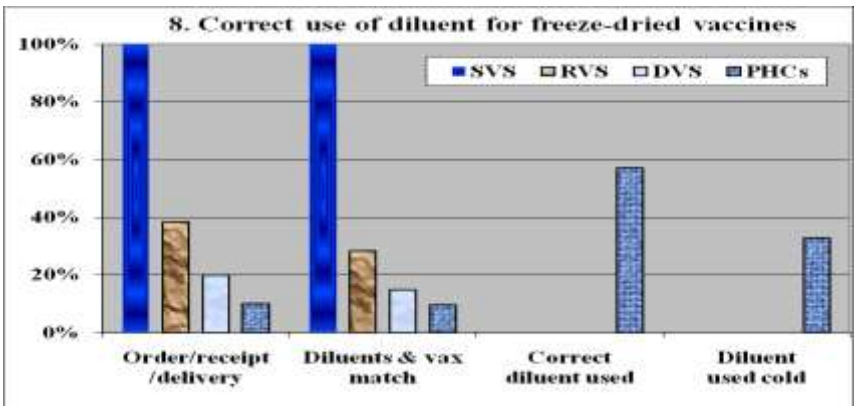
Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	**100**	~~**20**~~	~~**19**~~	~~**30**~~

At the state vaccine store, there is a good management of the diluents. Receipts and supplies are done in matching numbers. This is reflected by the perfect score at SVS.

However, at lower levels, the score dips drastically. The responsible parameters are identified from the adjacent graph:

Under utilized new cold room at Motihari



1. There is discrepancy between the quantity of vaccine and diluents at many places. As an example at Saran RVS there are 60 vials of diluent for 900 vials of BCG. As a result the correct quantities cannot be supplied to lower levels.
2. Some store keepers do not know the importance of handling the diluent as a counterpart of the vaccine,
3. At the PHC level, besides the discrepancy in numbers there are three issues of major concern:
   - **Saline or distilled water is used in some places in place of diluents.**
   - **Diluent is not always cooled down to the same temperature as the vaccine before reconstitution. Often the diluents is removed from ambient stock, kept close to the IP for 15 minutes and then used for reconstitution.**
   - **Staff often carry the vaccines in the VCs and the diluent in their pockets to avoid breakage when going to outreach sessions.**

These practices are detrimental to the immunization goals and must be stopped immediately.

Hence the merging recommendations are :

- **There is an urgent need for training staff in handling, indenting & management and use of diluent particularly at DVS and PHC levels. This should include the practice of putting the diluent at 2-8C at least 12 hours prior to immunization.**

6.9 Effective VVM use

VVM are correctly interpreted and used in vaccine management of the EPI programme.

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	**91**	**98**	*82*	*88*

This criteria has the maximum, and commendable score at all levels. This is essentially thanks to the training obtained for the pulse polio campaigns. All staff are familiar with the VVM, its interpretation and its use.

The only small shortfall is the absence of poster or stickers in most places and some of the vaccine handlers and store keepers are confused with the 4th stage of VVM.

- **In all trainings of vaccine handlers and immunzation staff, to devote 10 minutes for a quick revision and clarifications related to VVM.**

6.10 Multi Dose Vial Policy

The MDVP is implemented correctly.

Vaccine Store	State	Regional	District	PHC
Performance Score	~~**0**~~	~~**0**~~	~~**3**~~	~~**15**~~

As the govt. of India has not adopted this policy, this criterion is not assessed systematically. However,

at service delivery level there have been startling findings. This results in a non-zero score at this level.

There have been circulars regarding reuse of unfinished vials during the Polio campaigns which are conducted over a period of one week at most. However, there seems to be a misinterpretation of this directives meant exclusively for OPV. In East and West Champaran districts these directives have been extended to the routine immunization. Partially used vials of all antigens have been found in the cold chain. This practice has continued, since it allows for additional buffer that protects from shortfall in stocks since supplies do not always arrive as indented.

The above case is a dangerous fallout of the unsystematic and incomplete supply of vaccines which have posed a threat to the continuity of the immunization programme. This practice, in the absence of proper training in MDVP for the different vaccines can lead to serious if not fatal AEFIs. The danger arises from extensive use of ice during transport of vaccines to the field, which is most likely to wet and contaminate the exposed caps of the half used vials. The wetting is also likely to damage the labels and the VVMs.

On the other hand, proper supply clubbed with a system of safety stock should avoid any temptation of conserving half used vials for reuse.

- **There is need to provide unambiguous instructions for reuse of OPV vials exclusively and not of any other vaccines.**
- **Staff need to be informed of the dangers of poor open vial practice**

6.11 Vaccine wastage control

A vaccine wastage monitoring system should be in place so that the store manager can use it to assess wastage and also make necessary corrections when re-ordering vaccines. The information should be used to incorporate improvements in the system to reduce wastage in future.

Findings

Vaccine Store	State	Regional	District	PHC
Performance Score	~~0~~	~~11~~	~~2~~	~~1~~

This criterion has been assessed without giving it too much of importance. In a state where coverage is as low as 37%, all efforts that lead to increasing the coverage should be given a greater priority, including ensuring excess of vaccines supply to avoid stock outs. Hence, monitoring and using the recoded data of wastage is not the top on the agenda. In fact, it is preferable to accept a certain level of wastage and ensure that potent vaccines are available for every child.

In most places staff have poor knowledge about wastage. There is no system to monitor, record and eventually use it to reduce wastage and adapt future indents.

In the opinion of the consultant, wastage issue should be undertaken when the performance of other criteria have improved through institutionalising good practices and establishing a good operational immunization programme with improved coverage.

7. Summary of Recommendations

In the previous section the recommendations have already been included along side the weaknesses they are meant to address. There is a significant level of work to be done. In this section the key recommendations have been consolidated for a quick reference. These have been categorized into the following four areas:

I. Core

II. Technical

III. Logistics

IV. Capacity building

V. Practices to be implemented and

The top priority items in each section are highlighted in blue.

I. Core:

The progress of state immunization programme, while on an increasing trend, has none the less been considerably slow till date. To add further impetus to these efforts the SHS has launched the MUSKAN initiative, with an objective to achieve 100% coverage. This is an important and necessary step. While both these programmes, are on the top priority of the state, more is needed to ensure definite and concrete progress.

In order to ensure the success of the initiative and reaching the targets the SHS should strengthen its infrastructure. These steps though should include :

1. Appoint a dedicated District Immunization Officer (DDIO) who will have full responsibility including financial, and accountability of the immunization programme of his district. He should not be burdened with other non-immunization related health or admin activities.
2. Define and allocate sufficient dedicated space (store or immunization room) at every level for the Vaccine storage, dry storage and immunization (at service level).
3. At each of these facilities there should be a full time dedicated store manager. Where the load of operations is high (SVS and RVS) the store manager should have adequate support staff to help him.
4. The specific responsibilities of each staff should be clearly defined.
5. Appoint a team consisting of technical and training expert who will monitor the proper operations of the immunization programme including vaccine management and logistics at all levels in an independent manner and report to the SHS.

II. Technical:

1. Most of the chart recorders are outdated and cannot be repaired, or their accessories are no longer available. Hence the more practical solution would be to procure good quality chart recorders from local market for all the WICs with sufficient supply of accessories (paper and pens). This would also reduce the administrative load of ordering and procuring such items from Copenhagen.
2. There is clearly a need to enhance the capacity of the state vaccine store further for 2-8^{o}C to ensure storage of at least 3 months of safety stock and 3 months of working stock of all antigens except OPV. It is however advised to enhance the capacity to store more than 3 months of safety stock at the state level.
3. At all RVS level, additional WICs should be installed to ensure sufficiency of storage space for routine and campaign vaccines. This will ease out the periodic load caused by the Polio campaigns and also provide safety for routine vaccines in case of equipment failure, since many of the RVS WICs are old. It will also provide space for the introduction of new vaccines in future. Alternatively more RVS may be considered to devide the burden on each RVS.

4. Ventilation in the SVS and some RVS need to be improved.
5. All repairable cold chain equipment, including stabilizers, needs to be put into operation with priority.
6. There is a need to ensure that the service provider shortens its response time and improves the quality of its repair service.
7. Electrical wiring needs to be improved in most places. In particular proper earthing needs to be provided to all equipment.
8. A comprehensive plan for upgrading and strengthening of CC equipment at all levels needs to be drawn, taking into account the storage needs at each level as discussed in the earlier section and condition of the current equipment.
9. The replacement plan should also include the replacement for old generators, as well as equipping the 129 new PHCs.
10. The new generators should have working auto-start mechanisms.

III. Logistic:

1. To reduce work load and support the store manager in better management the state should request GOI to supply large quantities of vaccines in each batch instead of several lots having small quantities.
2. There should be sufficient supply of temperature recording notebooks and properly functioning thermometers at all levels.
3. There is a need to ensure adequate cold chain capacity at all DVS and PHCs considering other vaccines. It would be still better to have a separate refrigerator for storing the other vaccines and drugs which do not belong to the immunization programme.
4. There is an urgent need to define policy on how to dispose off all unusable items (right from extra packing carton to condemned equipment) and implement the same in order to optimise use of all usable space. Some measures towards this is already being done.
5. The old stationary and records can be better stored in metal boxes which will look neat and protect the archives from rodents.
6. The larger hall of the vaccine store at PHI should be utilised to organise better the dry storage and store keeper's office.
7. Provide sufficient CB and VC at each level where there is shortage.
8. Funding for transport should be commensurate with the distance from the upper level.
9. The preventive maintenance should be integrated in the contract with the service provider.
10. In order to ensure sustainable operation, there is an imperative need to monitoring all repair and maintenance services provided by the contracted agency.
11. Define safety stock and working stock based on requirement, target beneficiaries & cold chain capacity. In earlier sections the estimate of 3 months of safety stock and working stock was given for SVS and RVS level. At DVS and PHC level, it is recommended to keep respectively 2 months and 1 month of safety stock besides the working stock.
12. Define a comprehensive indent and distribution plan – at all levels starting from GoI down to PHC based on safety stocks requirements, working stocks and available storing space.
13. Define safety and working stocks for all levels and implement them.
14. Define a comprehensive indent & supply form which also includes the details of quantities used and balance in stock. An example of such an indent form is given in Annexure M .
15. Provide and implement use of freeze indicators at all levels for use during transport of freeze sensitive vaccine.
16. Monitor some dispatches & storage of vaccine using freeze indicators.

IV. Capacity building:

Training to related health staff needs to be imparted on the following aspects:

1. Handling of excess stocks based on available space in the local private facilities and that at lower levels.
2. Use of stock register at all levels with all salient parameters including VVM status.
3. Proper management of Vaccine or diluent when either is broken.
4. How to note wastage at all levels with adequate documentation of proof.
5. Ice-pack conditioning & vaccine packing.
6. Handling, indenting & management and use of diluent particularly at DVS and PHC levels. This should include the practice of putting the diluent at 2-8C at least 12 hours prior to immunization.
7. Instructions related to reuse of OPV vials exclusively and not of any other vaccines.
8. Dangers of poor open vial practices.
9. How to operate and change over safely to back-up generator power during power failure.

V. Practices to be implemented:

1. In order to ensure proper traceability of each lot of vaccine arriving in the state, it is recommended to fill up the VAR for and every type and lot of vaccine. The VAR should be verified by a supervisor and a copy should be sent to GOI or UNICEF as required for further record and follow ups.
2. In order to ensure safe storage of vaccines, there is a need to maintain proper and complete temperature records of all equipment containing vaccines. The staff, particularly at PHC level, need to be trained in proper reading and recording of temperature 7 days on 7.
3. Written contingency plans are needed at every level. This should include the safe hold over time of the equipment beyond which the action should be considered. It should also include periodic check of generator and fuel status. The staff should be trained in its implementation through mock exercise.
4. Standardized stock register to include diluent parameters,
5. RIMS implementation should be prioritized, this will allow routine assessment of some of the basic parameters of the vaccine logistics,
6. Stock should be verified periodically, and consequently the stock book should be updated as required,
7. In all trainings of vaccine handlers and immunzation staff, devote 10 minutes for a quick revision and clarifications related to VVM.

Much is wanting and unless adequate and rapid action is taken now. Taking the Muskan initiative as a driving force, Bihar can make significant progress for years to come.

As a very first step it is recommended that the MoH should define an action plan with clearly defined time frames to implement the recommendations given above.

Let us care for the vaccines for the sake of our children

Acknowledgement

The Consultant would like to first thank UNICEF for offering me this opportunity to contribute towards the efforts to improve their vaccine management system across the state of Bihar. The support from Dr. Sherin Varkey, Dr. Narottam Pradhan and Mr. Preetam Patro has been of utmost value for the initiation and fulfilment of this mission.

The entire exercise of training and field assessment would have lost its charm and worth without the zeal and efforts put in by the whole team of Child Survival Coordinators of UNICEF and the SIO of WHO. The active participation of all the other staff from GoB at the induction training made it all the more dynamic and interesting. It is hoped that these efforts will percolate to more people through capacity building to make the whole effort more sustainable.

Thanks to this exercise and the previous one at Orissa, the consultant has acquired a very valuable experience in the training of teams in VMAT which is a very powerful tool for self assessment of vaccine management. Only time can tell its true benefits when such capacity is disseminated to more and more health associated staff.

ANNEXURES

A – Schedule of the induction programme

Wednesday - 9 April 2008

Starting time	Topic
9:00 AM	Registration
9:15 AM	Welcome and Ice breaker
9:30 AM	Introduction to the Training programme
9:45 AM	Programme of the day + House rules
10:00 AM	Tikayana
10:15 AM	*Tea Break*
10:45 AM	Origin of assessments
11:15 AM	Introduction to VMAT
11:30 AM	Questionnaires 1 to 3
12:45 PM	Details of field work
1:00 PM	*Lunch*
2:00 PM	**Field work - Collection of data at respective stores**
4:30 PM	**Return to Venue - Submission of data**
5:00 PM	Evaluation of the day

Thursday - 10 April 2008

Starting time	Topic
9:00 AM	Energiser
9:15 AM	Programme of the day
9:30 AM	Discussion on the experience of the previous day - Q 1-3
10:30 AM	Questionnaires 4-6
11:30 AM	*Tea break*
12:00 PM	Questionnaires 4-6 Continued
1:00 PM	*Lunch break*
2:00 PM	**Field work - Collection of data at respective stores**
4:30 PM	**Return to Venue - Submission of data**
5:00 PM	Evaluation of the day

Friday – 11 April 2008

Starting time	Topic
9:00 AM	Energiser
9:15 AM	Programme of the day
9:30 AM	Discussion on the experience of the previous day - Q 4-6
10:30 AM	Questionnaires 7-11
11:30 AM	*Tea break*
12:00 PM	Questionnaires 7-11 Continued
1:00 PM	*Lunch break*
2:00 PM	**Field work - Collection of data at respective stores**
4:30 PM	**Return to Venue - Submission of data**
5:00 PM	Evaluation of the day

Saturday – 12 April 2008

Starting time	Topic
9:00 AM	Energiser
9:15 AM	Programme of the day
9:30 AM	Discussion on the experience of the previous day - Q 7-11
10:30 AM	Analysis Discussion on the results
11:00 AM	*Tea break*
11:30 AM	Analysis Discussion on the results continued
1:00 PM	*Lunch*
2:00 PM	Energiser
2:15 PM	**Field Assessment plans and team formation and instructions**
2:45 PM	Miscellaneous issues
3:15 PM	Feedback on training session.
3:30 PM	Closing session
4:00 PM	*Tea break*

B – Plan and groups for field exercise

Day 1					
	Team 1	**Team 2**	**Team 3**	**Team 4**	**Team 5**
Type of VS	**SVS**	**DVS**	**PHC-1**	**PHC-2**	**PHC-3**
Name of VS	PHI-Patna	Patna	Phulwari Sharif	Danapur	Rajbanshi Nagar H.
Form to be used	National	Sub-national	Service	Service	Service

Day 2					
	Team 1	**Team 2**	**Team 3**	**Team 4**	**Team 5**
Type of VS	**PHC-3**	**PHC-2**	**DVS**	**PHC-1**	**SVS**
Name of VS	Rajbanshi Nagar H.	Danapur	Patna	Phulwari Sharif	PHI-Patna
Form to be used	Service	Service	Sub-national	Service	National

Day 3					
Type of VS	**PHC-2**	**PHC-3**	**SVS**	**DVS**	**PHC-1**
Name of VS	Danapur	Rajbanshi Nagar H.	PHI-Patna	Patna	Phulwari Sharif
Form to be used	Service	Service	National	Sub-national	Service

Team formations for field training					
Category	**Team 1**	**Team 2**	**Team 3**	**Team 4**	**Team 5**
Team Leader	**Er. Alok Ranjan**	**Dr Syed Haider Hussain**	**Dr Syed Hubbe Ali**	**Dr Anand Rai**	**Dr Preeti H. Negandhi**
UNICEF	Dr Norrotam Pradhan	Dr Rajashree Roy	Dr Ashok Shirang Sankpal	Dr. Vijay Kumar	Dr. Satyabrata Routray
	Mr Rakesh Kumar Jha		Dr Shailesh B Jagtap		Dr Alok Ranjan
GOB		Dr R.P.Swetanki	Dr Prabhunandan Prasad	Dr Gopal Krishna	Dr Manika Sinha
	Mr Surajnandan Sinha	Ms Ranjulata	Mr Mokhtar Singh	Mr Md Hashmi	Mr Shishupal Kumar

C – List of Participants and Facilitators

#	PARTICIPANT	Designation		Location
1	Dr Manika Sinha	Director - PHI	GoB	
2	Dr R.P.Swetanki	DIO,	GoB	Patna
3	Dr Prabhunandan Prasad	DIO,	GoB	Vaishali
4	Mr Alok Ranjan	CCO	GoB	Patna
5	Mr Surajnandan Sinha	Storekeeper, PHI,	GoB	Patna
6	Mr Mokhtar Singh	Technician, PHI,	GoB	Patna
7	Mr Shishupal Kumar	Clerk, RVS,	GoB	Muzaffarpur
8	Ms Ranjulata	Storekeeper, DVS,	GoB	Vaishali
9	Mr Md Hashmi	Storekeeper, DVS,	GoB	Patna
10	Dr Norrotam Pradhan	Sr Consultant - RI	Unicef	Patna
11	Dr Rajashree Roy	CSC	Unicef	Vaishali
12	Dr Syed Hubbe Ali	CSC	Unicef	Darbhanga
13	Dr Ashok Shirang Sankpal	CSC	Unicef	Koshi
14	Dr Shailesh B Jagtap	CSC	Unicef	Munger
15	Dr Preeti Sanzgiri	CSC	Unicef	Tirhut
16	Dr Anand Rai	CSC	Unicef	Saran
17	Dr Syed Haider Hussain	CSC	Unicef	Purnia
18	Dr Alok Ranjan	CSC	Unicef	Patna
19	Mr Rakesh Kumar Jha	CSC	Unicef	Bhagalpur
20	Mr Preetam K Patro	Cold Chain Consultant	Unicef	Patna
21	Dr. Satyabrata Routray	SRIO	WHO	Patna
23	Dr. Kshem Prasad	Consultant - Facilitator	Unicef	
24	Ms. Bhairavee Shah	Support staff		

D – Summary of Evaluation Results

VMAT Training programme
EVALUATION FORM

TRAINER Evaluation

UNDERSTANDING OF THE SUBJECT MATTER

Fully	*Majority*	*Partially*	*Minority*	*None*
10	**6**	**1**		

TRAINER'S DELIVERY

Very good	*Good*	*OK*	*Poor*	*Very poor*
12	**5**			

PACE of the Training

Way too fast	*Fast*	*OK*	*Slow*	*Far too slow*
1	**1**	**14**	**1**	

PROGRAMME Evaluation

METHODOLOGY

Very Productive	*Good*	*Classic*	*Poor*	*Very ineffective*
9	**8**			**1**

RELEVANCE for your work

Completely	*Majority*	*Partially*	*Minority*	*None*
9	**8**	**1**		

FIELD WORK DURING TRAINING

Completely	*Majority*	*Partially*	*Minority*	*None*
6	**10**	**2**		

SELF Evaluation

YOUR ENGAGEMENT IN THE TRAINING

Completely	*Majority*	*Partially*	*Minority*	*None*
8	**8**	**2**		

YOUR CONFIDENCE IN USING THE TOOL

Completely	*Majority*	*Partially*	*Minority*	*None*
7	**8**	**3**		

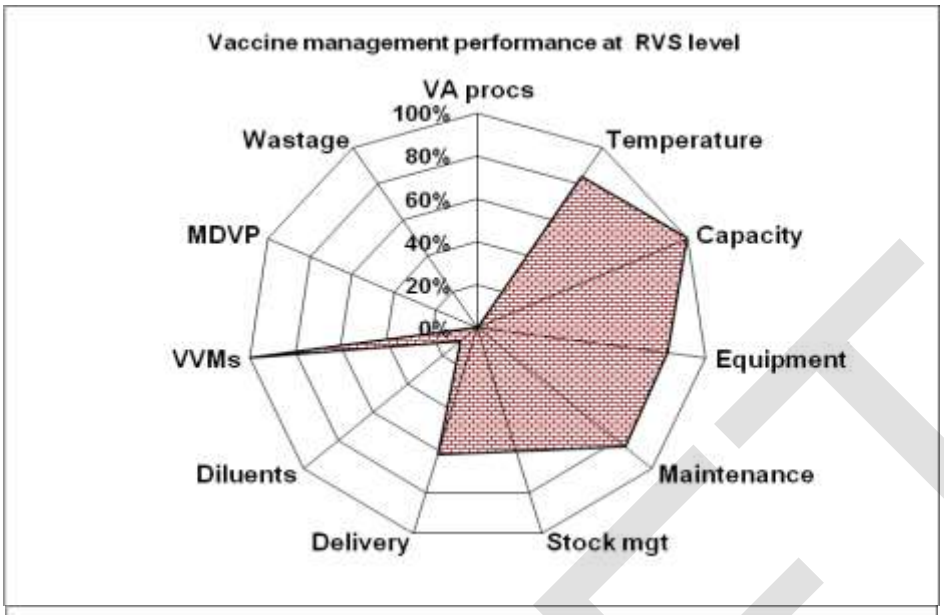
YOUR CONFIDENCE IN ANALYSING THE RESULTS

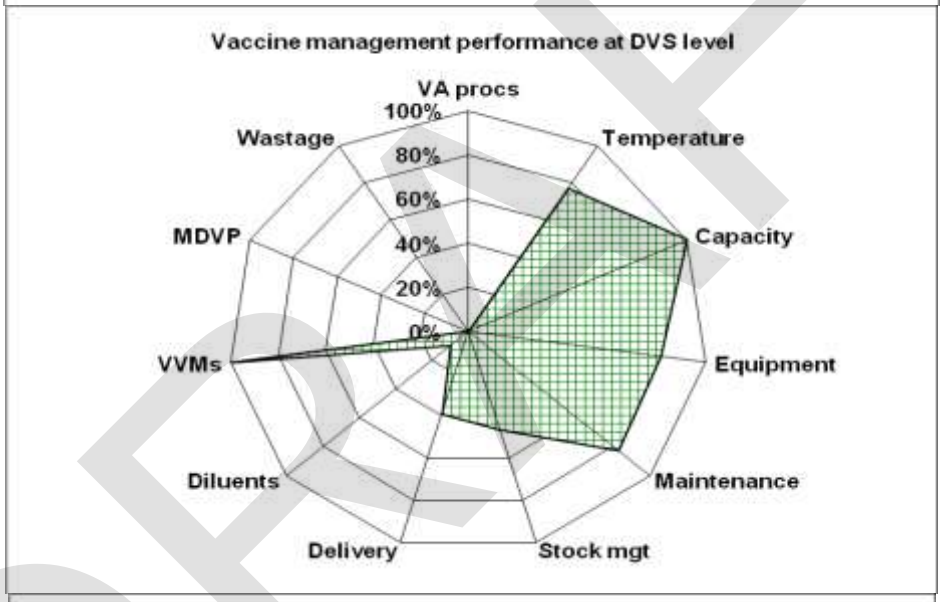
Completely	*Majority*	*Partially*	*Minority*	*None*
7	**8**	**3**		

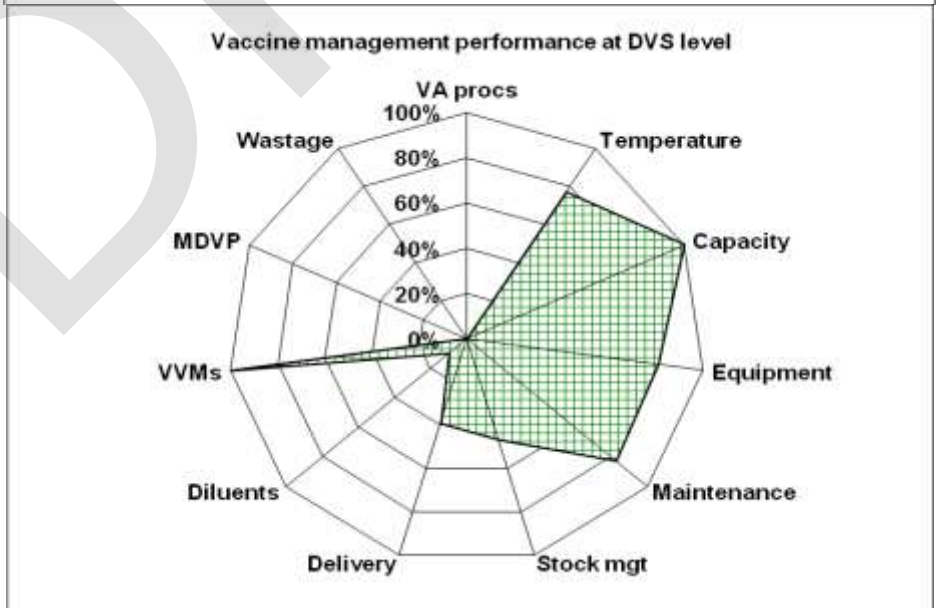
E - Team formations for Field Assessment and Target Locations

Teams	Location	Team Leader	Team Member	RVS	DVS	PHCs
1	Aurangabad	Dr. Vijay Kumar	Dr Syed Haider Hussain	Aurangabad	Arwal	Kurth Karpi Shivsagar Dehri
2	Bhagalpur	Mr Rakesh Kumar Jha	Dr Arun Kumar Sinha (Bhagalpur) Dr P.Jha (Banka)	Bhagalpur	Bhagalpur Banka	Sabour Shambhuganj Amarpur
3	Chappra	Dr Ashok Shirang Sankpal	Dr Anand Rai	Saran	Saran Siwan Gopalganj	Hussainganj
4	Darbhanga	Dr Syed Hubbe Ali	Dr Norrotam Pradhan	Darbhanga	Madhubani	Rahika Pandaul
5	Motihari	Dr. Satyabrata Routray	Dr Preeti H. Negandhi Mr Mokhtar Singh	Motihari	Bettiah	Sahgoli Jogapatti Majholli Mehsi
6	Muzaffarpur	Dr Rajashree Roy	Dr Alok Ranjan	Muzaffarpur	Sheohar Sitamarhi	Piprahi Nirbara Parihar Runi Saidpur
		Total		**6**	**10**	**18**

F1 - AURANGABAD Region

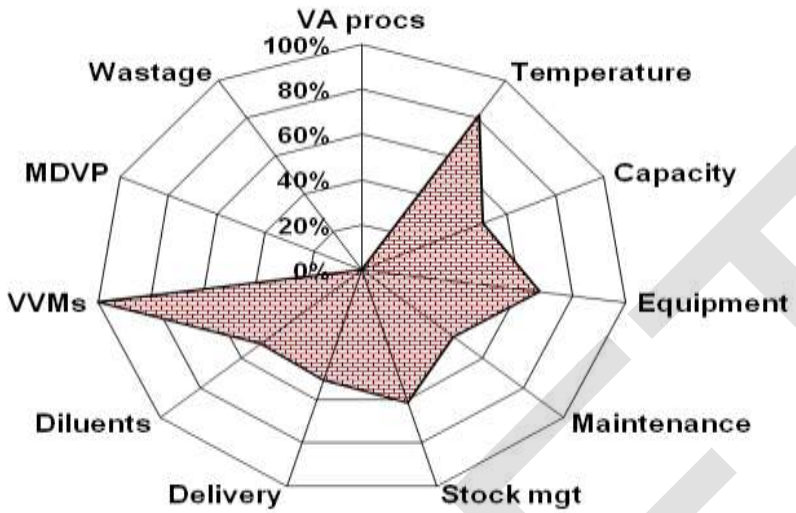




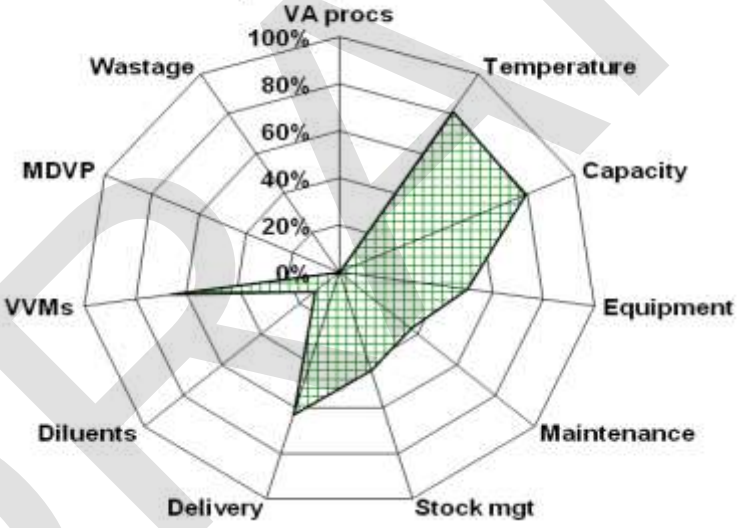


F2 - BHAGALPUR Region

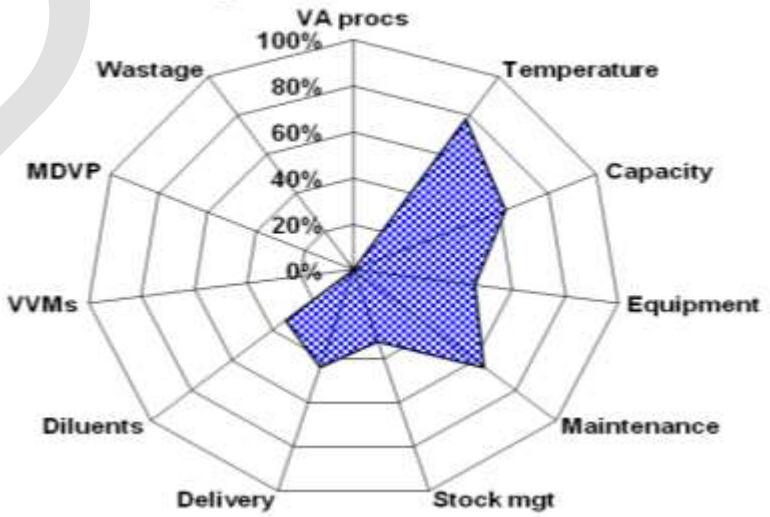
Vaccine management performance at RVS level



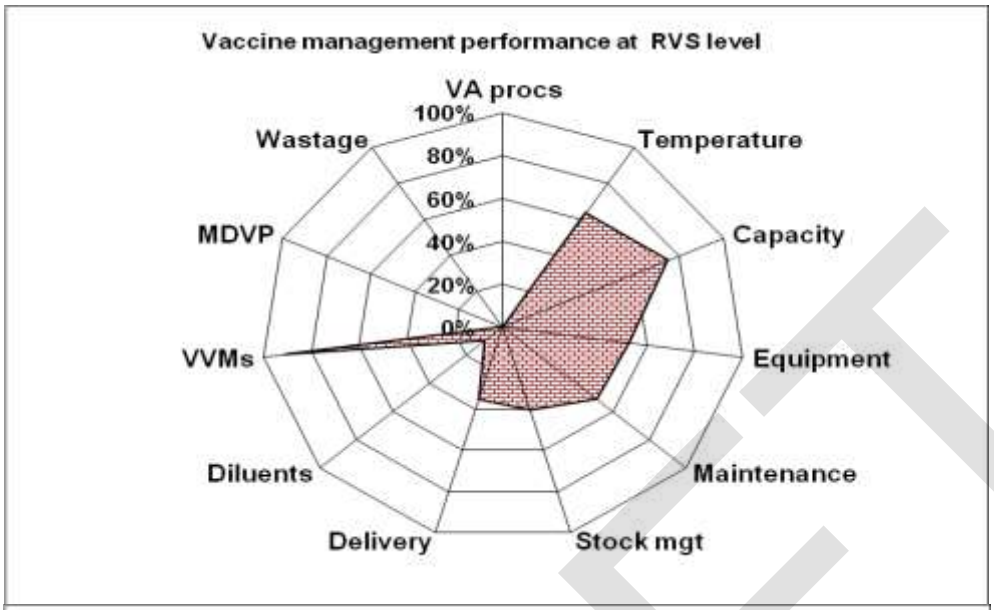
Vaccine management performance at DVS level

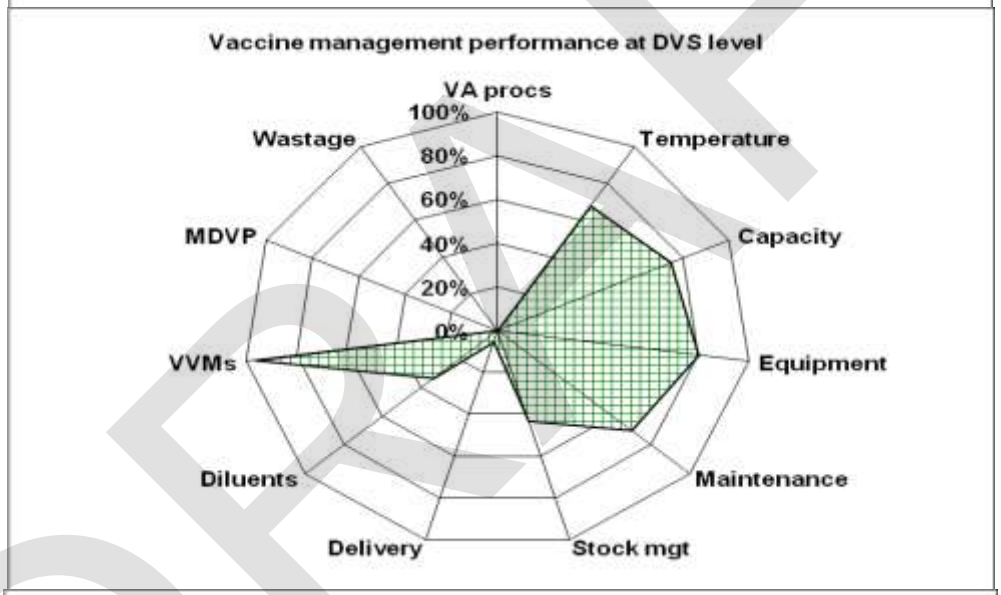


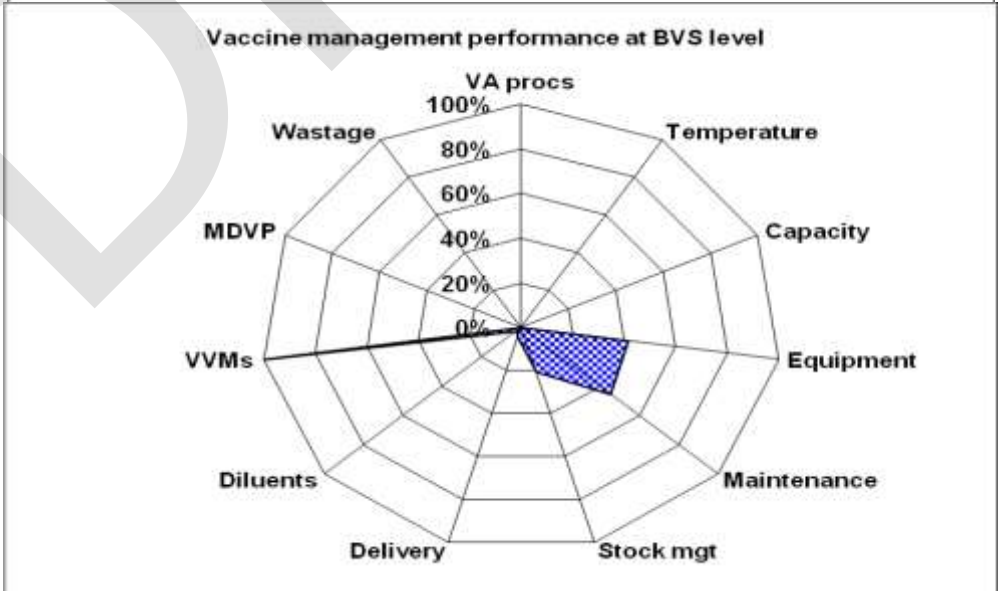
Vaccine management performance at PHC level



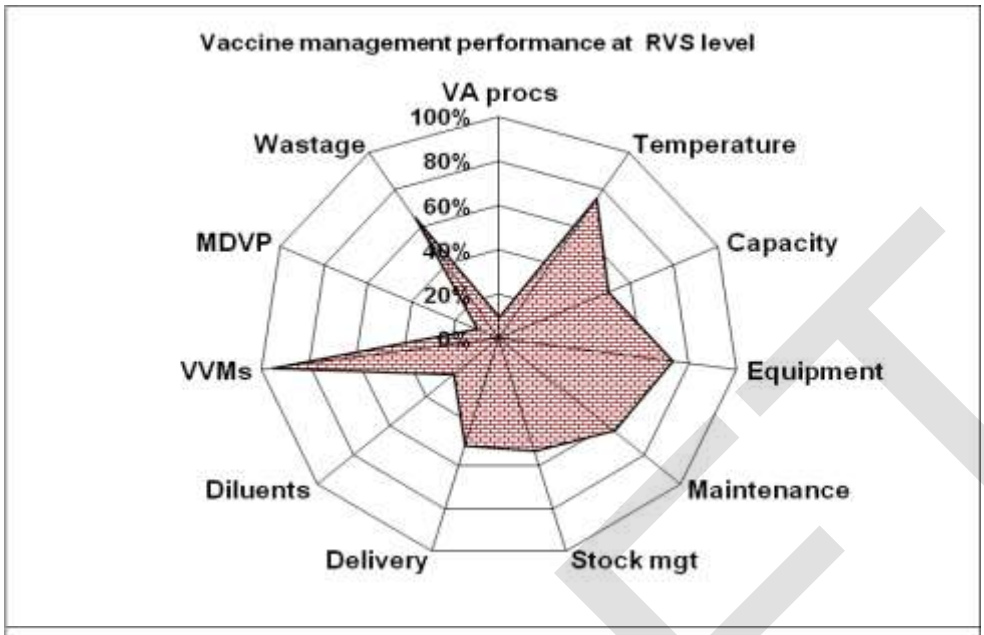
F3 – CHAPPRA Region

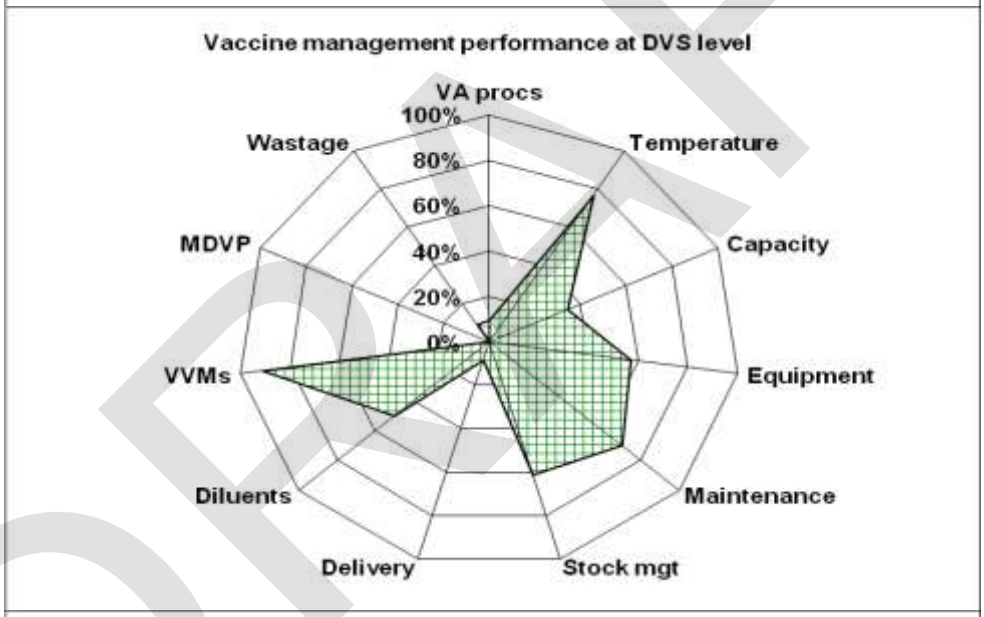


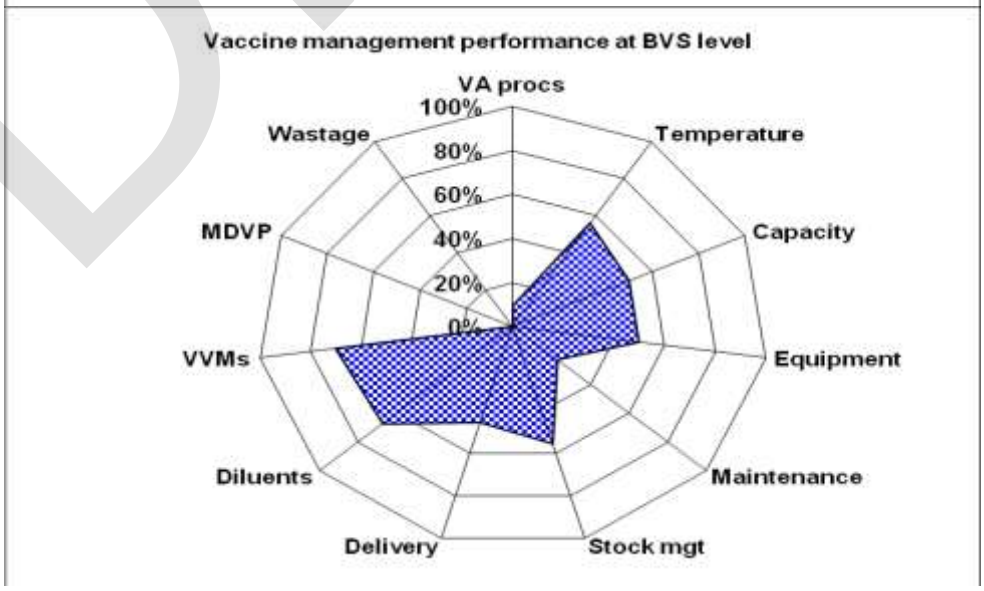




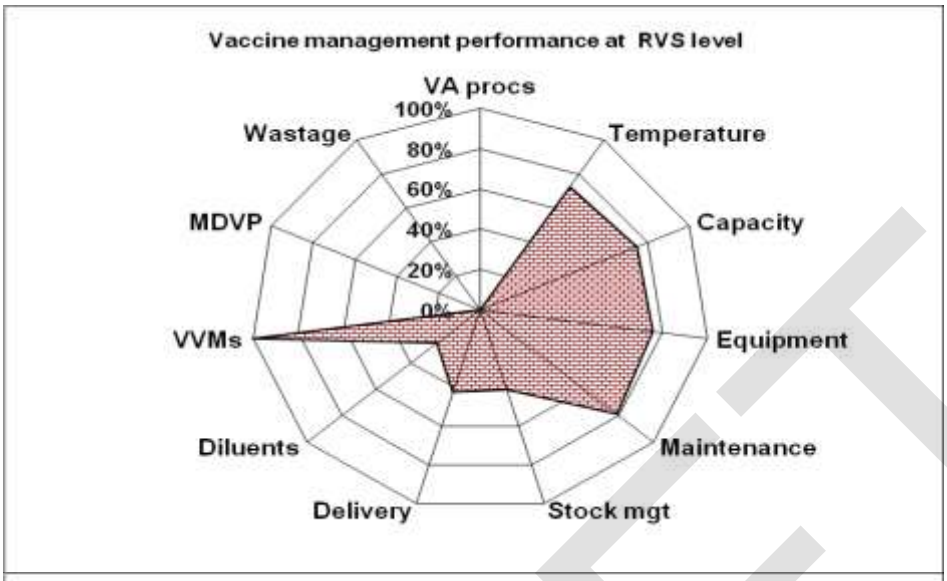
F4 - DARBHANGA Region

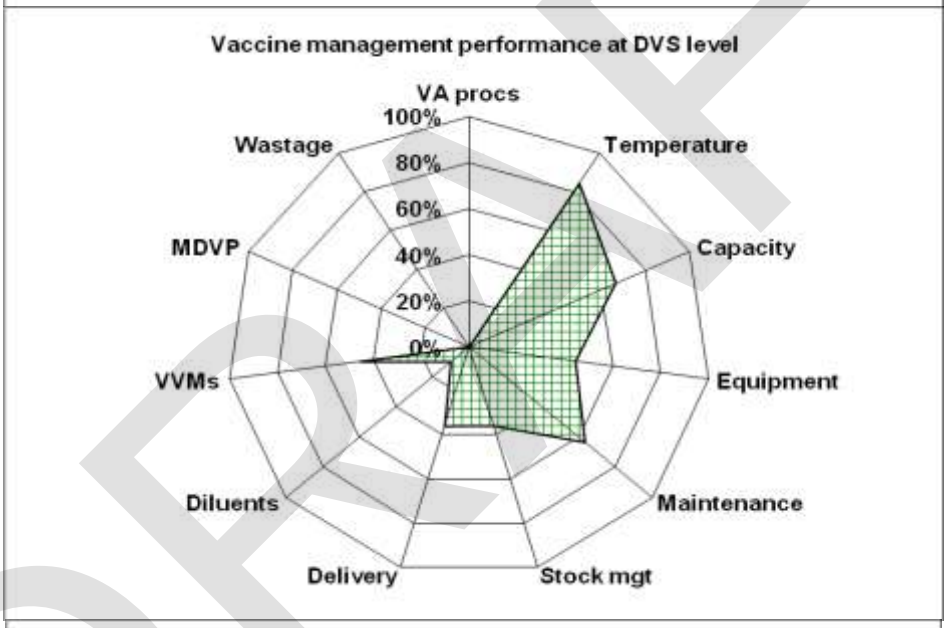


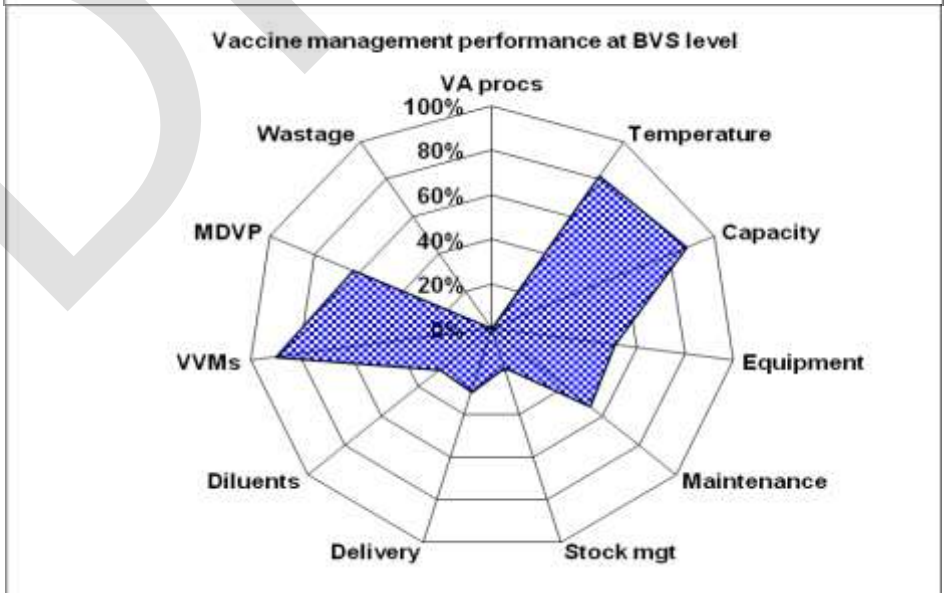




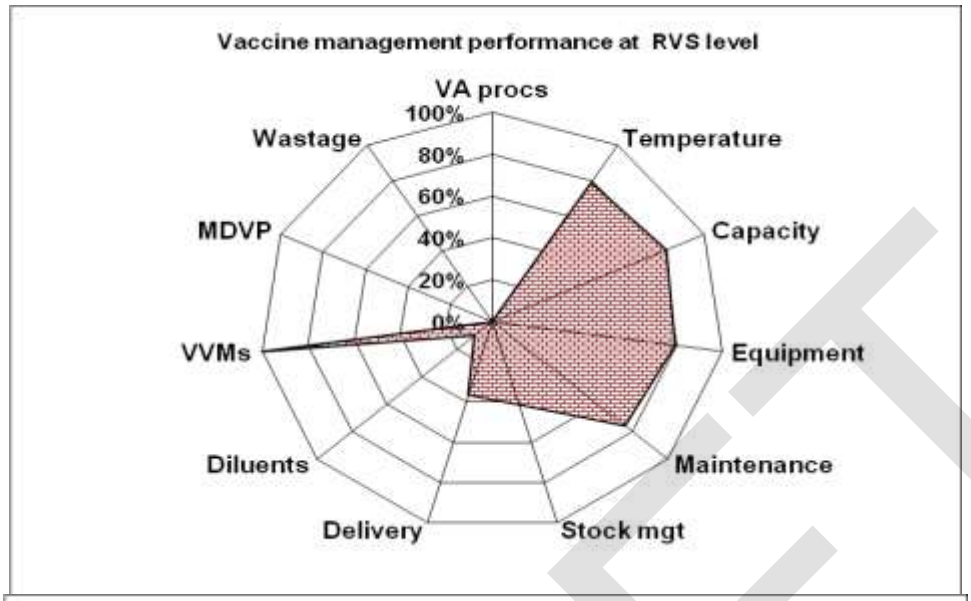
F5 - E. C-MOTIHARI Region

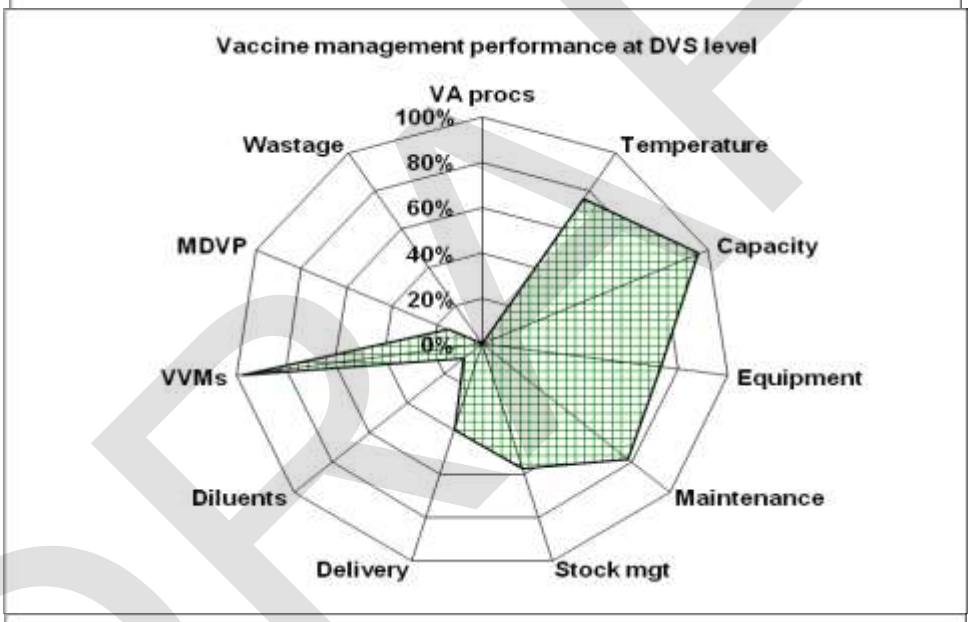


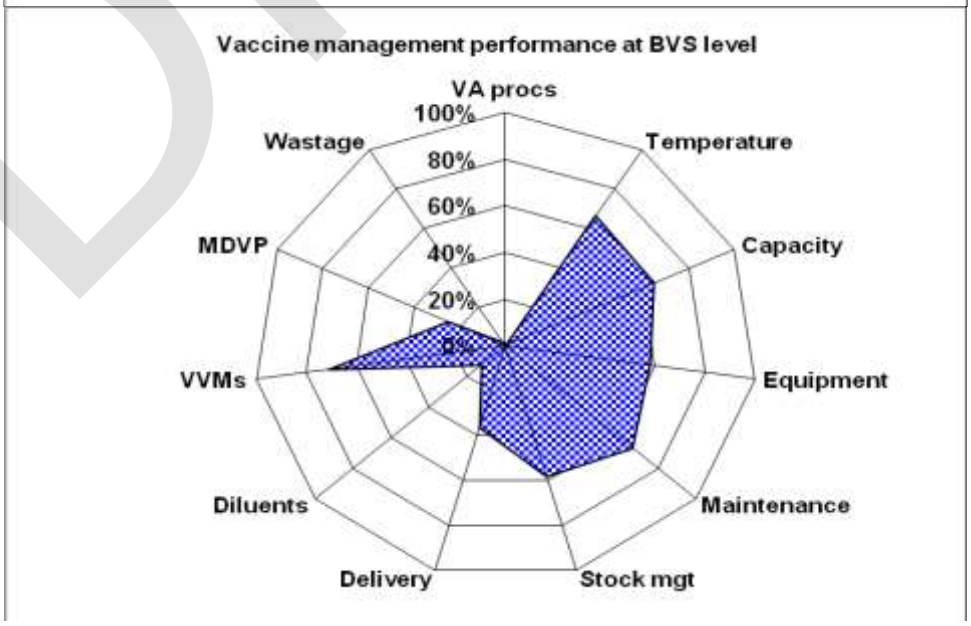




F6 - MUZAFFARPUR Region







G - Indicator scores for all Regional and their respective District and PHC level vaccine stores

No.	Indicator	SVS	RVS							DVS							PHC						
	No. of locations	1	1	1	1	1	1	1	6	2	2	1	3	1	2	11	4	3	2	1	4	4	18
			Aurangabad	Bhagalpur	Chapra	Darbhanga	Motihari	Muzzafarpur	Average	Aurangabad	Bhagalpur	Chapra	Darbhanga	Motihari	Muzzafarpur	Average	Aurangabad	Bhagalpur	Chapra	Darbhanga	Motihari	Muzzafarpur	Average
2	Vaccine storage temperature	86	83	82	63	75	72	79	76	82	81	68	77	84	76	78	76	78	0	56	81	66	60
3	Cold store capacity	58	100	50	75	50	75	83	72	100	79	75	34	67	96	75	100	63	0	50	88	65	61
4	Building, cold chain equipment	75	83	68	53	73	76	80	72	86	50	80	57	44	73	65	88	46	42	50	51	58	56
5	Maintenance of cold chain	98	85	45	52	64	79	76	67	89	37	70	70	63	78	68	76	65	46	23	53	67	55
6	Stock management	59	60	61	41	53	41	41	50	46	43	43	61	36	57	48	46	32	21	55	18	58	38
7	Effective vaccine ddlivery	33	62	51	35	51	42	36	46	58	63	6	8	36	40	35	77	44	0	45	30	36	39
8	Correct diluents use for freeze dried	100	5	50	10	25	25	10	21	23	13	33	50	0	10	22	38	33	0	68	28	13	30
9	Effective VVM use	91	100	100	91	95	100	100	98	100	66	96	91	45	98	83	100	95	100	70	89	71	88
10	Multi-Dose Vial Policy	0	0	0	0	0	0	0	0	0	0	0	0	0	15	3	0	0	0	3	63	25	15
11	Vaccine wastage control	0	0	0	0	65	0	3	11	0	0	0	9	0	0	2	0	5	0	0	0	2	1

H - Details of WIC and WIF at PHI and RVS

	Location	WIC / WIF	Make	L	W	H	L	W	H	Vol.	Gross volume	Net Capacity
				inches	inches	inches	cm	cm	cm	Ltrs	Ltrs	**Ltrs**
	Patna	*WIF*	*Freeze king*	*147*	*78*	*87*	*373*	*198*	*221*	*16,347*	*32,402*	***19,441***
		WIF	*Hurre*	*108*	*108*	*84*	*274*	*274*	*213*	*16,056*		
		WIC	Hurre	158	146	84	401	371	213	31,753	77,331	**46,399**
		WIC	Hurre	170	135	83	432	343	211	31,215		
		WIC	Yorko	110	96	83	279	244	211	14,363		
1	Aurangabad	WIC	Hurre	112	112	104	284	284	264	21,378	21,378	**12,827**
2	Bhagalpur	WIC	Foster	108	108	84	274	274	213	16,056	16,056	**9,633**
3	Darbhanga	WIC	Hurre	170	135	83	432	343	211	31,215	31,215	**18,729**
4	Motihari	WIC	Hurre	170	135	83	432	343	211	31,215	31,215	**18,729**
5	Muzzafarpur	WIC	Foster	108	108	84	274	274	213	16,056	16,056	**9,633**
6	Purnia	WIC	Foster	108	108	84	274	274	213	16,056	16,056	**9,633**
		WIF	*Hurre*	*139*	*110*	*82*	*353*	*279*	*208*	*20,546*	*20,546*	***12,327***
7	Saran	WIC	Hurre	112	112	104	284	284	264	21,378	21,378	**12,827**

I - Annual Vaccine Requirement for 2008-09 (vials)

SN	WIC	District	Est. Population 2008 (as per CENSUS 2001 with GR-2.8%))	Total BCG Required Annual	Total DPT required per Annum	Total OPV required per Annum	Total Measles required per Annum	Total DT required per Annum	Tota l TT required per Annum
2	WIC AURANGABAD	ARWAL	8,63,507	17,856	17,457	10,911	8,203	3,643	10,133
3	WIC AURANGABAD	AURANGAABAD	24,42,348	78,768	49,374	30,859	23,202	10,304	28,661
16	WIC AURANGABAD	KAIMUR	15,63,976	44,784	31,617	19,761	14,858	6,598	18,353
29	WIC AURANGABAD	ROHTAS	29,73,380	82,008	60,110	37,569	28,247	12,544	34,893
	WIC AURANGABAD		78,43,211	2,23,416	1,58,559	99,099	74,511	33,089	92,040
4	WIC BHAGALPUR	BANKA	19,51,851	63,792	39,458	24,662	18,543	8,234	22,905
6	WIC BHAGALPUR	BHAGALPUR	29,39,925	91,440	59,434	37,146	27,929	12,403	34,500
14	WIC BHAGALPUR	JAMUI	16,97,094	53,784	34,309	21,443	16,123	7,160	19,916
20	WIC BHAGALPUR	LAKHISARAI	9,73,302	31,536	19,676	12,298	9,246	4,106	11,422
23	WIC BHAGALPUR	MUNGER	13,80,435	40,680	27,907	17,442	13,114	5,824	16,200
	WIC BHAGALPUR		89,42,687	2,81,232	1,80,784	1,12,990	84,955	37,727	1,04,942
13	WIC SARAN	GOPALGANJ	26,11,697	70,992	52,798	32,999	24,811	11,018	30,649
32	WIC SARAN	SARAN	39,41,502	1,23,984	79,682	49,801	37,444	16,628	46,254
36	WIC SARAN	SIWAN	32,93,195	1,07,208	66,575	41,609	31,285	13,893	38,646
	WIC SARAN		98,46,394	3,02,184	1,99,055	1,24,409	93,541	41,539	1,15,548
11	WIC DARBHANGA	DARBHANGA	39,98,630	1,01,880	80,836	50,523	37,987	16,869	46,924
22	WIC DARBHANGA	MADHUBANI	43,37,725	1,32,624	87,692	54,807	41,208	18,300	50,903
31	WIC DARBHANGA	SAMASTIPUR	41,18,747	1,20,240	83,265	52,040	39,128	17,376	48,334
	WIC DARBHANGA		1,24,55,102	3,54,744	2,51,792	1,57,370	1,18,323	52,545	1,46,161
9	WIC MOTIHARI	CHAMPARAN EA	47,79,946	1,25,856	96,631	60,394	45,409	20,165	56,093
10	WIC MOTIHARI	CHAMPARAN WE	36,92,499	1,07,568	74,648	46,655	35,079	15,578	43,331
	WIC MOTIHARI		84,72,445	2,33,424	1,71,279	1,07,049	80,488	35,743	99,424
24	WIC MUZAFFARPUR	MUZAFFARPUR	45,45,715	1,39,752	91,896	57,435	43,184	19,177	53,344
34	WIC MUZAFFARPUR	SHEOHAR	6,25,991	16,560	12,655	7,909	5,947	2,641	7,346
35	WIC MUZAFFARPUR	SITAMARHI	32,54,821	96,552	65,800	41,125	30,921	13,731	38,196
	WIC MUZAFFARPUR		84,26,527	2,52,864	1,70,351	1,06,469	80,052	35,549	98,886
1	WIC PURNIA	ARARIA	26,18,940	72,216	52,945	33,090	24,880	11,049	30,733
17	WIC PURNIA	KATIHAR	29,02,878	85,176	58,684	36,678	27,577	12,247	34,065
19	WIC PURNIA	KISHANGANJ	15,72,800	45,360	31,796	19,872	14,942	6,635	18,457
21	WIC PURNIA	MADHEPURA	18,52,208	65,088	37,444	23,403	17,596	7,814	21,736
28	WIC PURNIA	PURNIA	30,86,449	90,072	62,396	38,997	29,321	13,021	36,220
30	WIC PURNIA	SAHARSA	18,29,809	51,840	36,991	23,120	17,383	7,720	21,473
37	WIC PURNIA	SUPAUL	21,02,057	62,064	42,495	26,560	19,970	8,868	24,668
	WIC PURNIA		1,59,65,141	4,71,816	3,22,751	2,01,719	1,51,669	67,353	1,87,351
5	WIC PATNA	BEGUSARAI	28,50,378	87,696	57,623	36,014	27,078	12,025	33,449
7	WIC PATNA	BHOJPUR	27,21,506	91,440	55,018	34,386	25,854	11,481	31,937
8	WIC PATNA	BUXAR	17,01,463	50,976	34,396	21,498	16,164	7,178	19,967
12	WIC PATNA	GAYA	42,14,151	1,59,408	85,193	53,246	40,034	17,778	49,453
15	WIC PATNA	JEHANABAD	9,73,742	41,544	19,685	12,303	9,251	4,108	11,427
18	WIC PATNA	KHAGARIA	15,53,395	47,088	31,403	19,627	14,757	6,553	18,229
25	WIC PATNA	NALANDA	28,76,053	90,720	58,142	36,339	27,323	12,133	33,750
26	WIC PATNA	NAWADA	21,95,621	57,024	44,387	27,742	20,858	9,263	25,766
27	WIC PATNA	PATNA	57,24,852	1,55,304	1,15,734	72,334	54,386	24,152	67,181
33	WIC PATNA	SHEIKHPURA	6,37,569	23,688	12,889	8,056	6,057	2,690	7,482
38	WIC PATNA	VAISHALI	32,98,137	1,02,168	66,675	41,672	31,332	13,914	38,704
	WIC PATNA		2,87,46,867	9,07,856	5,81,146	3,63,216	2,73,095	1,21,276	3,37,344

J - Storage capacity in terms of requirement at PHI and RVS'

State Primary Store

		Vaccine Requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Avaialble	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	**BCG**	**30,26,736**	15,13,368	7,56,684	10	1.2		18,160	9,080
2	**DPT**	**20,35,717**	10,17,858	5,08,929	10	3.0		30,536	15,268
3	**DT**	**4,24,821**	2,12,410	1,06,205	10	3.0		6,372	3,186
4	**Measles**	**9,56,634**	4,78,317	2,39,158	5	12.0		28,699	14,350
5	**TT**	**11,81,695**	5,90,848	2,95,424	10	3.0		17,725	8,863
		Total (2-8C)					**46,399**	**1,01,493**	**50,746**
6	**OPV**-Routine	**12,72,323**	6,36,161	3,18,081	10	1.0		6,362	3,181
	One Campaign	**12,83,255**			10	1.0		12,833	12,833
		Total (-20C)					**19,441**	**19,194**	**16,013**

Aurangabad Regional Vaccine store

		Vaccine requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Available	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	**BCG**	2,23,416	1,11,708	55,854	10	1.2		1,340	670
2	**DPT**	1,58,559	79,279	39,640	10	3.0		2,378	1,189
3	**DT**	33,089	16,544	8,272	10	3.0		496	248
4	**Measles**	74,511	37,255	18,628	5	12.0		2,235	1,118
5	**TT**	92,040	46,020	23,010	10	3.0		1,381	690
		Total (2-8C)					12,827	7,831	3,916
6	OPV-Routine	99,099	49,550	24,775	10	1.0		495	248
	One Campaign	91,166			10	1.0		912	912
		Total(-20C)						1,407	1,159

Bhagalpur Regional Vaccine store

		Vaccine requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Avaialble	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	BCG	2,81,232	1,40,616	70,308	10	1.2		1,687	844
2	DPT	1,80,784	90,392	45,196	10	3.0		2,712	1,356
3	DT	37,727	18,863	9,432	10	3.0		566	283
4	Measles	84,955	42,477	21,239	5	12.0		2,549	1,274
5	TT	1,04,942	52,471	26,235	10	3.0		1,574	787
		Total (2-8C)					9,633	9,088	4,544
6	OPV-Routine	1,12,990	56,495	28,247	10	1.0		565	282
	One Campaign	1,17,420			10	1.0		1,174	1,174
		Total(-20C)						1,739	1,457

Darbhanga Regional Vaccine store

		Vaccine requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Avaialble	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	BCG	3,54,744	1,77,372	88,686	10	1.2		2,128	1,064
2	DPT	2,51,792	1,25,896	62,948	10	3.0		3,777	1,888
3	DT	52,545	26,272	13,136	10	3.0		788	394
4	Measles	1,18,323	59,162	29,581	5	12.0		3,550	1,775
5	TT	1,46,161	73,080	36,540	10	3.0		2,192	1,096
		Total (2-8C)					18,729	12,436	6,218
6	OPV-Routine	1,57,370	78,685	39,343	10	1.0		787	393
	One Campaign	1,45,393			10	1.0		1,454	1,454
		Total (-20C)						2,241	1,847

Motihari Regional Vaccine store

		Vaccine requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Avaialble	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	**BCG**	**2,33,424**	1,16,712	58,356	10	1.2		1,401	700
2	**DPT**	**1,71,279**	85,639	42,820	10	3.0		2,569	1,285
3	**DT**	**35,743**	17,872	8,936	10	3.0		536	268
4	**Measles**	**80,488**	40,244	20,122	5	12.0		2,415	1,207
5	**TT**	**99,424**	49,712	24,856	10	3.0		1,491	746
		Total (2-8C)					**18,729**	**8,412**	**4,206**
6	**OPV**-Routine	**1,07,049**	53,525	26,762	10	1.0		535	268
	One Campaign	**1,15,870**			10	1.0		1,159	1,159
		Total (-20C)						**1,694**	**1,426**

Muzzafarpur Regional Vaccine store

		Vaccine requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Avaialble	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	**BCG**	**2,52,864**	1,26,432	63,216	10	1.2		1,517	759
2	**DPT**	**1,70,351**	85,176	42,588	10	3.0		2,555	1,278
3	**DT**	**35,549**	17,775	8,887	10	3.0		533	267
4	**Measles**	**80,052**	40,026	20,013	5	12.0		2,402	1,201
5	**TT**	**98,886**	49,443	24,721	10	3.0		1,483	742
		Total (2-8C)					**9,633**	**8,491**	**4,245**
6	**OPV**-Routine	**1,06,469**	53,235	26,617	10	1.0		532	266
	One Campaign	**97,427**			10	1.0		974	974
		Total (-20C)						**1,507**	**1,240**

Purnia Regional Vaccine store

		Vaccine requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Avaialble	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	**BCG**	**4,71,816**	2,35,908	1,17,954	10	1.2		2,831	1,415
2	**DPT**	**3,22,751**	1,61,376	80,688	10	3.0		4,841	2,421
3	**DT**	**67,353**	33,676	16,838	10	3.0		1,010	505
4	**Measles**	**1,51,669**	75,834	37,917	5	12.0		4,550	2,275
5	**TT**	**1,87,351**	93,676	46,838	10	3.0		2,810	1,405
		Total (2-8C)					**9,633**	**16,043**	**8,021**
6	**OPV**-Routine	**2,01,719**	1,00,860	50,430	10	1.0		1,009	504
	One Campaign	**2,49,124**			10	1.0		2,491	2,491
		Total (-20C)						**3,500**	**2,996**

Saran Regional Vaccine store

		Vaccine requirement in vials					Storage space required in Ltrs		
#	Vaccine	Annual Requirement (2007-08)	50% of annual require-ment	25% of annual require-ment	Presen-tation	Vol	Net storage Space Avaialble	For 50 % of annual need	For 25% of annual need
		Vials	Vials	Vials	doses /vial	Ccm/ dose	Ltrs	Ltrs	Ltrs
1	**BCG**	**3,02,184**	1,51,092	75,546	10	1.2		1,813	907
2	**DPT**	**1,99,055**	99,528	49,764	10	3.0		2,986	1,493
3	**DT**	**41,539**	20,770	10,385	10	3.0		623	312
4	**Measles**	**93,541**	46,770	23,385	5	5.0		1,169	585
5	**TT**	**1,15,548**	57,774	28,887	10	3.0		1,733	867
		Total (2-8C)					**12,827**	**8,324**	**4,162**
6	**OPV**-Routine	**1,24,409**	62,205	31,102	10	1.0		622	311
	One Campaign	**1,04,897**			10	1.0		1,049	1,049
		Total (-20C)						**1,671**	**1,360**

K - Example of Service log sheet for WIF and WIC

Department of Health Services

Cold Chain Section (Maintenance Log Sheet)

WIF / WIC

Make: …… Model No: ……

Capacity: …….. Date installed: ……... Unit No: ……

Date	Detail of the Work	Time for work		Verified Signature	
		Started date	Ended date	Technician	Section In-charge

Annexure I – reverse

Walk-In-Freezer / Walk-In-Cooler

Ref.	Items of maintenance/Check list	Frequency	Date attended								
1	Cleaning of external surface of condensor units.	1 / month									
2	Cheaking function of electrical switch & circuit breaker.	1 / month									
3	Cleaning and checking condensate & drain line.	1 / month									
4	Cheaking of electrical conection of motor/ compressor terminal wires.	1 / 3 month									
5	Cleaning the condensor coil by brush with blower.	1 / 3 month									
6	Cheak & note voltage, ampere of motor/compressor.	1 / 3 month									
7	Check vibration and noise source.	1 / 3 month									
8	Checking and tighting the screws of contactors.	1 / 6 month									
9	Cleaning and lubricating the fan motor.	1 / 6 month									
10	Cleaning the evaporator coil by brush with blower.	1 / 6 month									
11	Checking refrigerant pressure and level.	1 / 6 month									
12	Checking tube insulation.	1 / year									
13	Checking & noting the winding insulation resistance of motor/compressor.	1 / year									
14	Calibration of thermometer and thermostat.	1 / year									

Please indicate when attended

Cl-Cleaned, Ch-Checked, S-Serviced, Specify other details on front page

L - Vaccine Batch Card (New for each batch of Vaccine)

Name of Vaccine:		**Diluent:**
Date received:	**Number of cartons:**	**Number of cartons:**
Temp. Rec. Status:	**Vial size:**	**Ampoule size:**
	Batch No:	**Batch No:**
VVM Status:	**Expiry date:**	**Expiry date:**
CCM Status:	**Quantity Received (vials):**	**(opening balance)**
Manufacturer:		

Vaccine issued / received (including diluents if applicable)

Date	Issued to / Received from	Invoice / Voucher	Quantity Issued	Balance (Doses)	Entry Reference	signature

M - Example of Indenting Form

		Quantities of Vaccine and Diluent (Vials or Doses)							
		BCG	Diluent for BCG	Measles	Diluent for Measles	OPV	TT	Td	DTP
Last Receipts and Status (doses)	Opening Balance (as of 1st of the month)								
	RECEIVED (from upper store during the month)								
	TOTAL (available for use during the month)								
Current status (doses)	USED / DISTRIBUTED during the month								
	BALANCE in hand								
	Quantity corresponding to SAFETY stock								
	Quantity required								
Indent and Delivery Details (doses)	SUPPLIED by the upper store								
	LOT no.								
	Expiry date								
	VVM status								

- **Make annual indent of vaccines to GoI with a suggested plan for deliveries in a quarterly basis**