Vaccine Management Training and Assessment – Assam 2010

A collaboration between DHS, Assam, NRHM and UNICEF

TABLE OF CONTENTS

ABBREVIATIONS

Abbreviation	Description
ACMO	Assistant Chief Medical Officer
AD	Auto Disable
ARS	Anti Rabies Serum
ARV	Anti Rabies Vaccine
AVS	Anti Snake Venom
BCG	Bacille Calmette Guerin
CCL	Cold Chain and Logistics
CCO	Cold Chain Officer
CES	Coverage Evaluation Survey
CFC	Chloro Flouro Carbon (refrigerant)
CHC	Community Health Centre
cm^3	Cubic Centimeter
CMO	Chief Medical Officer
^0C	Degree Celsius
DF	Deep Freezer
DH&FW	Department of Health and Family Welfare
DLHFS	District Level Health Facility Survey
DPT	Diphtheria, Pertussis, Tetanus
DRCHO	District Reproductive and Child Health Officer
DT	Diphtheria Tetanus
EPIO	Expanded Program of Immunization Officer
EVSM	Effective Vaccine Store Management
FIC	Fully Immunized Child
HepB	Hepatitis B
ILR	Ice Lined Refrigerator
IPHS	Indian Public Health Standards
KVA	Kilo Watt Ampere
m^3	Cubic Meter
MDVP	Multi Dose Vial Policy

Abbreviation	Description
MIS	Management Information System
ml	Milliliter
MOHFW	Ministry of Health and Family Welfare
MOIC	Medical Officer In-Charge
NRHM	National Rural Health Mission
OPV	Oral Polio Vaccine
PHC	Primary Health Centre
PIP	Program Implementation Plan
POL	Petrol Oil and Lubricant
RCH	Reproductive Child Health
RIMS	Routine Immunization Management System
SEPIO	State Expanded Program of Immunization Officer
TA/DA	Travelling Allowance/Dearness Allowance
TT	Tetanus Toxoid
UIP	Universal Immunization Program
UNICEF	United Nations Children's Fund
VMAT	Vaccine Management Assessment and Training
VVM	Vaccine Vial Monitor
WHO	World Health Organization

ACKNOWLEDGEMENT

EXECUTIVE SUMMARY

Directorate of Health Services (DHS(FW)) Assam in collaboration with UNICEF state office aims to strengthen its immunization programme through several innovative strategies. Considering the importance of vaccine management and logistics, the assessment of the existing vaccine management system in eleven districts of Assam has been conducted.

WHO/UNICEF Vaccine Management Assessment Tool (VMAT)[1] has been adopted for a systematic assessment and capacity building of the health department staffs involved in routine immunization vaccine handling and management.

The vaccine management assessment was carried out for the retrospective period of 6 months (October-2009 to March 2010), with objectives of:

1) Identifying the strengths and good practices of vaccine stores;
2) Train the staff responsible for handling state, intermediate and primary health vaccine stores in vaccine management practices ;
3) Identify major knowledge gaps;
4) Identify major performance gaps ;
5) Identify resource and training needs;
6) Develop internal capacity of the system to conduct similar self assessment for remaining districts and repeat the training and assessment periodically.

The VMA was carried out using following steps:

1) Trained the selected staff in conducting the Sites assessment cum training using VMA Tool during four days workshop held in Guwahati;
2) The state vaccine store was assessed on VMAT criteria using VMA Tool;
3) The assessment covered 11 districts and 2 PHC approximately per district. The districts were assessed by the team from other districts except for few exceptions;
4) The DIOs and other members of each district participated in assessment carried out the one day training of cold chain handlers in their own district based on the standard operating procedures discussed during the program;
5) A three days consultative workshop held at Guwahati to submit and compile the assessment data;
6) Participants formulated standard operating procedures for district stores and PHC during the consultative workshop;

[1] WHO/IVB/ 05.02 April 2005, Vaccine Management Assessment, Geneva

7) Major findings, its cause and solutions were formulated to draw key recommendations from the assessment exercise;

8) Outcome of the assessment was presented to dignitaries for their perusal and line of action for implementing the recommendations.

Key Findings from assessment

The assessment reflected the good practices, gaps and issues that needed technical and management intervention. These are summarized below:

Good practices and findings

1. The temperature records at state and district levels were well maintained. The staff shows the good knowledge of thermo-sensitivity of vaccines.

2. Solar refrigerators installed in the boat clinics were very successful every since their installation five years ago.

Areas that needed improvement

1. The Walk-in-Freezer at state vaccine store and cold rooms (Walk-in-Cooler) regional stores of Cachar and Dibrugarh were not functioning properly. These units are more then 20 years old and are due for replacement.

2. The building hosting the state vaccine store needs refurbishing to obtain the required electrical and building standards and to host the newly supplied cold room and freezer room by MOHFW.

3. The building of state vaccine store is being used to store the supplies other then vaccine and diluent (such as spare parts, promotion material etc) which makes the store very congested and leaves no room for packaging of vaccine for transportation (including space for ice-pack conditioning).

4. The vaccine storage capacity of the state store is sub optimal hence as a result vaccine is stored in undesirable conditions.

5. Vaccine stores of most of the districts are located in rooms that are much smaller then required.

6. There is no dedicated standby power supply through generators for district stores of Kamrup, Mirogaon, Dhubri, Cachar, Nagaon, Berpeta, Udalguri, Darrang, Dibrugarh and Dhemaji.

7. Post of refrigerator technician is vacant for past six years at Cachar district ever since the technician was transferred to Nagaon district.

8. Vaccine delivery van is not functioning properly in the districts of Cachar, Karimganj, Morigaon, Dhemaji, Kamrup, Darrang and Barpeta as the vaccine van in these districts are very old and needed frequest repairing.

9. There were condemned items found occupying the stores of Nagaon and Morigaon districts.

10. Some of the ILRS and DFs of Kamrup, Darrang and Barpeta district were functioning sub-optimally with frequent breakdowns.

11. Some of the solar refrigerators installed in boat clinics of Dibrugarh and other districts stopped functioning, as the battery needed replacement and in other cases the spare parts were not locally available.

12. Vaccine stock outs were observed in the districts of Nagaon, Morigaon and Udalgudi. These were primarily because of gap in indent quantities, estimation of vaccine requirement and actual consumption of vaccine.

13. Stock books were not maintained well in the districts of Kamrup, Darrang and Barpeta.

The key issues emerging out from the assessment that needed immediate attention has been listed below.

Issues which requires capacity building exercises

- Knowledge on best practices of vaccine management
- Accurate method of preparing indent for vaccine and related supplies
- Knowledge on best practices of stock management

Issues that see management intervention

- Ensure adequate staff for immunization program
- Implementation of standardized reporting on vaccine consumption, wastage, maintenance of cold chain and vehicles
- Ensure timely maintenance of cold chain equipment and transport
- Ensure timely condemnation of non-repairable equipment
- Implement effective stock management through maintenance of stock book (introduce explicit recording of diluents, VVM)
- Optimize and standardize the frequency of vaccine delivery

Issues requiring procurement and supply

- Provide generators of required capacity at cold chain points
- Provide replacement of aged and non repairable cold chain equipment, with new equipment for expansion of program (to new PHCs and fill the gap of cold chain capacity based on the updated cold chain inventory.
- Provide spare parts of cold chain equipment especially of solar refrigerators

Infrastructure requirement

- The size of dedicated cold storage area for ILRs and other UIP supplies to be as per IPHS standard.
- Provide restricted access to cold store facility and cold chain equipment for security of vaccine and related supplies
- The vaccine packing area to be climate controlled at state and district stores (15 to 25 ^{0}C)
- Improve the electrical wiring to high standards of safety and efficiency

Key recommendations emerging out of the assessment

1. File and retain (for a period of atleast four years) the complete set of documents related to vaccine received from manufacturer at state vaccine store (Lot release certificates, Invoices, airway bill copy, inspection note and allocation list).

2. Refurbish the state vaccine store as per the suggested layout plan in figure 2 to accommodate and install the new WIC and WIF. The exhaust fans of industrial standards (minimum size of 14 Inch diameter of impeller with air volume of 3400 m^3 per hour) should be installed at all the provided slots in the store building.

3. The building hosting the state vaccine store should be dedicated for vaccine and related supplies only. Dedicate and relocate other unrelated supplies to another location.

4. Install the newly supplied cold rooms at state and regional stores on priority.

5. Strengthen the temperature monitoring through strict supervision by medical officers/DIOs. Include supervision checklist for monitoring and documenting supervisory visits.

6. Adopt the standard format for temperature monitoring and stock book maintenance as recommended by MOHFW. Include diluent bundling and recording in standard recording procedures. Standardize the vaccine and diluent unit in doses for recording and indent.

7. Prepare/adopt the Standard Operating Procedures for cold chain maintenance and disseminate using various mechanisms like booklet, job aids and posters.

8. Refurbish the vaccine stores (regional, district and PHC) (including space for ILR/DF, dry storage (for syringes and diluent) and store keeper's office) based on the good warehouse practices recommended by WHO (reference document WHO/V&B/02.34).

9. Provide the dedicated power supply backup (auto start Generator with capacity of 5 or 15 KVA depending on number of refrigeration units) at district stores.

10. Dismantle the non-functional WIC (aged more then 20 years) at Cachar and Dibrugarh district and utilize the space for installation of newly supplied cold room based on the recommended layout plan.

11. Appoint the refrigeration technician at Cachar district store, as the position is vacant for past few months.

12. A new vehicle for vaccine delivery should be allotted to the districts of Cachar, Karimganj, Morigaon, Nagaon, Dhemaji, Kamrup, Darrang and Barpeta district. The vehicle should have local service support including locally available spare parts. The vehicles intended for hilly areas should have four wheel drive provision with minimum ground clearance as required.

13. Equip the cold rooms in the state with 24x7 temperature monitoring system preferably computer based system where temperature records can be stored and analyzed on computer.

14. Auction/dispose the condemned items (cold chain refrigeration units (ILR/DF/Cold boxes and vaccine carrier that are beyond economic repair) to clear the room space at district stores.

15. Replenish the vaccine storage capacity by installing new ILR/Dfs as per the requirement by computing peak vaccine volume loads for specific districts of kamrup, Darrang and Berpeta districts.

16. Prepare and implement the vaccine distribution plan for the districts of Kamrup and Darrang based on the requirement, adjusted frequency depending on cold chain capacity of district stores.

17. Establish the stock levels (safety and maximum) for all districts, regional and state vaccine store. Establish the indent (re-ordering) system that strictly adheres to these set stock levels.

18. For the maintenance of solar refrigerators used for UIP program, it is recommended that:

a. Batteries to be replaced every five years;

b. Solar panels should be cleaned from dust every week;

1 Introduction

Directorate of Health Services (DHS(FW)) Assam in collaboration with UNICEF state office initiated the process to strengthen its immunization programme through several innovative strategies. Considering the importance of vaccine management and logistics, the assessment of the existing vaccine management system in eleven districts of Assam has been initiated.

WHO/UNICEF Vaccine Management Assessment Tool (VMAT)[2] has been adopted for a systematic assessment and capacity building of the health department staffs involved in routine immunization vaccine handling and management.

The vaccine management assessment was carried out for the retrospective period of 6 months (October-2009 to March 2010), which aimed to:

1. Improve the vaccine-management systems and procedures
2. Investigate both the knowledge and practice of vaccine-management amongst health staff operating at State, District and Service-delivery levels (PHCs).
3. Identify areas of good practices so lessons can be learnt from them
4. Provide targeted support and training – for skill development and capacity building

The field assessment becomes the basis for making immediate and long-term implementable recommendations. This structured approach provides the opportunity to train the District Immunization Officers (DIO) and Medical Officers in good practices of managing vaccine logistics.

2 Objective

The objectives of Vaccine Management Assessment of Assam using the VMAT were to:

7) Identify the strengths and good practices of vaccine stores

8) Train the staff responsible for handling state, intermediate and primary health vaccine stores in vaccine management practices

9) Identify major knowledge gaps

10) Identify major performance gaps

11) Identify resource and training needs

12) Develop internal capacity of the system to conduct similar self assessment for remaining districts and repeat the training and assessment periodically

To achieve these objectives, the first step is to train staff of the health department at the state level and from the districts in the use of the VMA Tool so as to apply it periodically through

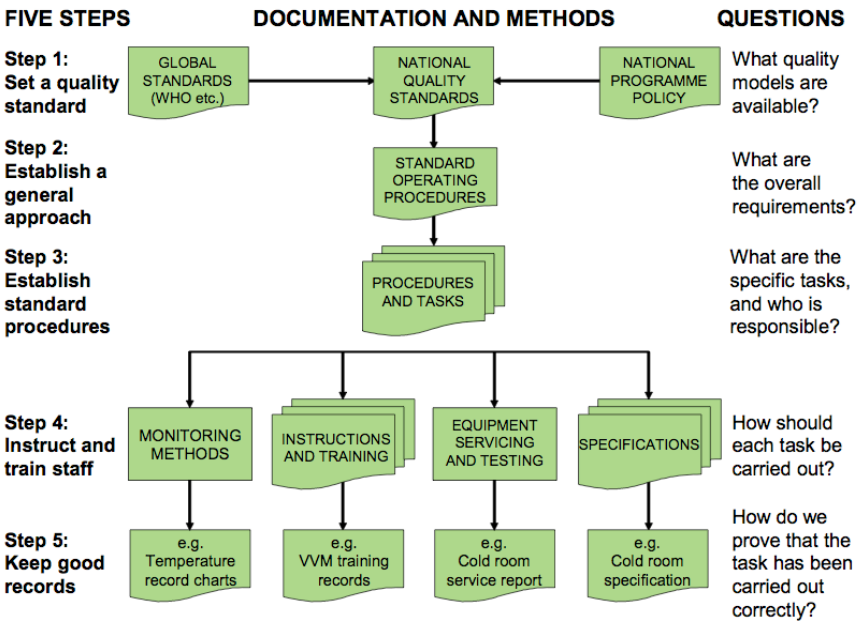
[2] WHO/IVB/ 05.02 April 2005, Vaccine Management Assessment, Geneva

self assessment. This was done in selected districts and in two PHCs of the identified districts to assess the current status. The analysis of the data defines the future course of action to improve and ensures quality vaccine management and logistics. With these objectives the assessment and training exercise was performed from 16 to 28 February 2009. This document reports on the entire activity starting from induction training till the final outcome of analysis and recommendations.

3 Expectations from Vaccine Management Assessment

There are five steps to improve the quality of vaccine and logistics management to increase Availability, Utilization, Adequate Coverage and Effective coverage in Routine Immunization services for the beneficiary.

1. **Set a quality standard:** Establish a national quality standard based on national programme policy guidelines and national /global standards, as recommended by WHO and UNICEF.
2. **Establish a general approach:** Prepare and adopt ***standard operating procedures*** (SOP).
3. **Establish standard procedures:** Identify the specific task and procedure and assign these tasks to specific persons responsible for maintenance of cold chain, vaccine and logistics upkeep.
4. **Instruct and train staff** on specific tasks of monitoring methods, instructions and training, equipment servicing and testing to perform them proficiently.
5. **Keep good records** of temperature charts, VVM training, cold room service report and cold room specifications.



Steps to improve the quality of vaccine management:

- Training of trainers, training of field staff

- Scope and level of training required at all levels (state, districts and PHC)
- Standard Operating Procedures based on standards by WHO/national program policies
- Action plan for system strengthening
- Radiation/learning / sharing of good practices across state

4 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 system and procedures down to the service delivery level. The original work on the vaccine-management assessment tool (VMAT) was carried out by WHO Regional Office for Africa (AFRO) in 2001. After consultations, reviews and field trials it has developed into today's document. This is a spreadsheet-based tool that provides a set of structured questions for the use of national and external assessors. It is designed to be used to carry out a rapid assessment of vaccine-management procedures in a national store, followed by a similar assessment of sub national stores (State) and service delivery points (PHCs). Assessment results are displayed in graphical form and should be supplemented by written comments. 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 and sub national (State) primary stores.

The tool is based upon eleven global criteria listed below. The first seven have been derived directly from Effective Vaccine Store Management (EVSM) initiative. Criteria 8, 9 & 11 are indigenous 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. Criteria 1 Vaccine arrival Procedures (VAR) is applicable only for state store.

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

There are multiple specific questions under each of the above mentioned 11 criterion, which are applicable to different levels of vaccine supply chain within the rolling down health system (State, District and PHC) and to which one attributes a mark corresponding to the

answer: 0 (no), 1 (yes) or n/a (not applicable). The collation of these marks is then integrated to give an overall score for each criterion on a scale of 0 to 100 %.

Some of the questions under the criterion 1, 2, 5, 6, 7, 8, 9 &11 are critical indicators designated by CI. These questions are intended to test the most important aspects of vaccine-management. For this reason each question attracts a weighted score. A low score against a critical indicator provides strong evidence that an aspect of vaccine-management is dangerously weak and that significant improvements are needed.

These collated scores are then used to depict graphically on a spider web the strengths and weaknesses of a country's, state's, district's or PHC's vaccine management systems. A minimum score of 80% is recommended for each criterion as shown by the red polygon in the graph.

NB. Criteria 1 - Vaccine arrival procedures applies more to a national store receiving vaccines from overseas or directly from the manufacturer. Hence criteria 1 are assessed only for the state store. Govt. of India has not adopted MDVP in Routine Immunization (criteria 10).The 10th criterion MDVP is only applicable in mass immunization campaign of "Polio" and is not applicable in routine sessions in any state of India.

5 Methodology

The VMA was carried out using following steps:

9) Trained the selected staff in conducting the Sites assessment cum training using VMA Tool during four days workshop held in Guwahati;

10) The state vaccine store was assessed on VMAT criteria using VMA Tool;

11) The assessment covered 11 districts and 2 PHC approximately per district. The districts were assessed by the team from other districts except for few exceptions;

12) The DIOs and other members of each district participated in assessment carried out the one day training of cold chain handlers in their own district based on the standard operating procedures discussed during the program;

13) A three days consultative workshop held at Guwahati to submit and compile the assessment data;

14) Participants formulated standard operating procedures for district stores and PHC during the consultative workshop;

15) Major findings, its cause and solutions were formulated to draw key recommendations from the assessment exercise;

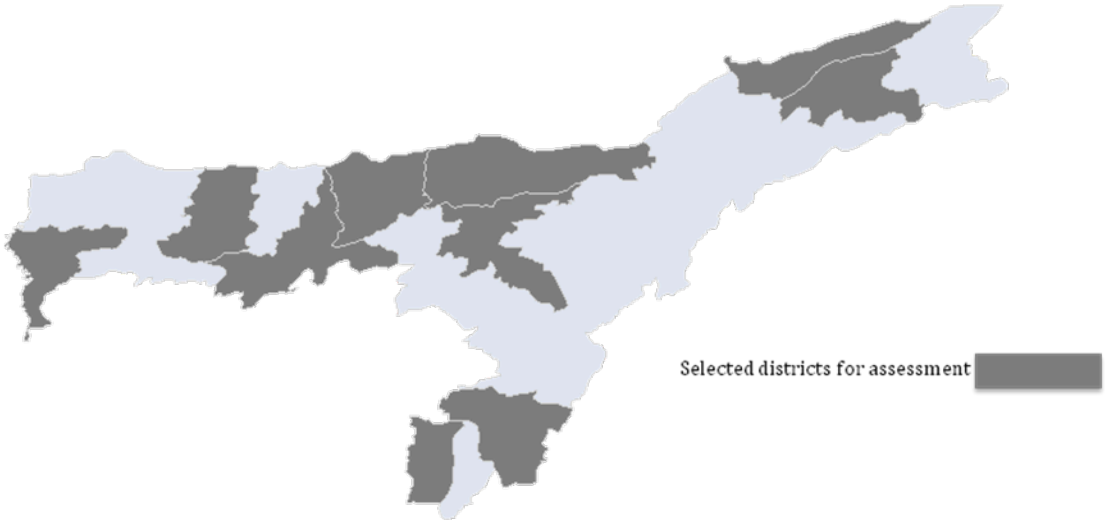
16) Outcome of the assessment was presented to dignitaries for their perusal and line of action for implementing the recommendations.

6 Activities

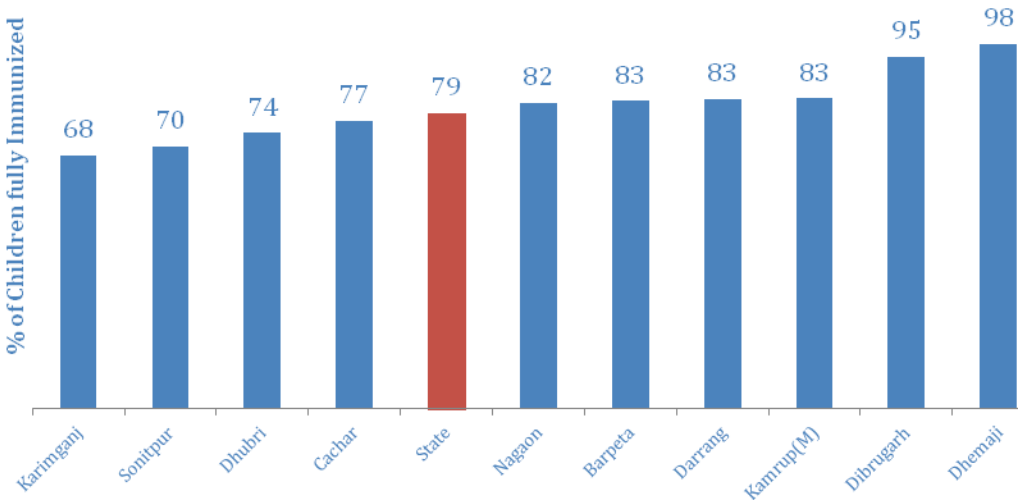
6.1 Selection of sites for assessment

There are five regions in Assam – Cachar, Dibrugarh, Goalpara, Kamrup and Sonitpur. Atleast two districts from each region were selected. Two PHCs were randomly selected from each district for assessment of lower level store. Vaccine Management Assessment was carried out at state vaccine store, 11 districts and 22 service delivery points.

Districts selected for VMAT assessment



Full Immunization Coverage of Selected districts of Assam- 2009



The participants from Sonitpur district could not attend the training workshop therefore participants from Moregaon districts joined the workshop to replace the Sonitpur district.

6.2 Selection of participants

With the objective of training the trainers in the state who will further conduct the trainings in the state, the participants selected for the workshop represent the following profiles:

- *District Immunization Officers (DIO),* were selected as overall team leaders
- *Refrigerator Technicians* were included for the representation of technical cold chain personnel;
- *Statistics Investigators (SI)* were included for their strength in financials and estimations;
- *Computer operators* were included for their IT skills which leads to computerization of stock records and vaccine volume calculations;
- *RI Consultants* of UNICEF from districts for their extended support in implementing the recommendations;

6.3 Training of trainers

The participants were trained in all the major aspects of vaccine management. The broad spectrum of the training program include:

- The correct method of estimating the vaccine requirement based on target population of UIP program and session planned for immunization activity;
- Procedures involved in the vaccine arrival process, which includes, documentation of key documents, preparation of Vaccine Arrival Report (VAR) and checking and reporting the status of vaccine upon arrival;
- Needs and aspects of temperature monitoring of cold chain equipment at storage and transportation level. Periodic reviews of temperature monitoring and contingency planning for situations resulting in violation of recommended temperature range of cold chain;
- Process involved in the calculating the vaccine storage volume required and the available capacity which helps in standardizing the frequency of vaccine arrival and formulate the expansion plan of cold chain equipment;
- The essentials of the building standards required for vaccine stores which includes the size of store for installing the cold chain equipment, electrical standards, space planning for packing vaccine and storing the supplies that require dry storage area;
- The essentials of transportation facilities for shipping vaccine between stores and up to the service delivery level. This includes budgetary provisions for smooth operation and maintenance of vehicles and cold chain equipment used during transportation;
- The best practices of vaccine stock management that ensures seamless supply of quality vaccine as required up to the service delivery level;
- The methods involved in effective delivery of vaccine to lower levels;

- Correct use of Vaccine Vial Monitors (VVM), a stimulator of loss of potency of vaccine due to exposure to head and time factor combined, as a deciding tool for using the vaccine well in time before it expires;
- Correct use of diluent supplied with lyophilized vaccine of BCG, Measles and JE;
- Measures to control the vaccine wastage and principles involved in computing the vaccine wastage rate.

6.4 Assessment of temperature maintenance

The monitoring of temperature at the cold chain storage point and transportation of vaccine is most essential process to ensure that the cold chain has been maintained. The standard protocol of temperature monitoring in India at the various levels of cold chain storage points is explained below.

	Primary level	Intermediate level	Cold chain point	Session site
Stores	- Government Medical Store Depot (GMSD) - State Vaccine Stores - Regional Vaccine stores	District Stores	- Block Primary Health Centers (PHC) - PHC	- Fixed session - Outreach session - Mobile session
Volume of vaccine stored	Three to Six months of supply for stores down the supply chain	One to three months of supply for entire district	Upto two months of supply for PHC	Supply for one session only
Type of cold chain equipment	- Walk-in-Cooler (WIC) - Walk-in-Freezer (WIF) - Deep Freezer (DF)	- Ice Lined Refrigerator (ILR) - DF	- ILR - DF	Vaccine Carrier
Temperature monitoring device	- Temperature plotter of WIC/WIF - Computerized temperature monitoring devices	- Thermometer inside the ILR or DF	- Thermometer inside the ILR or DF	None
Temperature recording method	-Automatic recording of temperature of every WIC/WIF through plotter on a seven day chart sheet - Manual reading of temperature twice daily of every unit	- Manual reading of temperature twice daily of every unit	- Manual reading of temperature twice daily of every unit	None
High and low temperature alarming method	- Built in audible alarm in WIC/WIF - Computerized alarms (Audible and phone calls)	No alarms	No alarms	No alarms
Decision supporting tools	- Temperature records (plotted, computerized and manual readings) -Vaccine Vial Monitor (VVM)	-Records of manual temperature readings -VVM	-Records of manual temperature readings -VVM	VVM

The cold chain equipment such as ILR and DF used for storing vaccine are monitored (by observing and recording temperature) twice daily (morning and evening) by cold chain handler or store incharge of cold chain point. This process only provides the situational snapshot at the time of observation. Further, the incorrect methods used for observing or recording the temperature reduces the effectiveness of this method of temperature monitoring. To understand this phenomena, two electronic temperature monitoring devices called Fridge-Tag and Tiny-Tag were introduced in the training program. All the participants were trained in using the Fridge-Tag during the VMAT training workshop. Following steps were followed to train the staff:

- A Video training tool developed by WHO was shown to participants. The video guides the audience through all the steps of activating the device and reading the device through history mode.
- All the participants activated the device themselves during the workshop

The Fridge-Tags were activated during the last day of the training program. Following activation, all the participants were required to place the Fridge-Tag in the ILRs along with the DPT vaccine at designated stores from 12th of April till 26 of April (for a period of fortnight). The Fridge-Tags were then brought back by participants to Guwahati during the three days consultative workshop from 27 to 29th April 2010. The readings from Fridge-Tag were read and interpreted by the participants and at the same time it was transferred to an Excel Worksheet for further analysis. The real time data from the stores provided good evidence on the performance of cold chain equipment and the degree to which the vaccine was exposed to extreme temperatures.

To validate the readings from Fridge-Tag and manual temperature records, six number of Tiny-Tag data loggers were bundled together with Fridge-Tags. Three of those were placed inside the cold rooms at Goalpara, Dibrugarh and Cachar and other three were issued to participants from different regions based on following protocol:

Type of site	Type of package	Type of Equipment	Total Number of Testing points
District with cold room(Goalpara, Dibrugarh and Cachar)	Fridge-Tag bundled with tiny tag	Inside cold room, along with DPT Vaccine	3
All the District stores assessed against VMAT standards (including Goalpara, Dibrugarh and Cachar)	One Fridge-Tag	Inside ILR along with DPT Vaccine	10
Selected district store (Non WIC District)	Fridge-Tag bundled with tiny tag	Inside the ILR, along with DPT Vaccine	1
Selected PHC	Fridge-Tag bundled with tiny tag	Inside the ILR, along with DPT Vaccine	1
All the PHCs assessed against the VMAT standards	One Fridge-Tag	Inside ILR along with DPT Vaccine	20
Selected four sites where Solar refrigerator has been installed	One Fridge-Tag	Inside Solar Refrigerator along with DPT or other freeze sensitive vaccine	4
Selected site where	Fridge-Tag bundled	Inside Solar	1

Solar refrigerator has been installed	with tiny tag	Refrigerator along with DPT or other freeze sensitive vaccine	
Total			40

6.5 Training of cold chain handlers

The DIOs of the participating districts conducted the special one day training programs of cold chain handlers by focusing on following topics:

- Preventive maintenance of cold chain equipment;
- Contingency plan in the event of power failure or cold chain equipment failure;
- Standards of building of cold chain points including electrical standards, earthing and operating generators;
- Packing the vaccine carrier and cold boxes (conditioning of ice packs)
- Effective temperature monitoring;
- Correct use of VVM and diluents;
- Good practices of book keeping and indent preparation;
- Session planning and vaccine wastage control.

6.6 Assessment of sites

The participants assessed the district vaccine stores and two PHCs against the VMAT standards. The sites assessed and list of team members are listed below in table.

District assessed	Name of PHCs assessed	Members of assessment teams	District of assessment team
Barpeta	Nagaon Mandia	- Dr Kandarpa Pathak (DIO) - Bhupen Kalita (SI) - Naryan Kakati (Ref Tech,) - Atanu Roy Choudhary (Comp. Asst)	Kamrup
Cachar	Sonai Harinagar	- Dr Ashim Kanti Das (DIO), - Nilanjan Gupta (Statistical investigator) - Dilip Dutt Choudhary (Store incharge)	Cachar
Darrang	Sipajhar Jaljali	- Dr R Das (DIO) - H Roy (Ref Mechanic) - B Ojha (SI) - Sanjay Das (Comp Asst)	Berpeta
Dhemaji	Bengnagarah Sissibargaon	- Dr P Saikia (DIO) - Sadek Ali Ahmed (Comp Asst)	Dhemaji

Dhubri	South Salmara Dharamshala	- Dr N K Choudhary (DIO) - Bhupendra Nath Sharma (Ref Mech) - Hiranmay Chakkraborty (Comp Asst) - Uttam Choudhary (SI)	Dhubri
Dibrugarh	Barbaruah Panitola	- Dr Bharti Baruah (Adl. CM& HO (FW)- Dibrugarh - Misbahul Hussain(SI), - Mrigen Das (Store incharge), - Arshad Hussain (Comp. Asst)	Dibrugarh
Kamrup (M)	Rampur Pandu	- Dr U P Baruah (DIO) - Mohendra Dekka (store incharge) - Amal das (comp. Asst.)	Darrang
Karimganj	Nilam Bazar Patherkandi	- Dr Ashim Kanti Das (DIO), - Nilanjan Gupta (Statistical investigator) - Dilip Dutt Choudhary (Store incharge)	Cachar
Morigaon	Laharighat Jhargaon	- Dr M.H. Saikia (DIO) - Mr. A. Saikia (SI) - Mr. L. C. Borgohain (Ref. Mechanic) - Mr. Aziz Aktar (Comp. Asstt.)	Nagaon
Nagaon	Bebejia Samuguri	- Dr R K Borkotakoy (DIO) - Pavitra Kumar Das (SI) - Manoj Kumar Phukan (Comp Asst)	Udalguri
Udalguri	Orang Udalgudi PHC	- Dr R K Borkotakoy (DIO) - Pavitra Kumar Das (SI) - Manoj Kumar Phukan (Comp Asst)	Udalguri

6.7 Submission and compilation of assessment data

The participants submitted the duly signed VMAT assessment forms to Cold Chain Officer (CCO) during the 3 days consultative workshop. The forms include:

- The assessment sheet of district store assessed
- The assessment sheets of two PHCs assessed.
- Name and signature of all the participants in the assessment team

The submitted data was compiled using the excel file of all the districts and PHCs assessed. The net assessment result is included in this report generated though this tool.

The compilation of data was done in one to one consultation with the team members of respective assessors of the districts to ensure the quality of assessment data.

6.8 Compilation of findings

The findings from the assessment was discussed in consultative workshop in the format of:

- listing the observations from the assessment relevant to each district;
- Discussed the cause of each of these observations;
- The effects of these observations;
- The solution for each of the problem identified during the assessment

This exercise complimented and completed the training of participants to correlate the learning with the practical observations and provided the result oriented approach.

6.9 Formation of recommendations

The solutions sought by the participants for the problems identified during assessment was translated into set of recommendations dividing into three phases of implementable immediately, short term recommendations (one year) and long term recommendations.

7 Key observations from assessment

7.1 State level

7.1.1 Major issues

1. The cold room and freezer rooms are more then 20 and 10 years old respectively, and the store has already received the replacement of both units. The new units of 16m3 size each along with 7.5 KVA generator is awaiting installation.

2. The building hosting the state vaccine store (152 Sq M size) is accommodating one WIC and one WIF of 20 m3 gross size each along with 8 DFs. Figure 1 below shows the layout of present store. Figure 2 suggests the possible refurbished layout with changes to accommodate the newly supplied cold rooms.

3. The store is equipped with a computerized temperature monitoring system (MULTILOG) that records the temperature of both WIC and WIF on 24x7 basis. However, the temperature trace recorder (Plotter) of both WIC and WIF are not operational because of ink and plotter pen being out of stock for many months.

4. The temperature records of WIF (from Multilog) suggests that the freezer room has been performing sub-optimally at the temperature band of -10 Deg C to + 4 Deg C (ideally it should be performing between -25 and -15 Deg C.) . This is because of leakages in the wall of WIF.

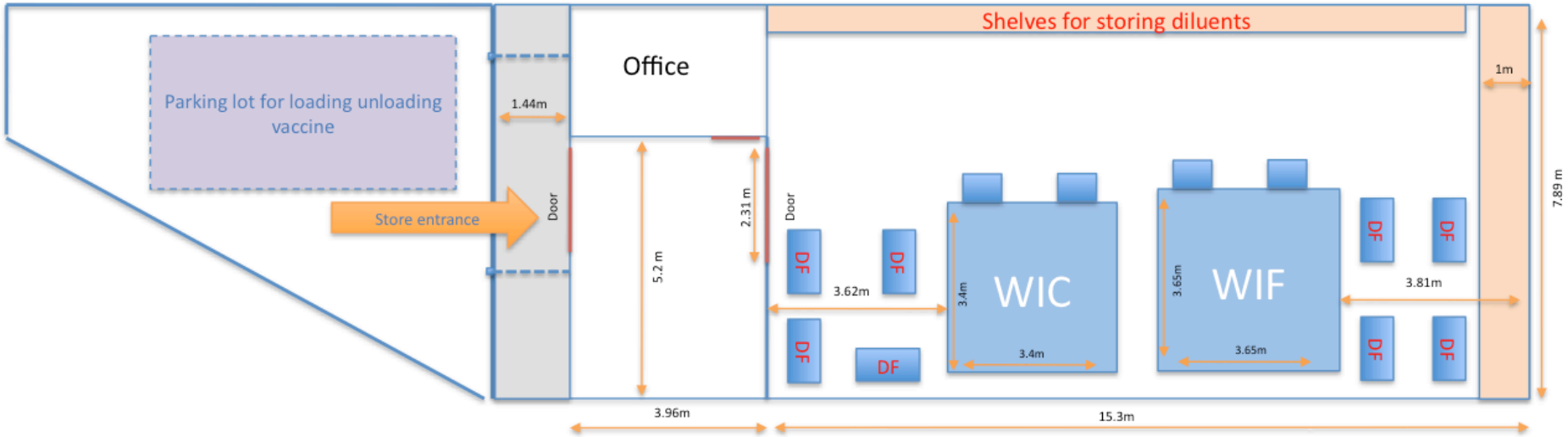


Figure 1: Present layout of state vaccine store

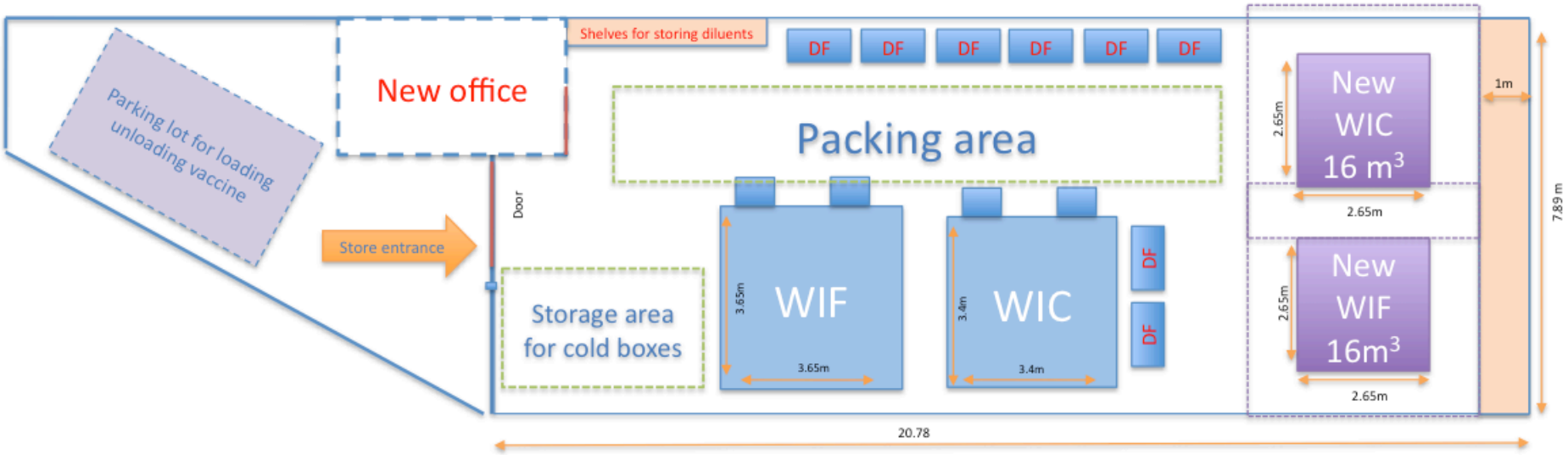


Figure 2: Proposed layout of state vaccine store (to accommodate two new units of WIC and WIF)

5. The storage capacity of freeze sensitive vaccine has been sub optimal. Looking at the stock situation of past 6 months, the store has been constantly falling short of capacity, which forces the vaccine to be stored on floor and leaves less room for circulation and movement inside the cold room. The installation of newly supplied WIC would just suffice the requirement, however this new WIC is only for the replacement of the old WIC, an additional WIC of 40 m3 size is required, which, in addition to the 16 m3 newly supply cold room will provide the sufficient capacity for routine vaccine and will also address the storage requirement of measles 2nd opportunity in RI program.

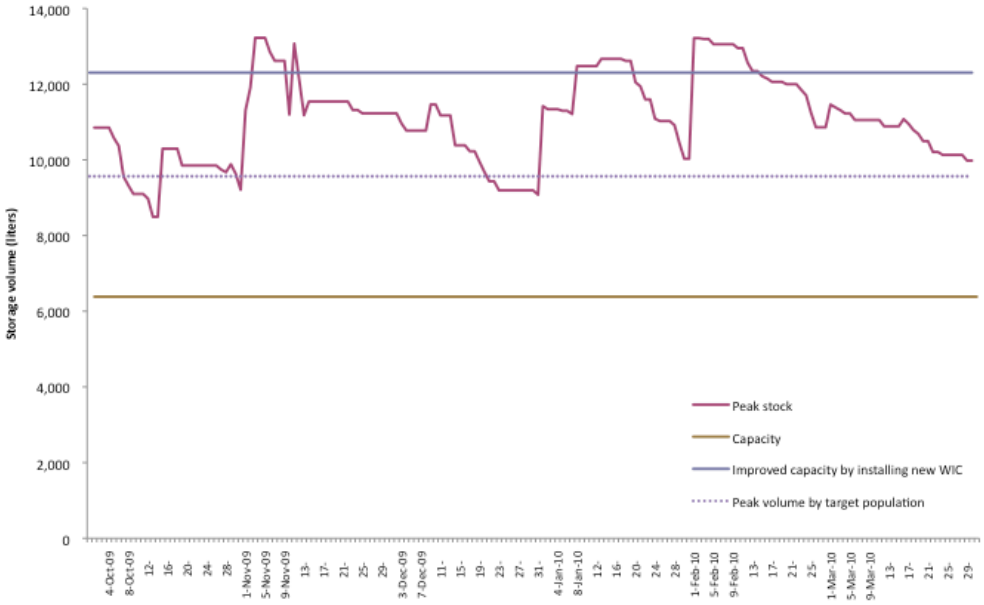


Figure 3: Storage volume of 2 to 8 Deg C

6. The ventilation inside the store need to be improved. The present provisions of exhaust do not provide adequate ventilation. Given that two new cold rooms will be installed soon at the site, the exhaust fans of industrial standards (minimum size of 14 Inch diameter of impeller with air volume of 3400 m^3 per hour) should be installed at all the provided slots in the store building.

7. The electrical wiring needs to be refurbished keeping in mind the installation of two upcoming WIC and WIF.

8. The store is over stocked with the other supplies leaving no room for packaging the vaccine and conditioning of ice packs.

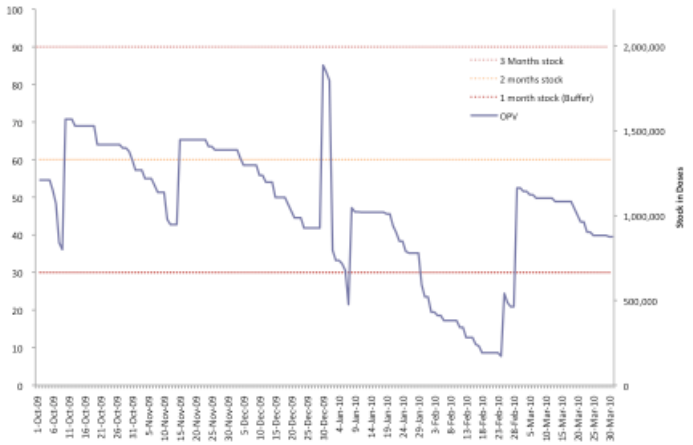
9. The general waste is accumulated just at the entrance of the store leads to high risk of penetration of pests inside the store.

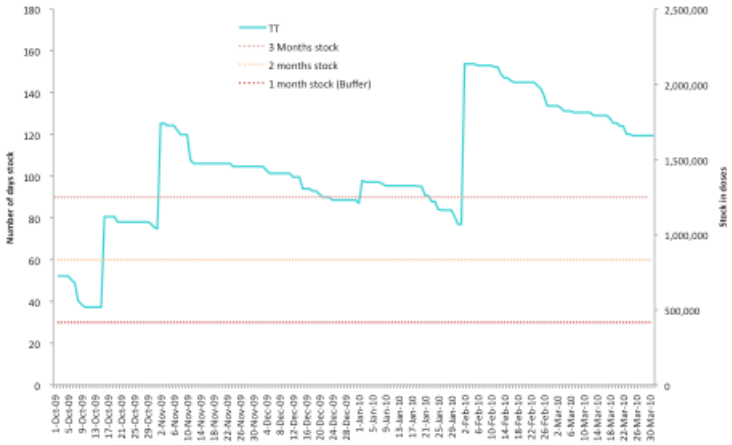
10. The state vaccine store typically need to stock the vaccine sufficient for atleast 2 months of supply with the maximum stock of up to six months of supply.

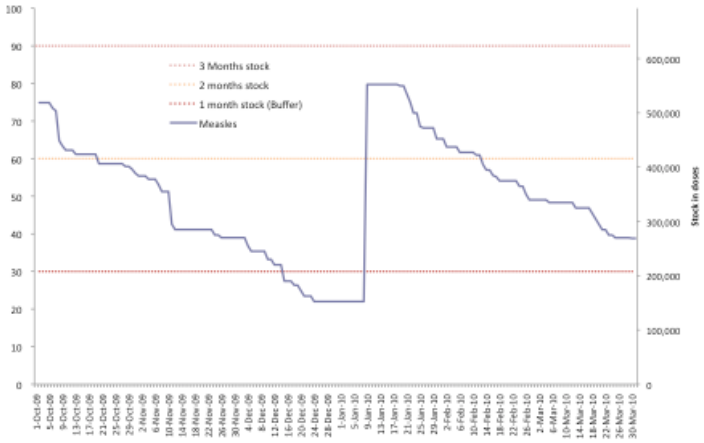
11. The stock of all the vaccine from 1 Oct 2009 till 31 March 2010 at vaccine store was reviewed against the months of requirement.

12. The stock of TT vaccine was normally above the requirement of three months. Stock went up to 5 months of supply in the month of February. The TT vaccine arrived 4 times during the assessment period of 6 months from 1-oct-09 till 31-Mar-2010.

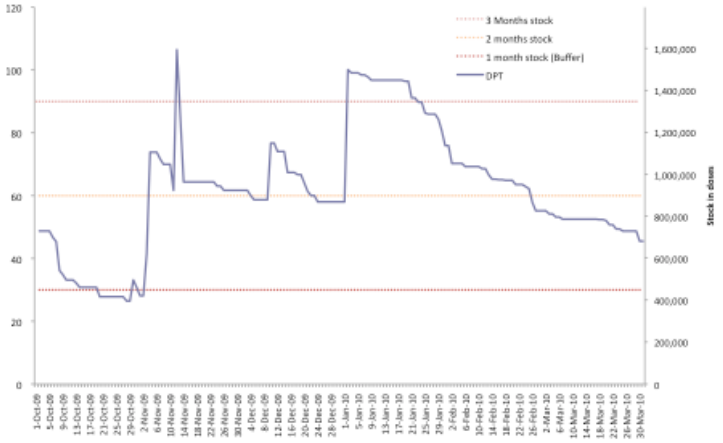
13. The stock of OPV vaccine for routine immunization had been sufficient for the supply period averaging between one to two months during the review period except for the month of February where the safety stock was breached and the stock went as low as for 10 days of supply only.

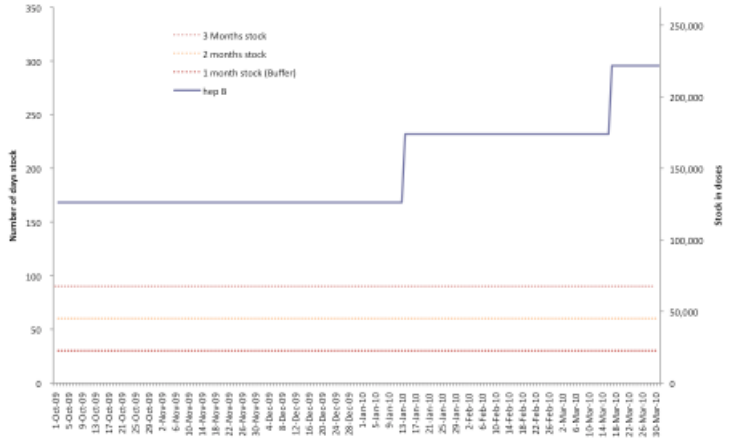

3 Months stock
2 months stock
1 month stock (Buffer)
OPV
Stock in Doses

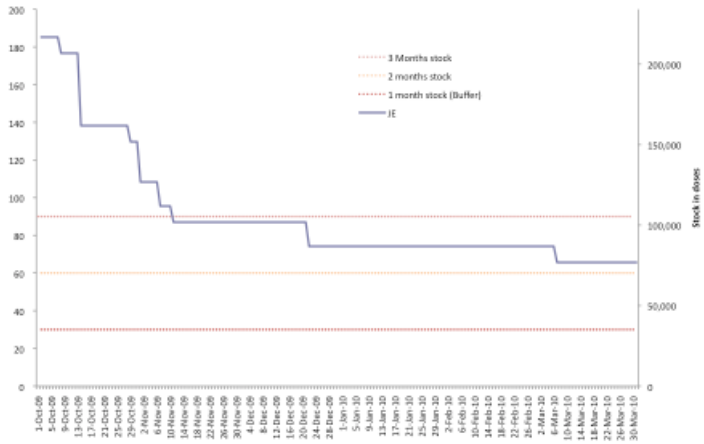

TT
3 Months stock
2 months stock
1 month stock (Buffer)
Number of days stock
Stock in doses


3 Months stock
2 months stock
1 month stock (Buffer)
Measles
Stock in doses


3 Months stock
2 months stock
1 month stock (Buffer)
BCG
Number of days stock
Stock in doses


3 Months stock
2 months stock
1 month stock (Buffer)
DPT
Stock in doses


3 Months stock
2 months stock
1 month stock (Buffer)
hep B
Number of days stock
Stock in doses


3 Months stock
2 months stock
1 month stock (Buffer)
JE
Stock in doses

7.2 District and PHC level

The observations by participants during the assessment reflect the key gaps of infrastructure, procedures and practices. These observations are mapped in the matrix of observations, cause, effect and solution. The matrix is included below in table:

Districts	Observation	Cause	Effect	Solution
All Districts	No satisfactory contingency Plan	No Documented Standard Operating Procedures (SOP)	High Risk of damage to the vaccine	Prepare SOP and adopt locally and include these in capacity building exercises. Post these SOP in cold chain facilities.
All districts	Vaccine store located in inadequately sized room(Space for ILR/DF (atleast 10 units (Morigaon and Udalgudi - atleast 8 units)) ,inadequate dry storage space , inadequate packing space, no icepack conditioning space, poor ventilation)	Store layout not according to national norms or WHO guidelines	No scope of expansion , Increased operational cost, compromised standards of building, affects vaccine management	Temporary solution : Hiring of additional space for store till permanent building is provided as per national or WHO norms Permanent solution: Provide dedicate space for vaccine logistics and plan the building layout as per national/WHO guidelines.
All districts	No system to monitor the vaccine wastage, incorrect vaccine wastage rates used	lack of knowledge, lack of planning, Poor flow of information	Incorrect estimate of vaccine	Analysis the data to estimate correct wastage rates and use the correct rates in estimating the vaccine requirement annually
Kamrup, Morigaon, Dhubri, Cachar, Nagaon, Barpeta, Udalgudi, Darrang, Dibrugarh, Dhemaji	No dedicated standby power supply (No generator)	Power backup not seen as priority and lack of planning to procure and commission the generators	Sub optimal performance of cold chain equipment may lead to high risk of damage to the vaccine or faster aging of vaccine and loosing potency during the shelf life in the event of unstable power supply	Temporary solution: hire generator locally , Request under UIP-pt-C while the new generator is procured and commissioned

Districts	Observation	Cause	Effect	Solution
Cachar, Dibrugarh	WIC not functioning, However 3 ILR (L) were provided by state as backup to store the vaccine for district requirement, New WIC awaiting installation	WIC is more than 20 yrs old, No Refrigeration Technician in district for last 6 yrs (Cachar). WIC just arrived and awaiting allocation of space for installation of WIC and technical team to install the WIC.	Reduced storage capacity of district, cannot supply to adjacent district	Dismantle the non-functional WIC to make room for new WIC. Provide clearance to technical team to install the WIC
Cachar	Post of refrigeration technician is vacant for past six years	The technician of Cachar district was transferred to Nagaon district and ever since the post went vacant it is awaiting replacement	High Risk of not repairing of equipment on time, lacks quality preventive maintenance	While the vacant post is filled, state to provide temporary arrangement for repair and maintenance
Cachar, Karimganj, Morigaon, Nagaon, Dhemaji, Kamrup, Darrang and Barpeta	Vaccine delivery van is not functioning properly	Vaccine van is very old & need frequent repairing.	Recurring expenditure is high. High risk of vaccine van not available when required.	Provide new vehicle for vaccine delivery
Cachar	The continuous temperature recorder of WIC is not functional	Ineffective monitoring and supervision	No evidence of temperature maintenance and hard to diagnose the problems with the cooling units on time.	Follow SOP for temperature monitoring. Establish accountability for maintaining continuous temperature records
Nagaon, Morigaon	Condemned items occupying the store	No directive to auction the condemned items	The scarce space is unnecessarily occupied	Issue directive from state to auction the condemned items and auction the condemned items locally.
Kamrup, Darrang, Barpeta	Cold chain equipment is functioning sub optimally, frequent breakdowns	The installed ILR/DFs are more then 10 years old	Shortage of vaccine storage capacity	Replenish the cold chain vaccine storage capacity by providing and installing new ILRs/DFs as per the requirement by computing peak vaccine volume load.
Kamrup, Darrang, Barpeta	Stock books not maintained	Untrained staff managing the vaccine store, No dedicated health worker posted	Poor vaccine management	Standardize the stock book format, strengthen supervision, establish accountability for maintaining stock books, include stock management

Districts	Observation	Cause	Effect	Solution
		Lack of supervision		in capacity building exercises
Kamrup, Darrang	No vaccine distribution plan	Lack of planning	Poor vaccine management, incorrect estimate of vaccine leading to short shipments, shortage or excess of stock	Establish the vaccine distribution plan
Nagaon, Udalguri, Morigaon	Power backup connected through the hospital generator, only 2 ILRs connected to generator	Power backup not seen as priority and lack of planning to procure and commission the generators	Inadequate power backup	Temporary solution: hire generator locally , Request under UIP-pt-C while the new generator is procured and commissioned
Nagaon	Two vehicles issued to Nagaon district are more tha 10 yrs old(with high wear and tear rate) and only one is operational	Timely replacement not done, No preventive maintenance plan	High maintenance cost, Non availability of vehicle when required	Provide new vehicle for vaccine delivery
Nagaon, Morigaon, Udalguri	Diluent stock mismatched. Diluent stock book not maintained	Untrained staff managing the vaccine store, lack of supervision	Reconstitution of lyophilized vaccine with incorrect diluent	Establish the essential stock management practices, maintain the stock book of diluent along with vaccine and establish the accountability of managing the diluent stock
Nagaon, Morigaon, Udalguri	Vaccine stock outs	Indent process not linked with estimation of vaccine, stock levels not established	Short shipments of vaccine, shortage of vaccine at service delivery level	Establish stock levels and indent accordingly
Dibrugarh, Dhemaji & Dhubri	Stock book entry made in vials not in doses other vital information such as manufacture details, manufacturing date and VVM status not recorded	Stock books not standardized as per recommendation of MOHFW and WHO	Stock books not in line with the method of vaccine estimation, chances of incorrect shipments and indent misinterpreting vials with doses and number of doses per vial	Standardize the stock book format, strengthen supervision, establish accountability for maintaining stock books, include stock management in capacity building exercises

7.3 Detailed assessment result

Detailed scoring of districts

Sections	1	2	3	4	5	6	7	8	9	11
Sites	Vaccine arrival procedures	Vaccine storage temperatures	Cold storage capacity	Building, cold chain equipment & transport	Maintenance CC equipment and transport	Stock management	Effective vaccine delivery	Correct diluent use	Effective VVM use	Vaccine wastage control
State vaccine store	**56%**	**91%**	**58%**	**81%**	**76%**	**44%**	**79%**	**0%**	**100%**	**67%**
Barpeta District		80%	33%	78%	63%	61%	78%	100%	91%	0%
Nagaon PHC		87%	100%	100%	70%	60%	55%	50%	70%	0%
Mandia PHC		85%	100%	100%	35%	52%	27%	50%	70%	0%
Cachar District		84%	67%	61%	100%	86%	92%	100%	100%	50%
Sonai PHC		82%	100%	100%	61%	66%	91%	100%	77%	50%
Harinagar PHC		82%	100%	90%	61%	66%	100%	100%	77%	50%
Darrang District		91%	83%	94%	76%	74%	79%	100%	81%	0%
Sipajhar PHC		98%	100%	91%	62%	80%	91%	100%	94%	0%
Jaljali PHC		93%	100%	82%	61%	80%	91%	100%	94%	0%
Dhemaji District		84%	83%	71%	80%	75%	86%	50%	100%	82%
Bengnagarah PHC		60%	100%	100%	80%	60%	91%	75%	100%	79%
Sissibargaon PHC		87%	100%	90%	80%	54%	91%	50%	100%	82%
Dhubri District		84%	67%	78%	89%	64%	86%	100%	100%	0%
South Salmara PHC		77%	100%	100%	73%	44%	9%	25%	100%	0%
Dharmashala PHC	N/A	87%	100%	100%	73%	63%	18%	75%	100%	0%
Dibrugarh District		84%	100%	41%	73%	41%	79%	50%	100%	0%
Barbaruah PHC		80%	100%	70%	73%	25%	73%	75%	94%	0%
Panitola PHC		100%	100%	90%	73%	56%	82%	75%	100%	0%
Kamrup (metro) District		84%	100%	65%	86%	44%	86%	50%	100%	18%
Rampur PHC		87%	100%	91%	79%	70%	91%	100%	77%	18%
Pandu PHC		83%	50%	91%	73%	16%	82%	75%	77%	0%
Karimganj District		91%	83%	78%	76%	73%	43%	50%	100%	7%
Nilam Bazar PHC		82%	100%	100%	65%	66%	55%	75%	84%	7%
Patherkandi PHC		80%	100%	93%	78%	62%	55%	75%	84%	7%
Morigaon District		89%	50%	71%	93%	32%	83%	0%	91%	0%
Laharighat PHC		83%	100%	75%	73%	19%	73%	100%	94%	0%
Jhargaon PHC		88%	100%	100%	61%	25%	64%	75%	94%	0%
Nagaon District		84%	0%	88%	76%	23%	85%	50%	100%	0%

Sections	1	2	3	4	5	6	7	8	9	11
Sites	Vaccine arrival procedures	Vaccine storage temperatures	Cold storage capacity	Building, cold chain equipment & transport	Maintenance CC equipment and transport	Stock management	Effective vaccine delivery	Correct diluent use	Effective VVM use	Vaccine wastage control
Bebejia PHC		87%	100%	75%	80%	84%	91%	75%	77%	0%
Samuguri PHC		80%	100%	67%	73%	27%	91%	75%	70%	0%
Udalguri District		84%	75%	95%	74%	59%	62%	100%	100%	18%
Udalgudi PHC		87%	100%	90%	62%	38%	55%	75%	100%	0%
Orang PHC		73%	100%	80%	53%	58%	91%	100%	77%	0%
District average		**86%**	**67%**	**74%**	**81%**	**57%**	**78%**	**68%**	**98%**	**16%**
PHC Average		**84%**	**98%**	**90%**	**68%**	**53%**	**71%**	**77%**	**88%**	**13%**

7.3.1 Vaccine arrival procedures

This section is applicable only at state vaccine store.

Ideal requirements: All the vaccine arrivals from manufacturer should accompany a set of key documents as listed below.

- Invoice indicating the value of goods shipped
- Lot release certificate of every batch of vaccine from Drug regulatory Authority
- Vaccine packing list
- Inspection note by inspection officer
- Airway bill copy
- Copy of vaccine allotment by MOHFW indicating the schedule and quantity of vaccine to be shipped

There should be advance intimation for each shipment from manufacturer or GMSD, preferably atleast seven days prior to scheduled date of arrival. This intimation should be either through fax or email. Telephonic intimations should be documented.

The state vaccine store is required to prepare the Vaccine Arrival Report in three copies within 3 days of each vaccine shipment arrival. A copy of this should be:

- Filed for documentation purposes;
- Sent to manufacturer for their records;
- Sent to MOHFW for their records.

Present status: State store received total of 28 shipments with 58 individual lots of vaccine during the review period of six months and only for six of 28 shipments, VAR were prepared. The figure 4 shows the percentage of each key document filed at state vaccine store.

The vaccine arrival procedures at state store were found to be inadequate. This is however also because these key documents do not accompany all the shipments coming from the manufacturer and further not followed by state store.

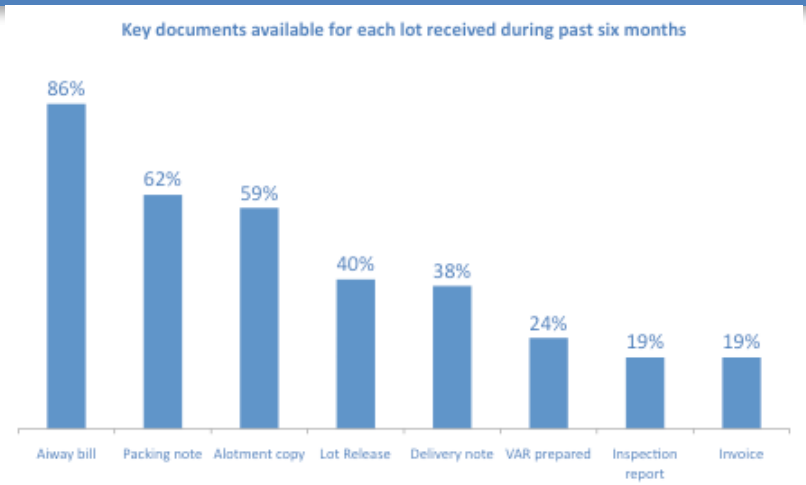


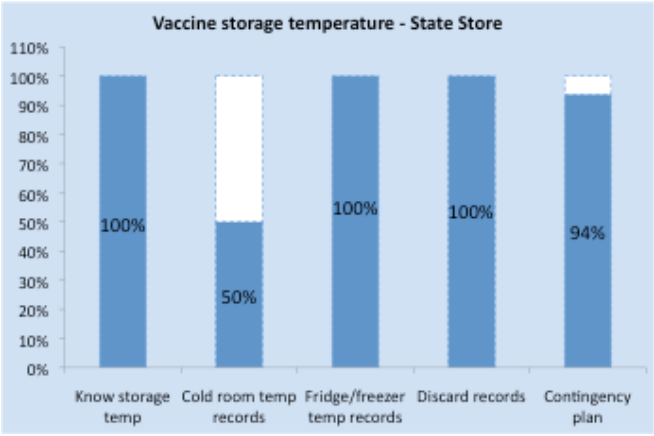
Figure 4: Key documents available pertaining to arrival of vaccine

7.3.2 Temperature monitoring

Ideal requirements: Temperature monitoring is critical for maintaining the cold chain. The monitoring is required to be done proactively and monitoring records of temperatures twice daily, should be made available for reference anytime in future (for atleast next two years). The person responsible for monitoring cold chain equipment should be well aware of temperature sensitivity of vaccines and store should be well prepared with contingency plans in case of emergency situations.

State and regional stores: In addition to above the temperature records of cold rooms and freezer rooms, recorded every one hour round the clock through trace plotter or other means, should be made filed for cold room performance reference.

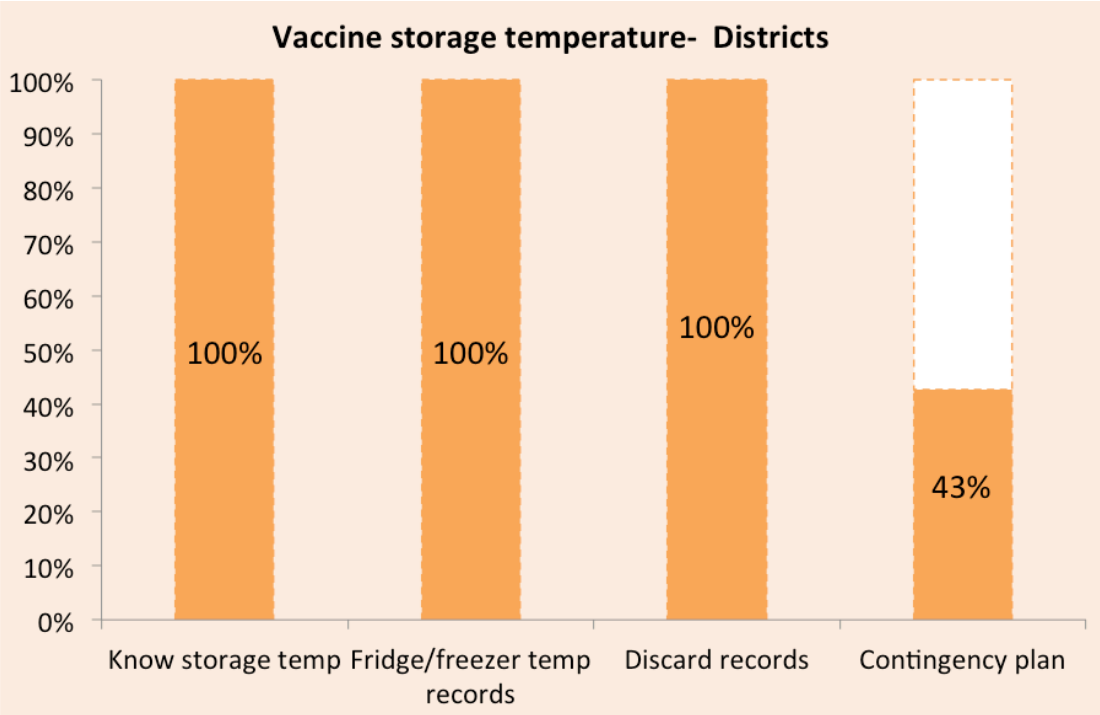
State vaccine store*:* The staff at state store are knowledgeable in up-keeping of vaccine in correct temperature ranges. The store also has satisfactory contingency plan in the event of emergency.



The temperature trace recorder of both WIC and WIF is not functioning, however, the store is equipped with computerized temperature monitoring system using 16 sensor data logger and alarming system. The system was found to be functional except for a short duration when the system was shut down due to hardware problems with the computer. Cold room is more then 20 years old. It is being repaired with an average of twice every month. The cold room has been occupied more then 100% of shelf capacity for past 6 months. Apart from 2 cold rooms in near-by districts (Goalpara (152 km) and Tezpur (181 km), there is no immediate backup of cold room. The store is operating with high risk of relying on sole old WIC. However, a new cold room of 16 m3 has been recently supplied by MOHFW which is awaiting installation but the new cold room will only offload the storage load of existing WIC and therefore will not provide adequate backup. They do however have 30 cold boxes in stock and 8 ice pack freezers (with 4 freezers

storing ice packs all the time). this provides them with an option of using cold boxes in case of emergency. They also have 3 large ILRs in stock which can be installed at any time. For all the problems in the past, the cold room has been repaired within 2 hrs by a dedicated technician.

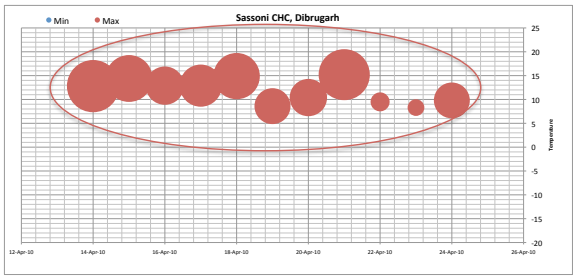
District stores: The staff of all the districts assessed knows the correct temperature range of all the vaccines. The temperature records also maintained for at-least past 6 months. The contingency planning was not demonstrated adequately in most of the districts. The section scored only 43% towards the preparedness in case of emergency situation.



Though the districts stores do have contingency plan, but the plan is either not satisfactorily or the plan was never rehearsed.

District stores except for Barpeta, Darrang and Karimganj did not had emergency contacts posted in the vaccine store. Also except for Morigaon, staff at districts were unable to demonstrate the steps they should follow in case of emergency.

PHC: The gaps were found in temperature monitoring and planning/execution of contingency plan. The fridge tags which were used during the assessment reflected the important finding that there were several instances of temperature of cold chain equipment, at district and PHC levels, were out of safe range and this was not captured by manual monitoring of temperature twice daily. The extracts from fridge tag data collected during this study is shown below in figure 5. The state has been supplied 300 Fridge tags in first phase now, these fridge tags would provide the better platform for effective temperature monitoring.



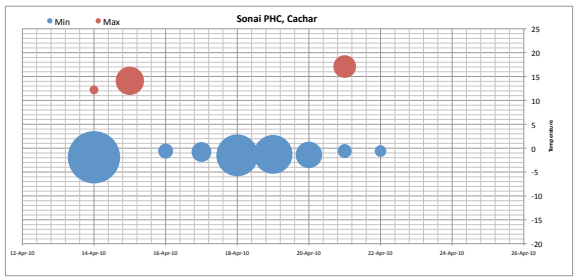
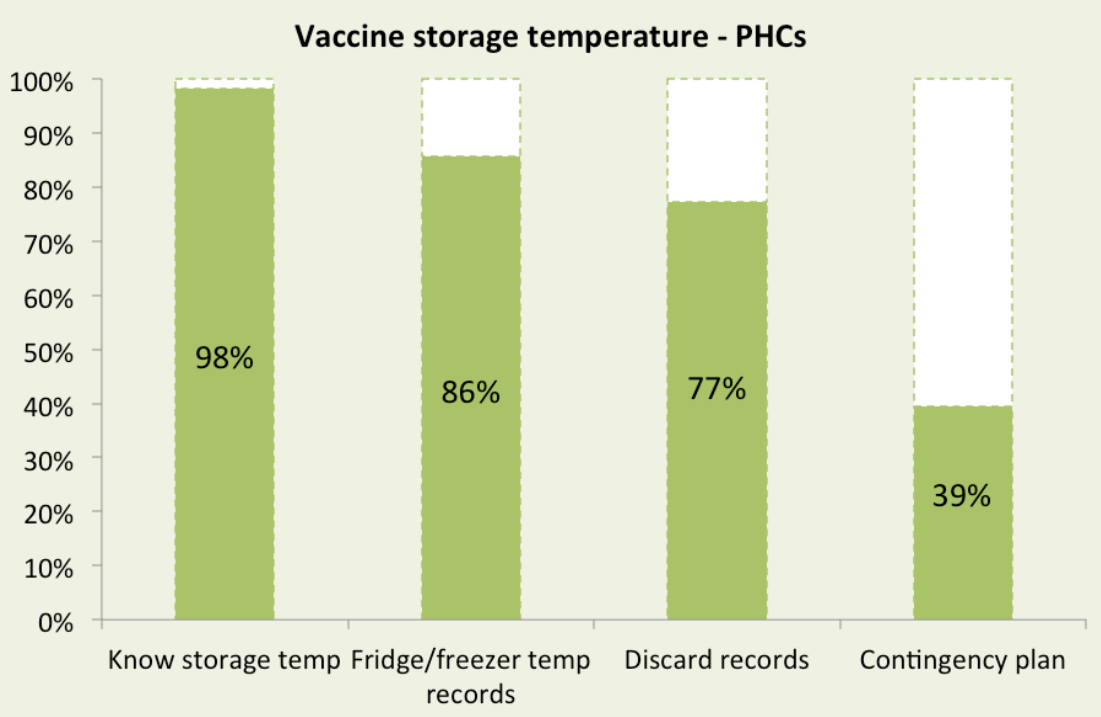


Figure 5: Extracts from Fridge-Tag data during assessment

In the figure 5 above, the two examples from Sassoni CHC, Dibrugarh and Sonai PHC, Cachar shows the instances of exposure and duration of temperatures outside the safe range. The red circle shows the instances of temperature above 8 Deg C and blue circle shows the instances of temperatures below 0 Deg C. the size of bubble indicated the duration of continuous violation outside the safe temperature range.

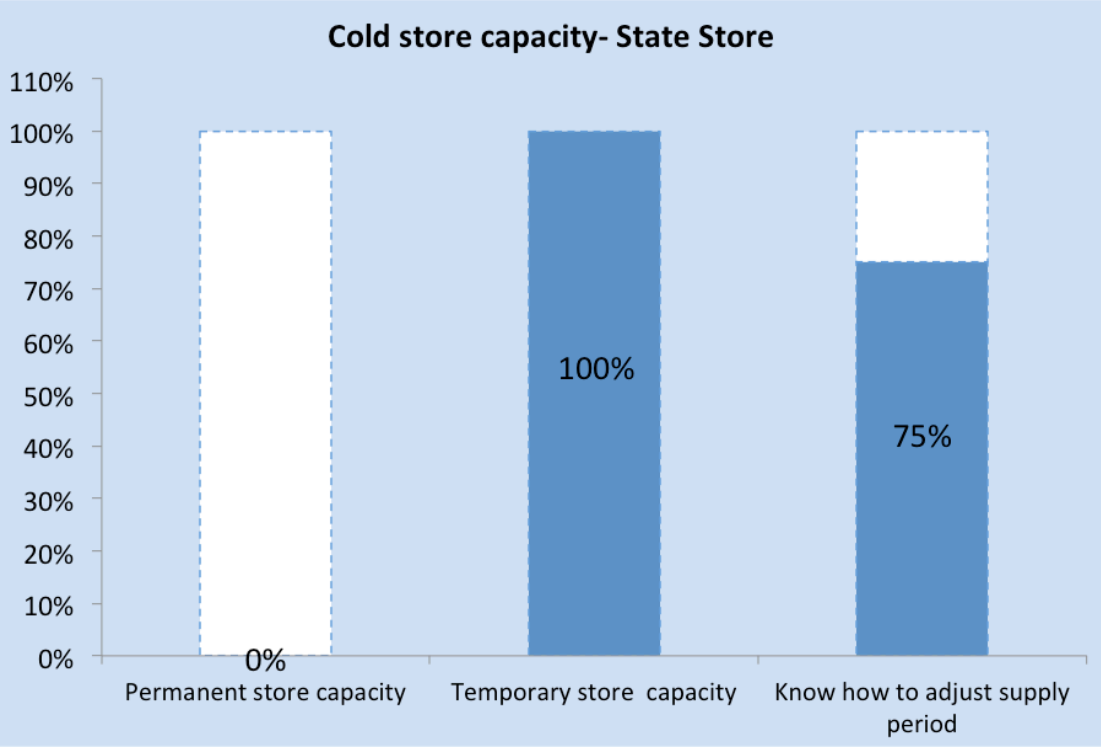


7.3.3 Cold chain capacity

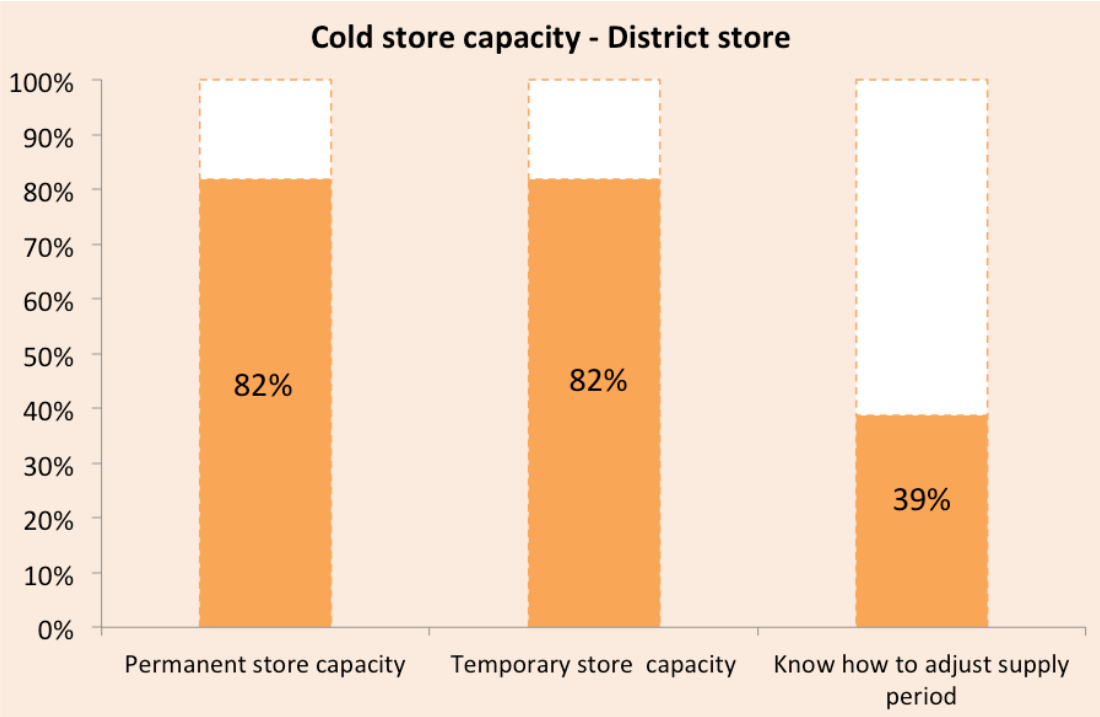
Ideal requirements: The vaccine stores should have the cold chain capacity to accommodate the peak load of vaccine volume during the year. This includes the

sufficient capacity to accommodate the vaccine for routine immunization program and well as the needs of Supplementary Immunization Days (SIAs). The storekeepers should also know how to adjust the volume of supplies and schedule of vaccine delivery when the capacity is not sufficient.

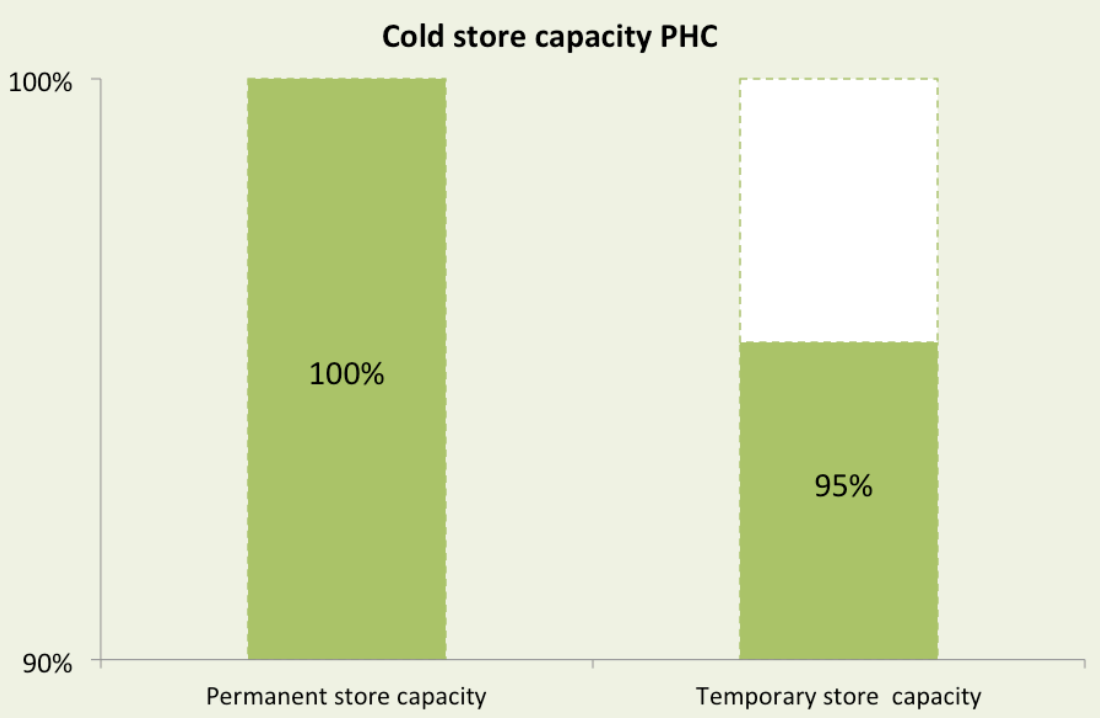
State store: As indicated above in the findings section, the vaccine storage capacity of state store is in-adequate for routine vaccine supplies looking at the peak volume during the past six months. A new WIC is awaiting installation that will improve storage capacity the requirement. The campaign vaccine is dispatched normally the same day it arrives at store.



District stores: Five of the 11 district stores (Barpeta, Cachar, Dhubri, Morigaon, Nagaon) assessed need additional cold chain equipment (ILR and DF) to suffice the requirement for routine immunization program. The districts reported that they have sufficient vaccine carriers for all their PHCs and sub centers. Four of the districts needed additional temporary cold chain support in the event of SIA's.



PHC : Except for Pandu PHC (Kamrup district), where there is a shortage of temporary storage space for campaigns, all others PHC have sufficient storage capacity for vaccine.



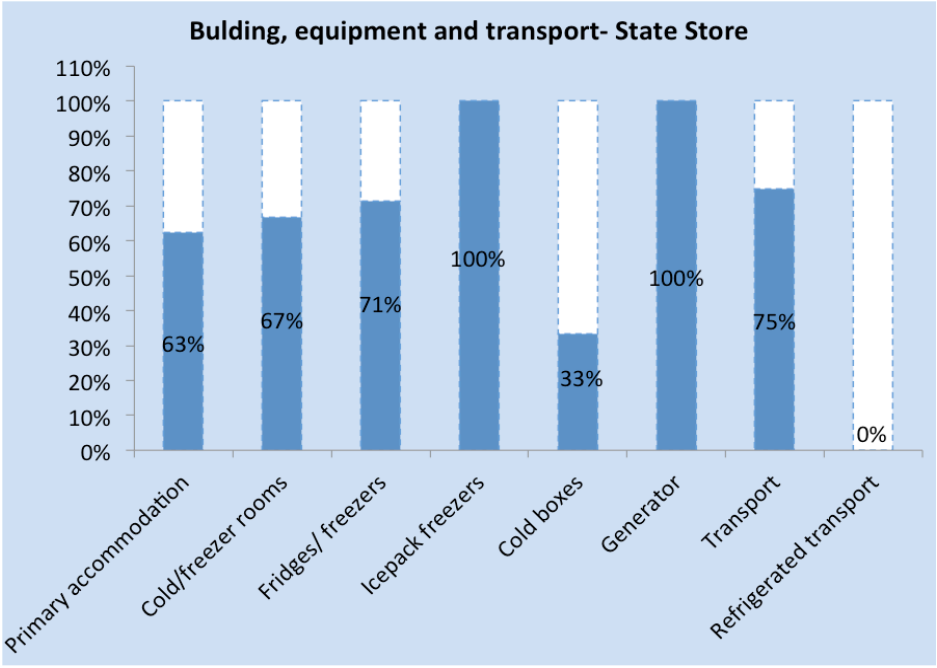
7.3.4 Building, equipment and transport

Ideal requirements: Vaccine and related supplies within the store building should be sufficiently accommodated. There should be adequate space for packaging of vaccine and ice-pack conditioning. The storekeeper office should have space to accommodate computer, storage shelves for documents and should have clear line of sight to monitor the cold storage area and packaging of vaccine. The cold chain equipment (cold rooms, ILRs and DFs) should be operational and should be equipped with operational temperature monitoring devices. The store should have sufficient capacity to freeze ice-packs. There should be sufficient number of cold boxes and vaccine carriers to address the peak transportation and standby storage demand. There should be a standy power supply for the store with automatic startup. Preferably the generator should serve the vaccine store alone. There should be satisfactory transport arrangements in place for transporting vaccine, including arrangements for the maintenance of correct temperatures during transport.

State store: The space available for UIP supplies, especially for storing diluents, including space for packaging of vaccine and ice-pack conditioning is inadequate. Referring to figure 1 and 2 in key findings section, the building need refurbishing to accommodate new cold room and space for packaging of vaccine.

The Walk in Freezer (WIF) was found to be working sub-optimally, the freezer was not maintaining the required temperature as the WIF is too old and the fabricated walls are leaking. There were noticeable droplets of water formed at the cracks and joints of walls of freezer during the defrosting cycle.

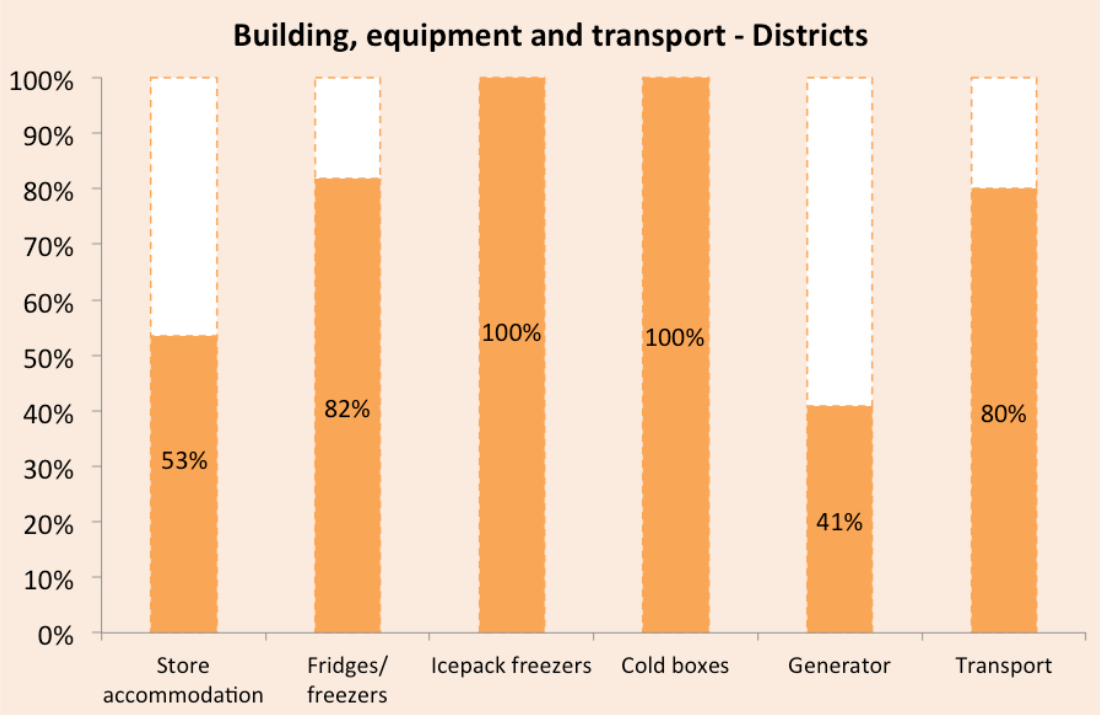
The staff engaged in packing of vaccine did not know how to properly condition the ice packs. Though the storekeeper and store supervisor were well aware of procedure of ice-pack conditioning.



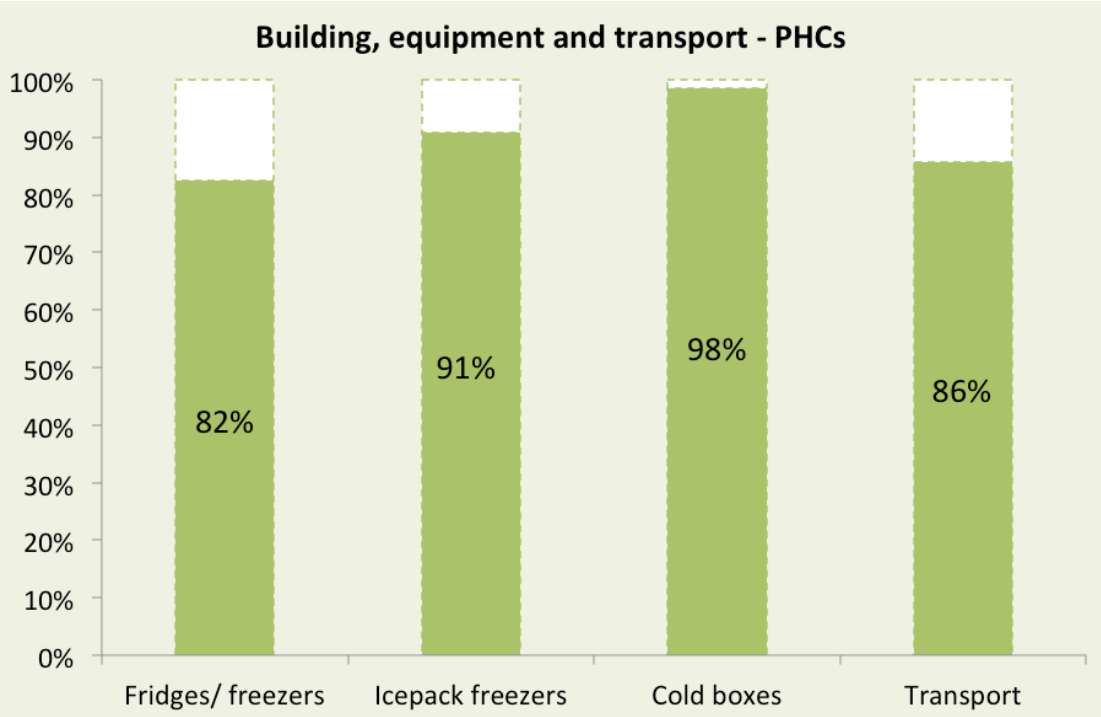
District stores: The store building of Kamrup, Karimganj, Nagaon disticts were severely short of adequate space for accommodating refrigeration units followed by Cachar, Dibrugarh and Morigaon where there is a need of additional space. All these districts were also severely constrained of space for packing, ice-pack conditioning and storing diluents.

The power backup (generator) was not available (or not operational) at the district stores of Kamrup, Cachar, Dhubri, Dibrugarh, Morigaon, Barpeta and Dhemaji.

The transport vehicle was not operational at the district stores of Cachar, Udalgudi, Karmiganj, Dibrugarh and Dhemaji.



PHC: The refrigeration units at PHCs of Darrang , Udalgudi , Dibrugarh, Morigaon and Nagaon district had shortage of voltage regulators. The building standards, number of freezers and ILRS and cold boxes were sufficient at all the PHCs.

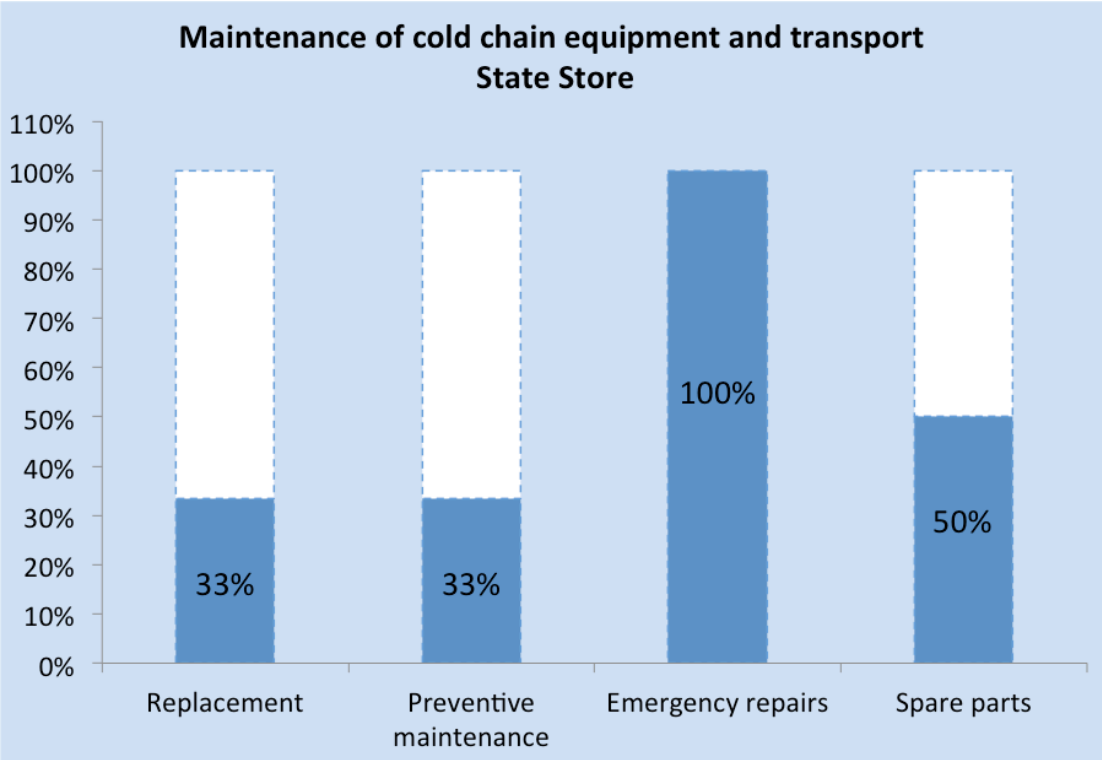


7.3.5 Maintenance of cold chain equipment and transport

Ideal requirement: The replacement plan for cold chain equipment has been planned and executed. The preventive maintenance should be done in timely manner. Emergency repair should have been carried out in time as and when needed. There should be adequate supply of spare parts to support the timely repair and maintenance of cold chain equipment and transport vehicles.

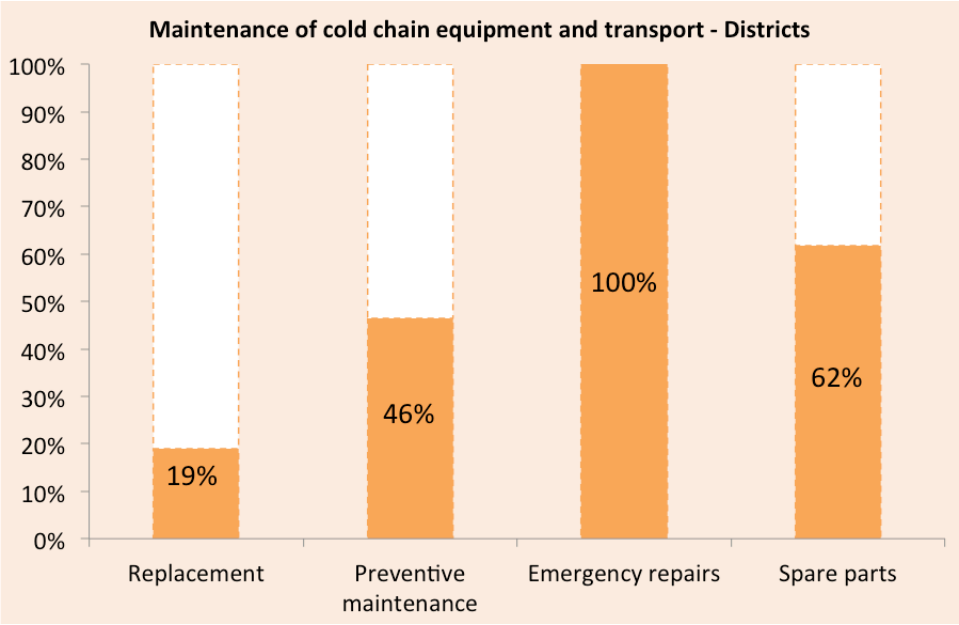
State store: The state does not have annual itemized replacement plan, however the replacement requirement was estimated for aged WIC and WIF and requirement was submitted to MOHFW for procurement. Though there were no damages to vaccine due to equipment failure, the preventive maintenance has been negligible and maintenance has been limited to attending reported problems by store keeper.

The state vaccine store does not have vaccine delivery van of their own and vaccine distribution, as a result of this, normally operates on pull mechanism by districts.



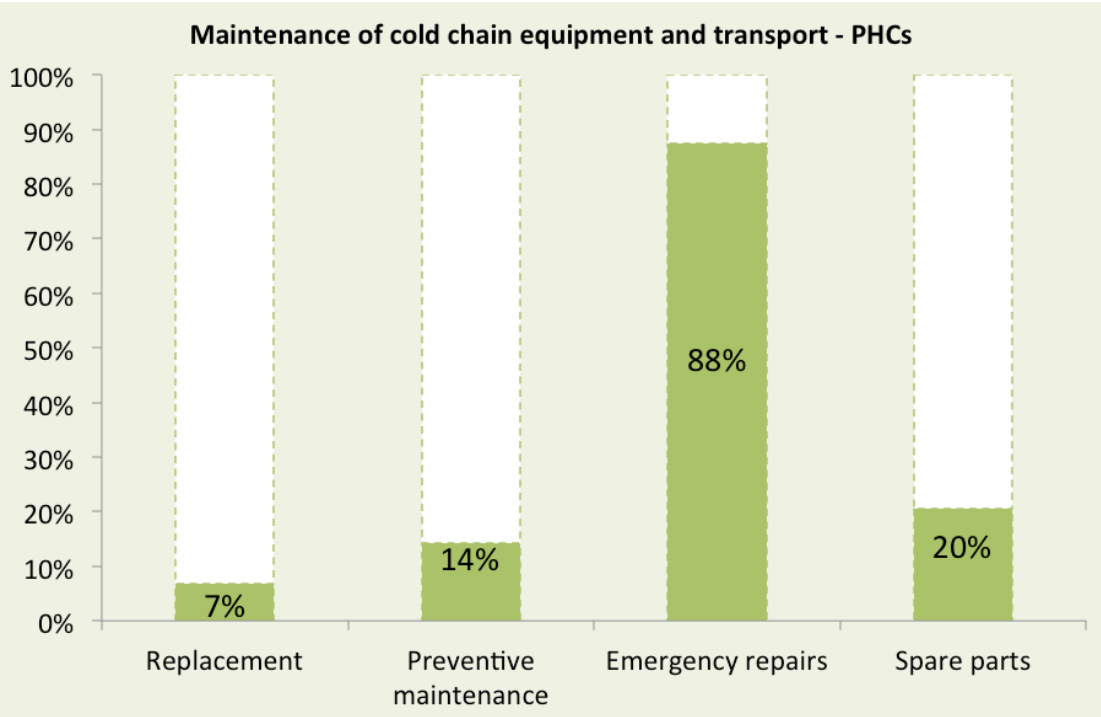
District stores: There was no itemized replacement plan for cold chain equipment in the districts of Kamrup, Darrang, Karimganj, Dhubri, Dibrugarh, Nagaon and Barpeta districts. The emergency repairs of cold chain units and vaccine delivery vehicles was satisfactorily at all the districts, the preventive maintenance was negligible in the districts of Darrang, Nagaon and Parpeta district.

There had been shortage of spare parts in the districts of Udalgudi, Barpeta, Dibrugarh and Dhemaji that had delayed the repair of cold chain equipment.



PHCs: The replacement plan of cold chain equipment did not exist at PHCs. This is primarily attributed to fact that the requirement analysis is done centrally at state level.

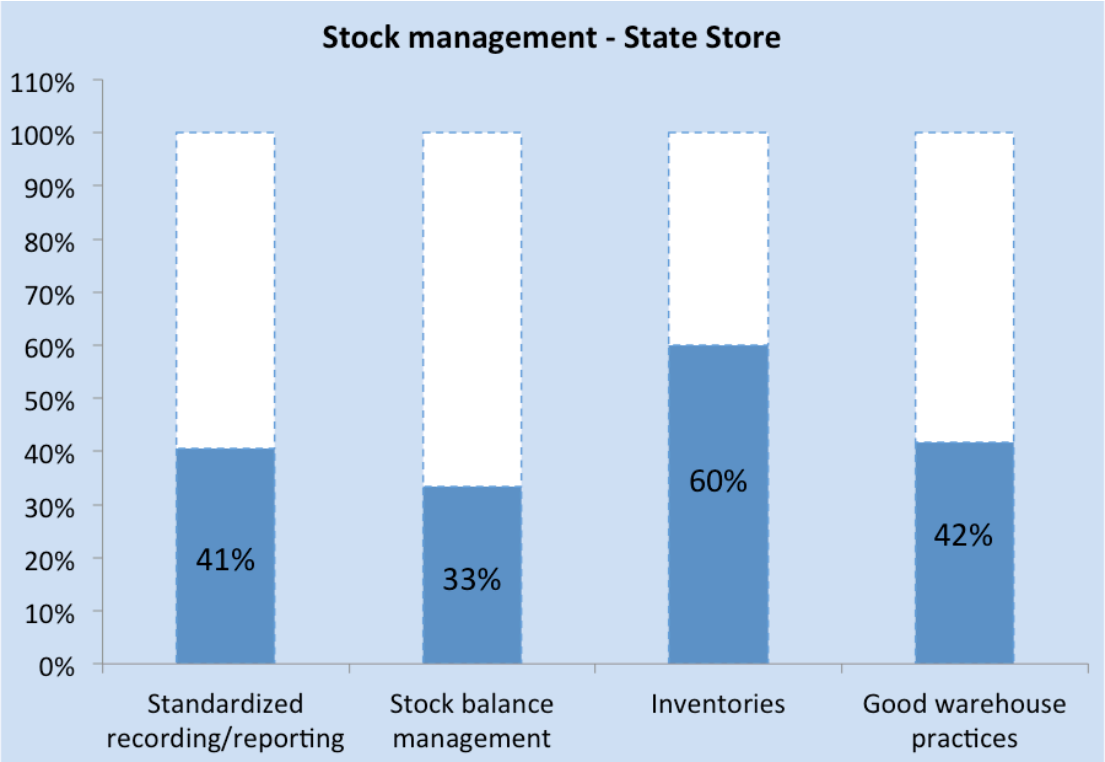
The preventive maintenance has been negligible at PHC level and this has been an alarming situation with shortage of spare parts for repairing the equipment.



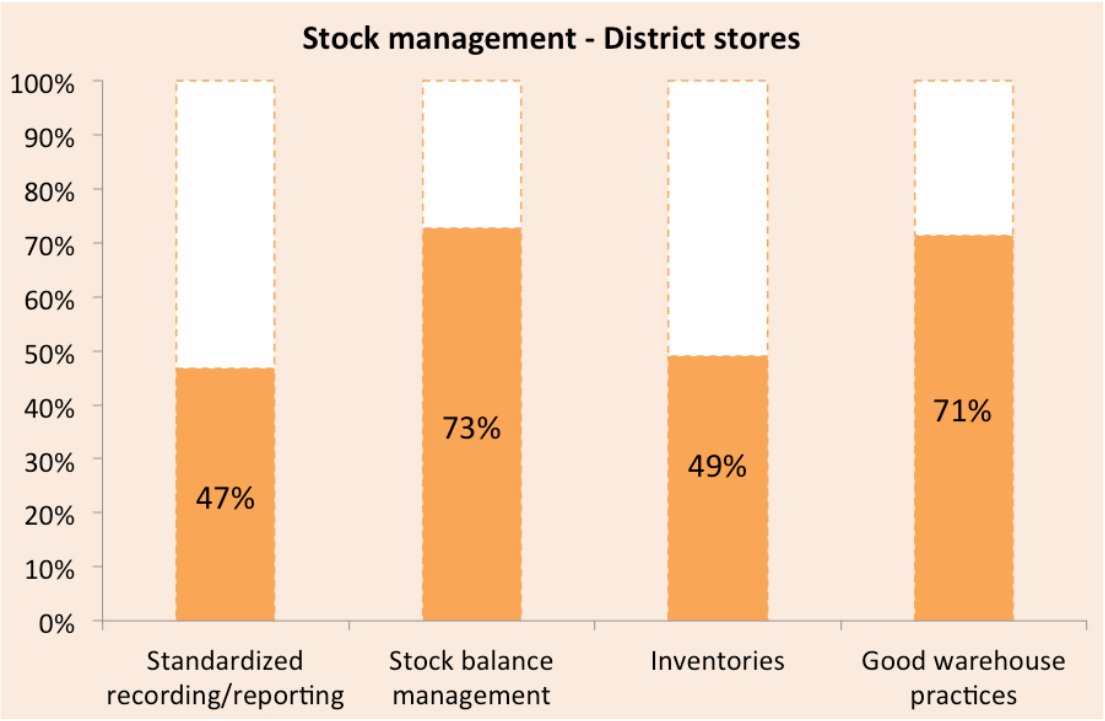
7.3.6 Stock management

Ideal requirement: The standardized recording and reporting of all stock transactions is carried out. Adequate stock levels have been maintained of vaccines. As a routine procedure, physical inventory should have been checked periodically. Good warehouse practices (cleanliness, security, data security and orderly storage of stock) are followed.

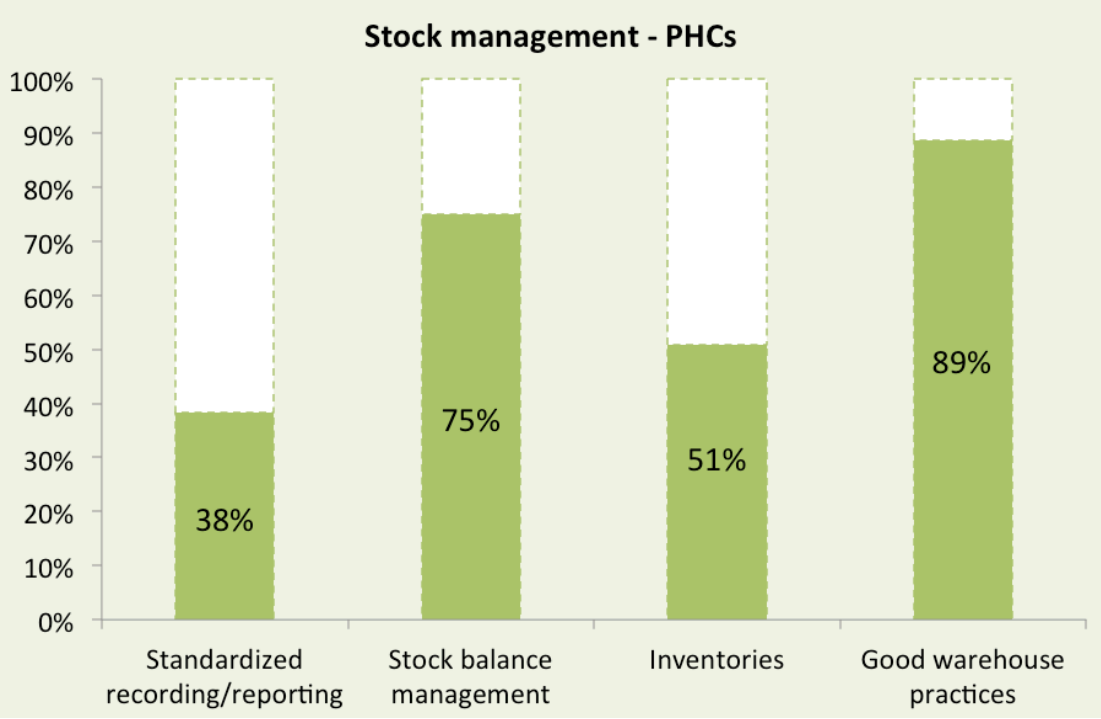
State store: The stock book register has not been changed since 2005 and hence the format of stock book has not been updated to incorporate the mandatory recording of expiry dates, vial size, manufacturing dates etc. Vaccine distribution reports were prepared and distributed on time. The distribution record and stock books however does not demonstrate that EEFO principle was followed. Stock levels (maximum and minimum stock) were not established. The physical count of stock and reconciliation was not done on routine basis. There is a good scope of improvement in stock management at state level.



District stores: The records of diluents have not been maintained at any of the district stores except for Cachar district. The stock management has been poor in the districts of Kamrup, Dibrugarh, Morigaon and Nagaon. The districts need to standardize on recording/reporting and inventory management.



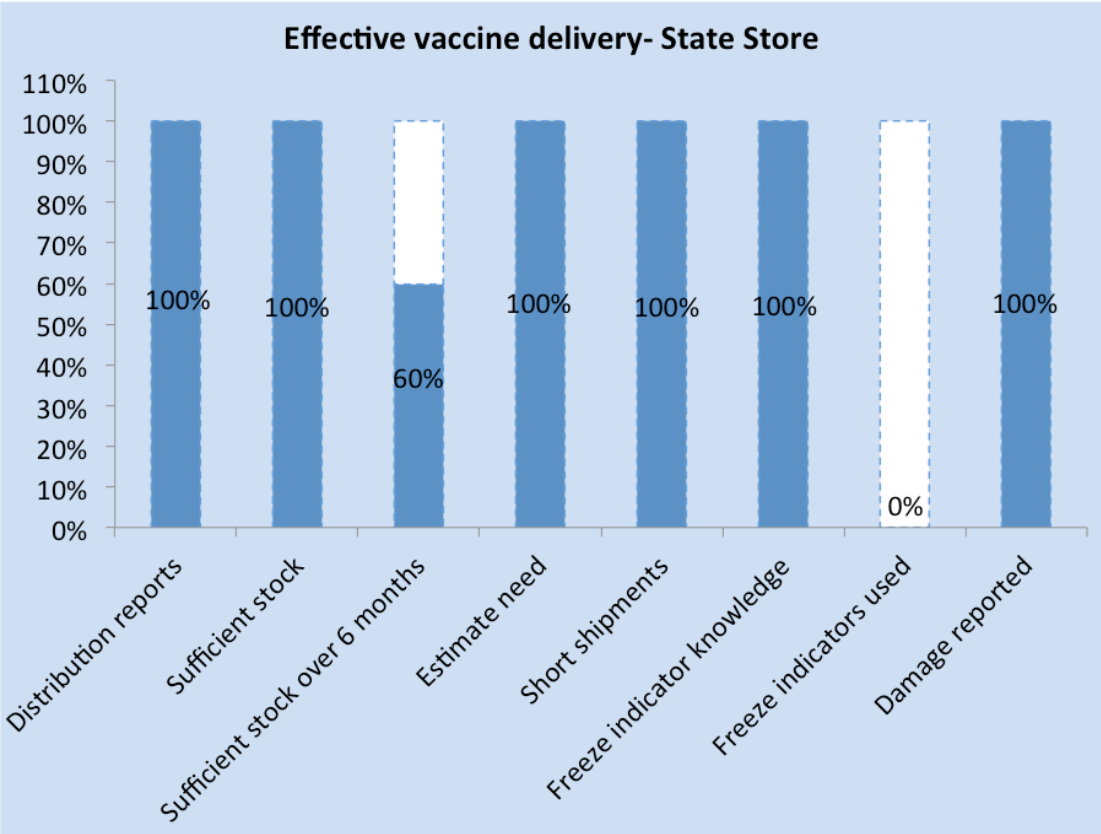
PHC: The problem of standardized recording and reporting continues at the PHC level as well. The stock book formats does not include the provision of recording diluents, VVM status etc. Sample physical count at 13 PHC out of 22 PHCs did not tally the stock book balance of vaccine.



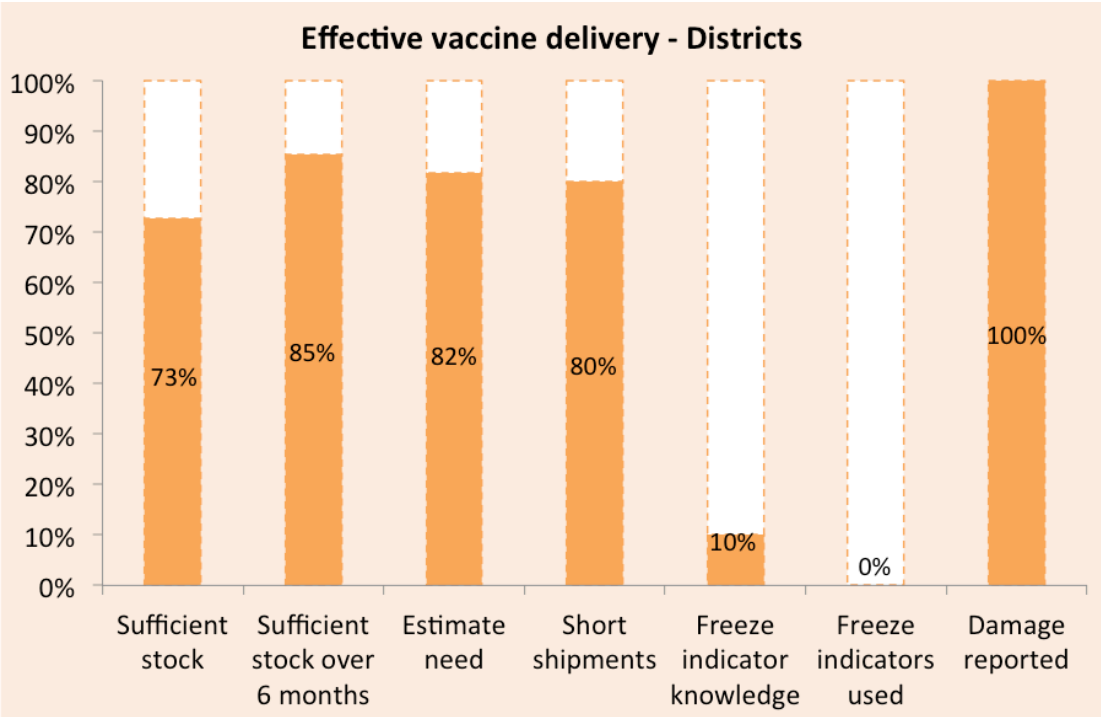
7.3.7 Effective vaccine delivery

Ideal requirement: The plan of vaccine distribution should be made and followed. there should not be stock out of any of the vaccine and diluents. Vaccine needs are correctly estimated. A System for managing short shipments should be in place. For all shipments, freeze indicators should be used. The damage during transportation should be controlled and minimized and there should be set procedures to replace the damaged quantities during transportation.

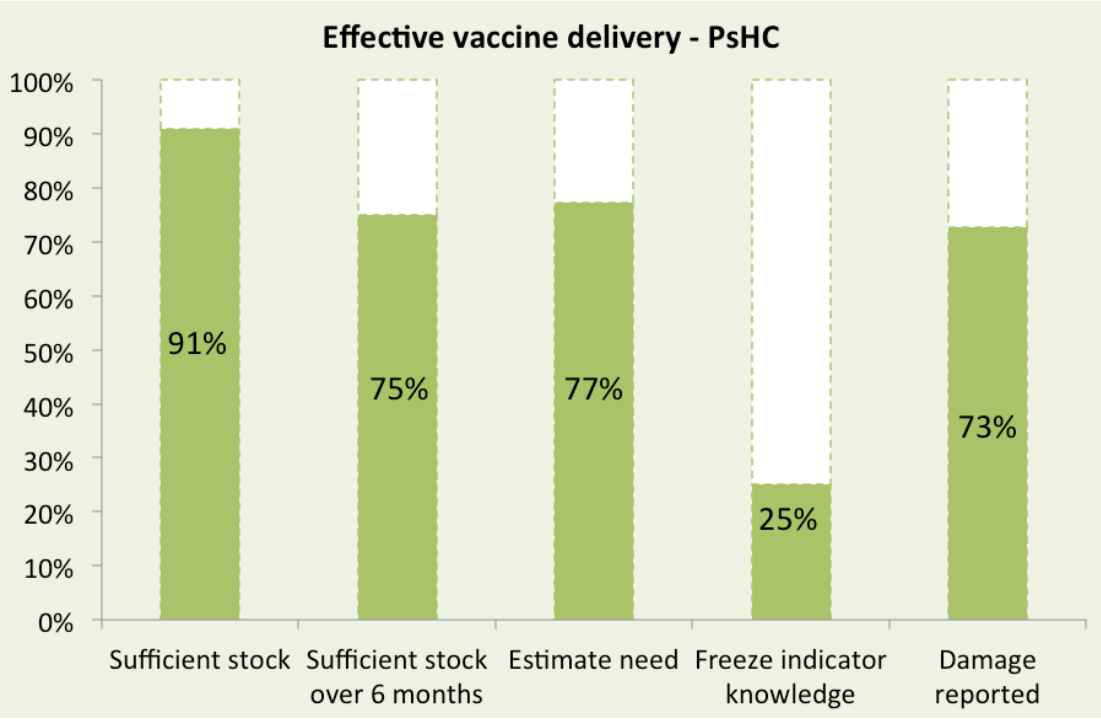
State store: The vaccine delivery from state store to lower levels have been satisfactory. There were instances of stock balance dropping down below minimum stock between the cycles of receipt of vaccine and this has been primarily because the stock levels have not been defined. The freeze indicators have not been used with shipment going down to districts as the state had no provision of providing shipping freeze indicators.



District stores: The vaccine delivery to lower levels have been satisfactory except for not using any freeze indicators and this has been the shortcoming at the state level planning.



PHC: The stocks at the PHCs have been satisfactorily, however there were shortcomings in terms of estimation of vaccine needs at the PHC of South Salmara, Patherkandi and Laharighat. The staff at most of the PHCs were not well aware of freeze indicators and its effective use in vaccine distribution to sub centers and session sites.



7.3.8 Correct diluent used for freeze dried vaccine

Ideal requirement: Freeze-dried vaccine should always be indented, received and distributed with the original diluent in matching correct quantities. Health workers demonstrate the knowledge of using correct diluent with freeze dried vaccine. Diluents for immunization sessions are stored and used at the correct temperature (between 2 and 8 Degrees Celsius).

Status across state: The stock of diluent did not match the stock of freeze dried vaccine at state vaccine store, Morigaon district store, Nagaon PHC and Pandu PHC. This is primarily because of three reasons 1) the diluents are not recorded in ledger books, 2) The breakage of diluent or vaccine is never replenished and 3) that there are often mismatch in number of diluent vials issued along with vaccine. Only Cachar, Darrang, Udalgudi and Dhubri districts had the matching stock (recorded) of diluent shipped with corresponding freeze dried vaccine.

7.3.9 Effective VVM use

Ideal requirement: Health workers know how to interpret and use VVM effectively such that vaccine is confidently used even outside the cold chain at the vaccination sites.

Health workers also use VVM to manage the stock transactions such that they prioritize issuing the aging VVM ahead of EEFO policy.

Status across state: All the staff across vaccine store levels has good understanding of VVM and they use and refer to VVM effectively during the immunization sessions and in stock management.

7.3.10 Vaccine wastage control

Ideal requirement: There should be a vaccine wastage monitoring system in place. Vaccine manager and health workers know how to compute the vaccine wastage correctly and correct wastage rates are used to estimate vaccine requirement. Available vaccine wastage data should be used to make other operational changes (in trainings, supervision, session size etc).

Status across state: There is very little knowledge among staff on how to compute the vaccine wastage accurately. The annual estimate of vaccine requirement of state is done with national wastage averages and in combination with the number of sessions planned annually.

CONCLUSION

The logistics of vaccine management in the state has been managed well to the extend that the quality of vaccine is ensured till the point of usage. There have been shortcomings in stock management but the stock outs were corrected such that there was no instances reported of session not held because of shortage of vaccine. There has been scope of improvement in terms of vaccine arrival procedures, stock management and correct diluent use at state vaccine store level. The district stores need improvement in cold storage capacity, stock management, building standards and transport management. The PHCs should strengthen the mechanism of controlling the vaccine wastage by deploying the mechanism of monitoring of vaccine wastage and revising the vaccination strategy to reduce the wastage.

8 Recommendations

1. File and retain (for a period of atleast four years) the complete set of documents related to vaccine received from manufacturer at state vaccine store (Lot release certificates, Invoices, airway bill copy, inspection note and allocation list).

2. Refurbish the state vaccine store as per the suggested layout plan in figure 2 to accommodate and install the new WIC and WIF. The exhaust fans of industrial standards (minimum size of 14 Inch diameter of impeller with air volume of 3400 m^3 per hour) should be installed at all the provided slots in the store building.

3. The building hosting the state vaccine store should be dedicated for vaccine and related supplies only. Dedicate and relocate other unrelated supplies to another location.

4. Install the newly supplied cold rooms at state and regional stores on priority.

5. Strengthen the temperature monitoring through strict supervision by medical officers/DIOs. Include supervision checklist for monitoring and documenting supervisory visits.

6. Adopt the standard format for temperature monitoring and stock book maintenance as recommended by MOHFW. Include diluent bundling and recording in standard recording procedures. Standardize the vaccine and diluent unit in doses for recording and indent.

7. Prepare/adopt the Standard Operating Procedures for cold chain maintenance and disseminate using various mechanisms like booklet, job aids and posters.

8. Refurbish the vaccine stores (regional, district and PHC) (including space for ILR/DF, dry storage (for syringes and diluent) and store keeper's office) based on the good warehouse practices recommended by WHO (reference document WHO/V&B/02.34).

9. Provide the dedicated power supply backup (auto start Generator with capacity of 5 or 15 KVA depending on number of refrigeration units) at district stores.

10. Dismantle the non-functional WIC (aged more then 20 years) at Cachar and Dibrugarh district and utilize the space for installation of newly supplied cold room based on the recommended layout plan.

11. Appoint the refrigeration technician at Cachar district store, as the position is vacant for past few months.

12. A new vehicle for vaccine delivery should be allotted to the districts of Cachar, Karimganj, Morigaon, Nagaon, Dhemaji, Kamrup, Darrang and Barpeta district. The

vehicle should have local service support including locally available spare parts. The vehicles intended for hilly areas should have four wheel drive provision with minimum ground clearance as required.

13. Equip the cold rooms in the state with 24x7 temperature monitoring system preferably computer based system where temperature records can be stored and analyzed on computer.

14. Auction/dispose the condemned items (cold chain refrigeration units (ILR/DF/Cold boxes and vaccine carrier that are beyond economic repair) to clear the room space at district stores.

15. Replenish the vaccine storage capacity by installing new ILR/Dfs as per the requirement by computing peak vaccine volume loads for specific districts of kamrup, Darrang and Berpeta districts.

16. Prepare and implement the vaccine distribution plan for the districts of Kamrup and Darrang based on the requirement, adjusted frequency depending on cold chain capacity of district stores.

17. Establish the stock levels (safety and maximum) for all districts, regional and state vaccine store. Establish the indent (re-ordering) system that strictly adheres to these set stock levels.

18. For the maintenance of solar refrigerators used for UIP program, it is recommended that:

a. Batteries to be replaced every five years;

b. Solar panels should be cleaned from dust every week;

Recommendations	Time frame			Applicable at these levels			
	Immediate	Medium term (1 year)	Long term (more then 1 year)	State	Regional/ District	PHC	Management & Administration
1. File and retain (for a period of atleast four years) the complete set of documents related to vaccine received from manufacturer at state vaccine store (Lot release certificates, Invoices, airway bill copy, inspection note and allocation list)	✓			✓			
2. Refurbish the state vaccine store as per the suggested layout plan in figure 2 to accommodate and install the new WIC and WIF.	✓			✓			
3. The building hosting the state vaccine store should be dedicated for vaccine and related supplies only. Dedicate and relocate other unrelated supplies to another location.		✓		✓			
4. Install the newly supplied cold rooms at state and regional stores on priority.	✓			✓	✓		
5. Strengthen the temperature monitoring through strict supervision by medical officers/DIOs. Include supervision checklist for monitoring and documenting supervisory visits.	✓			✓	✓	✓	✓
6. Adopt the standard format for temperature monitoring and stock book maintenance as recommended by MOHFW. Include diluent bundling and recording in standard recording procedures. Standardize the vaccine and diluent unit in doses for recording and indent.	✓			✓	✓	✓	✓
7. Prepare/adopt the Standard Operating Procedures for cold chain maintenance and disseminate using various mechanisms like booklet, job aids and posters.	✓			✓	✓	✓	✓
8. Refurbish the vaccine stores (regional, district and PHC)		✓			✓	✓	✓

(including space for ILR/DF, dry storage (for syringes and diluent) and store keeper's office) based on the good warehouse practices recommended by WHO (reference document WHO/V&B/02.34).							
9. Provide the dedicated power supply backup (auto start Generator with capacity of 5 or 15 KVA depending on number of refrigeration units) at district stores.		✓			✓		
10. Dismantle the non-functional WIC (aged more then 20 years) at Cachar and Dibrugarh district and utilize the space for installation of newly supplied cold room based on the recommended layout plan.	✓				✓		
11. Appoint the refrigeration technician at Cachar district store, as the position is vacant for past few months.		✓			✓		
12. A new vehicle for vaccine delivery should be allotted to the districts of Cachar, Karimganj, Morigaon, Nagaon, Dhemaji, Kamrup, Darrang and Barpeta district. The vehicle should have local service support including locally available spare parts. The vehicles intended for hilly areas should have four wheel drive provision with minimum ground clearance as required.			✓		✓		✓
13. Equip the cold rooms in the state with 24x7 temperature monitoring system preferably computer based system where temperature records can be stored and analyzed on computer.			✓	✓	✓		✓
14. Auction/dispose the condemned items (cold chain refrigeration units (ILR/DF/Cold boxes and vaccine carrier that are beyond economic repair) to clear the room space at district stores.	✓			✓	✓	✓	✓
15. Replenish the vaccine storage capacity by installing new		✓			✓	✓	✓

ILR/Dfs as per the requirement by computing peak vaccine volume loads for specific districts of kamrup, Darrang and Berpeta districts.							
16. Prepare and implement the vaccine distribution plan for the districts of Kamrup and Darrang based on the requirement, adjusted frequency depending on cold chain capacity of district stores.	✓				✓	✓	✓
17. Establish the stock levels (safety and maximum) for all districts, regional and state vaccine store. Establish the indent (re-ordering) system that strictly adheres to these set stock levels.	✓			✓	✓	✓	✓
18. For the maintenance of solar refrigerators used for UIP program, it is recommended that: a. Batteries to be replaced every five years; b. Solar panels should be cleaned from dust every week;	✓					✓	

Appendices

Introduction of Fridge-Tag

The possible addition to manual recording of temperature through thermometer (twice daily) is to use electronic devices. The World Health Organization (WHO) is supporting the 30 days electronic temperature logger for temperature monitoring of ILRs at district and cold chain points. The Berlinger & Co, Switzerland based firm, has developed a 30 days temperature indicator called Fridge-Tag. The device has been qualified by WHO for temperature monitoring of ILR through Product Quality Specification (PQS) standards (PQS code E06/03).

This device assists in temperature monitoring through following features:

1. It shows temperature of ILR in digital LCD screen at all the time
2. It indicates if there was any alarming situation during the past 30 days. The device shows “Alarm” on LCD screen if there was any alarming situation in past 30 days. The alarming situation is when the temperature went above 8 Degree Celsius over a consecutive period of ten hours or temperature drops down below -0.5 Degree Celsius for a consecutive period of 60 minutes.
3. It shows the duration of temperature violation for every alarming situation happened in past 30 days. To see the duration of temperature violation, device is equipped with a “Read” button, which guides the user through the history of past 30 days starting from “today” till “30 days ago”.
4. It shows an “OK” sign if there has been no violation of temperature in past 30 days.
5. It has a shelf life of two years from the date of activation of device. The device once activated, cannot be stopped through-out its operational life. Hence, it provides round the clock monitoring of ILRs without any need of intervention of user for two years of time.
6. It has been specifically designed to be used with ILRs and Walk-in-Coolers that are required to maintain the temperature between 2 to 8 Degree Celsius.
7. All the Fridge-Tags have a unique serial number therefore they can be easily “tagged” with a cold chain equipment.

Usage of Fridge-Tag

- Fridge-tag is shipped in “sleep mode”. The device can be activated using the combination of “read” and “set” button provided on the device. Once activated the device cannot be stopped. From the time of activation, the device is set to “monitoring” mode. Pressing the “read” button, which guides user to the history of

past 30 days, activates history mode. The device goes back to "monitoring" mode after 30 seconds of inactivity.

- Once activated, the device should be kept in ILR, along with vaccine in the vaccine basket. The health workers should follow these steps to use the device effectively:
- Check the daily temperature (morning and evening) through this device.
- Observe the device daily to check if an alarm has occurred. In case the device is showing the alarm, read the history to note the duration and day of alarm.
- Carefully interpret the device and note down the date, duration of alarm and type of alarm and share the readings with Medical Officer or in-charge of cold store and cold chain technician to diagnose and rectify the problem.

Status tracking tool

Cold chain capacity

District	ILR Sufficient	DF sufficient	Cold box sufficient	Vaccine carrier sufficient	Temporary arrangements for campaign
Barpeta District					
Nagaon PHC					
Mandia PHC					
Cachar District					
Harinagar PHC					
Sonai PHC					
Darrang District					
Sipajhar PHC					
Jaljali PHC					
Dhemaji District					
Bengenagaon PHC					
Sissiborgaon PHC					
dibrugarh District					
Panitola PHC					
Borbaruah PHC					
Dubri District					
Dharmasala PHC					
S.Salmara PHC					
Kamrup District					
Pandu PHC					
Rampur PHC					
Karimganj District					
Patherkandi PHC					

District	ILR Sufficient	DF sufficient	Cold box sufficient	Vaccine carrier sufficient	Temporary arrangements for campaign
Nilambazar PHC					
Morigaon District					
Jhargaon PHC					
Lahorighat PHC					
Nagaon District					
Samogori PHC					
Bebazia PHC					
Udalguri District					
Orang PHC					
Udlaguri PHC					

Legends Do not exist | Need improvement | Satisfactory

Adequacy of building standards

District	Space for						Power supply and backup				
	ILR/DF	Ice-pack conditioning	Packing	Dry storage	Office	Ventilation	Electrical condition	Earthing	Generator	Battery for generator	Fuel for generator
Barpeta District											
Nagaon PHC											
Mandia PHC											
Cachar District											
Harinagar PHC											
Sonai PHC											
Darrang District											
Sipajhar PHC											

District	Space for						Power supply and backup				
	ILR/DF	Ice-pack conditioning	Packing	Dry storage	Office	Ventilation	Electrical condition	Earthing	Generator	Battery for generator	Fuel for generator
Jaljali PHC											
Dhemaji District											
Bengenagaon PHC											
Sissibargaon PHC											
Dibrugarh District											
Panitola PHC											
Barbaruah PHC											
Dhubri District											
Dharamshala PHC											
S. Salmara PHC											
Kamrup District											
Pandu PHC											
Rampur PHC											
Karimganj District											
Patherkandi PHC											
Nilam Bazar PHC											
Morigaon District											
Jhargaon PHC											
Laharighat PHC											
Nagaon District											
Samuguri PHC											
Bebejia PHC											
Udalguri District											
Orang PHC											
Udalguri PHC											

District	Space for						Power supply and backup				
	ILR/DF	Ice-pack conditioning	Packing	Dry storage	Office	Ventilation	Electrical condition	Earthing	Generator	Battery for generator	Fuel for generator

Legends	Do not exist	Need improvement	Satisfactory