Guideline for cold chain equipment inventory data management

UNICEF 2020

unicef
for every child

unicef
for every child

About this guide

This document provides guidance on activities related to cold chain equipment inventory (CCEI) data management to countries that deliver comprehensive health services and immunization programs. It informs the reader on the collection, recording and reporting of meaningful data, for CCEI situations to be analysed to:

- produce maintenance workplans
- inform budgets
- purchase the right equipment
- organise effective training
- inform rehabilitation projects and decommissioning activities.

All of the above functions serve to support national stores, health facilities and health workers involved in health and immunization supply chain programmes.

If you have any questions or need additional information, please contact mseidel@unicef.org

Acknowledgements

- Ousmane Tamba Dia UNICEF
- Souleymane Kone WHO
- Michelle Seidel UNICEF
- Hailu Kenea UNICEF
- Dereje Haile UNICEF
- Serge Ganivet UNICEF
- Chandrasegarar Soloman UNICEF
- Abu Obeida Eltayeb UNICEF
- Srihari Dutta UNICEF
- Sviatlana Kavaliova UNICEF
- Isabelle Cantin Independent Consultant
- Eme Ekanem Independent Consultant
- The Immunisation Supply Chain Steering Committee

"Strong and efficient supply chains – equipped with reliable cold chain equipment (CCE) – are vital to helping countries increase immunisation coverage and equity, reaching children with lifesaving vaccines and protecting them against deadly diseases."

- Gavi, 2014

Table of contents

Acronyms 1

1. Introduction to cold chain inventory data management 2

Figure 1: Cold chain equipment inventory data management cycle 2

2. Why is cold chain inventory data management important? 3

3. What will I find in this guide? 3

4. Who will use this guide? 3

Figure 2: Who, what and how? 4

5. How can I use this guide? 5

Figure 3: Three core processes 5

6. What are the steps involved when doing a CCE inventory? 5

6.1 CCE data: 6

Figure 4: Data flow 6

6.2 CCE inventory data tools 7

6.3 CCE inventory data analysis collection 9

6.4 Use of CCE inventory data analysis for action 9

7. CCE inventory data management feedback mechanism for the health workers that supported the recording of data 10

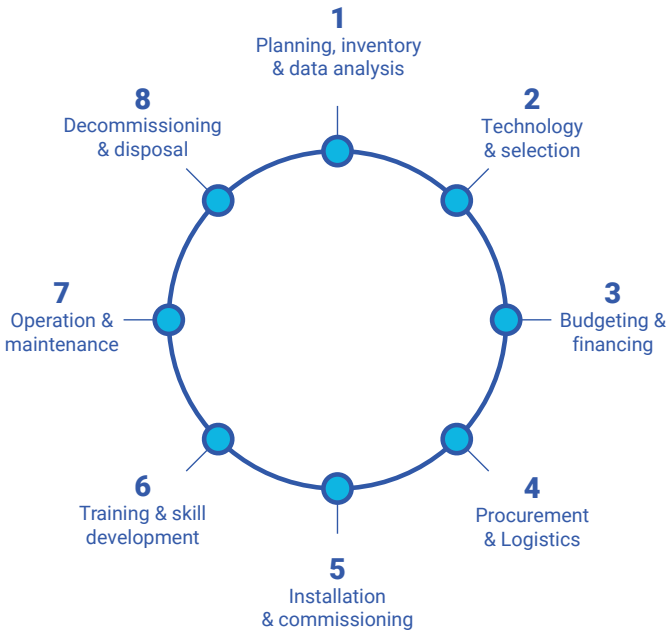
Acronyms

CCEOP	Cold Chain Equipment Optimisation Platform
CCE	Cold Chain Equipment
CCEI	Cold Chain Equipment Inventory
CCI	Cold Chain Inventory
CHAI	Clinton Health Access Initiative
DCCA	District Cold Chain Assistant
CCT	Cold Chain Technician
CTC	Controlled Temperature Chain (during immunization and outreach sessions)
DCCT	District Cold Chain Technician
DHO	District Health Officer
DVS	District Vaccine Store
EPI	Expanded Programme on Immunization
EVM	Effective Vaccine Management
iSC	Immunization Supply Chain
Gavi	Gavi, the Vaccine Alliance
HC	Health Centre (last service point)
HMIS	Health Management Information System
HPAC	Health Policy Advisory Committee
HSS	Health System Strengthening
ILR	Ice Lined Refrigerator
iSC	Immunization Supply Chain
MCV	Measles containing vaccine
LSP	Local Service Provider
MoH	Ministry of Health
NMS	National Medical Store
NUVI	New/Underutilized Vaccines Introduction
PMT	Programme Management Team
PPM	Planned Preventive Maintenance
PR	Primary Store
RI	Routine Immunization
SDD	Solar Direct Drive refrigerator
SC	Supply Chain
SN	Sub-national Store
SOP	Standard Operating Procedure
SP	Service Point (last service point)
SPSS	Statistical Package for the Social Sciences
UNICEF	United Nations Children's Fund
VVM	Vaccine Vial Monitor
vLMIS	Virtual Logistics Management Information System

1. Introduction to cold chain inventory data management

Cold chain equipment (CCE) inventory data management is a process that informs key stakeholders on the status, stock level, functionality and age of the equipment throughout its life cycle. At each phase, the data supports decision-making in terms of financial resources, human capacity and operational projects.

Figure 1: Cold chain equipment inventory data management cycle



Each phase involves different stakeholders, specific actions and results, which generate reports and workplans that help strengthen your country's health services and immunization programmes. The process of collecting, recording and reporting CCE inventory data supports each one of these phases, as listed below:

1. Planning, inventory and data analysis

- Data collection is the starting point of the CCE life cycle.
- The data recorded will inform your planning and analysis of the stock situation.
- Workplans and reports can be produced at the district, national and regional levels following the collection and recording of data sourced from all peripheral health posts.

2. Technology and selection

- The choice of CCE needed for your context will be guided by the data reported.
- Recording data on specific key indicators will inform the type of technology needed for your health post, district, country and region.
- Data can inform on lower-performing CCE brands or those that require additional attention and expenses for spare parts.

3. Budgeting and financing

- Both functions will need justification, which can be demonstrated by reports and analysis produced using the recorded data.

4. Procurement and logistics

- An accurate stock level can help develop procurement strategies and reduce costs by grouping purchases and planning fewer deliveries.
- Data can inform buyers on the performance of certain brands and models.
- Stock reports will inform decisions on the rehabilitation, transfer and decommissioning of equipment.

5. Installation and commissioning

- Accurate data analysis supports efficient planning and timely equipment installation.
- Analysis completed following data recording can inform decision-makers on the design of their operational development plans.

6. Training and skill development

- Stock and status reports will allow you to determine which districts require additional training or refresher workshops.
- Performance reports can help determine which type of training is required.

7. Operation and maintenance

- Stock level reports will inform the production of maintenance workplans.
- The reports will also indicate how many and what kind of spare parts are required.
- Status reports can indicate if there are quality issues with certain models.

8. Decommissioning and disposal

- Data collected will inform long-term planning for decommissioning and replacing older models.
- Budgets for disposal activities will be informed by the data collected.

2. Why is cold chain inventory data management important?

UNICEF is supporting countries in procuring CCE to ensure strong and efficient supply chains to deliver safe vaccines and health services. To plan and inform meaningful CCEI maintenance workplans, cold chain technicians indicated to UNICEF that some guidance in collecting, recording, analysing and planning inventory activities would be useful. Other documents do offer guidance for each phase of the equipment inventory data management cycle, but a gap has been identified with regard to planning, inventory and data analysis. This guide will inform you on:

- The tools available to collect, record, report and analyse data
- How CCE inventory data management can support activities to strengthen the quality and efficiency of immunization and health programmes

3. What will I find in this guide?

The guide aims to provide important CCEI concepts and concrete tools that can help optimize your national stock level of CCE and support successful national health services and immunization programmes. Its objective is to help you collect and record meaningful data, analyse CCE inventory situations and organize maintenance workplans informed by the inventory analysis. We know that a lack of easy-to-use reporting tools is demotivating and that, too often, health workers feel pressured to choose between delivering services and reporting data.[1] That is why this guide was developed to help you find an easy-to-use tool with some guidance.

You will find tools and guidance on how to:

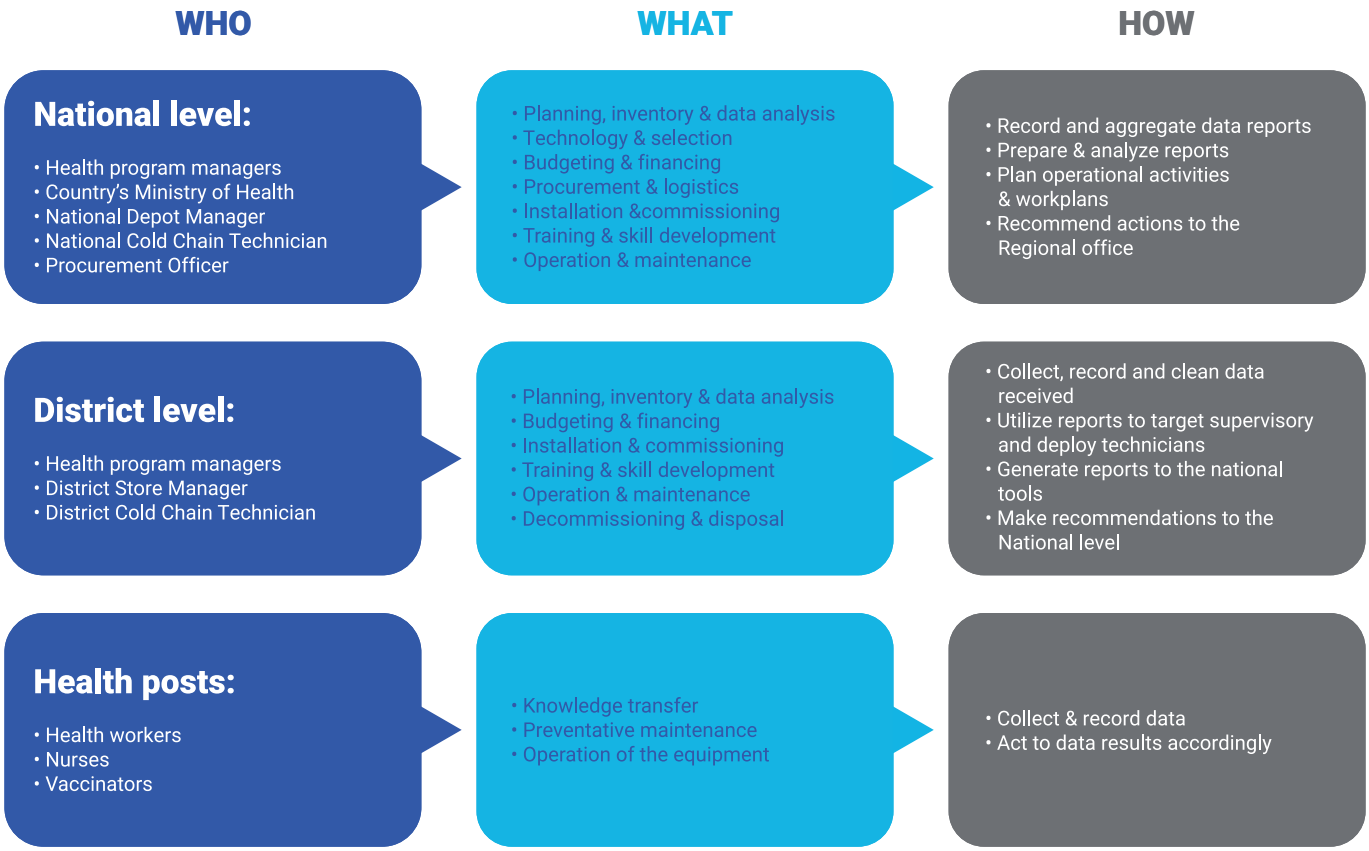
- Collect and record data effectively
- Choose a tool to analyse data to inform decisions
- Analyse data according to your country's context
- Obtain meaningful outputs by performing CCE inventory data management

4. Who will use this guide?

The guide supports health workers and logisticians involved in activities related to CCE inventory data management. Health workers working with cold chain products will find useful information in this guide.

1 JSI, 'VxDel Data Research: Kenya Initial Insights v4.1', May 2020. https://www.sonderdesign.org/vxdel/VxDel_InittialKenyaReport_v4_2.pdf

Figure 2: Who, what and how?



5. How can I use this guide?

Throughout this document, you will find suggestions of tools, systems and procedures that can support the activities in which you are involved with regard to CCEI management at all levels of the national health supply chain. If reference is made to a specific web-based tool, a link will be provided. If the guideline refers to an existing standard operating procedure (SOP), a link will take you to that specific procedure.

Other useful documents or information are:

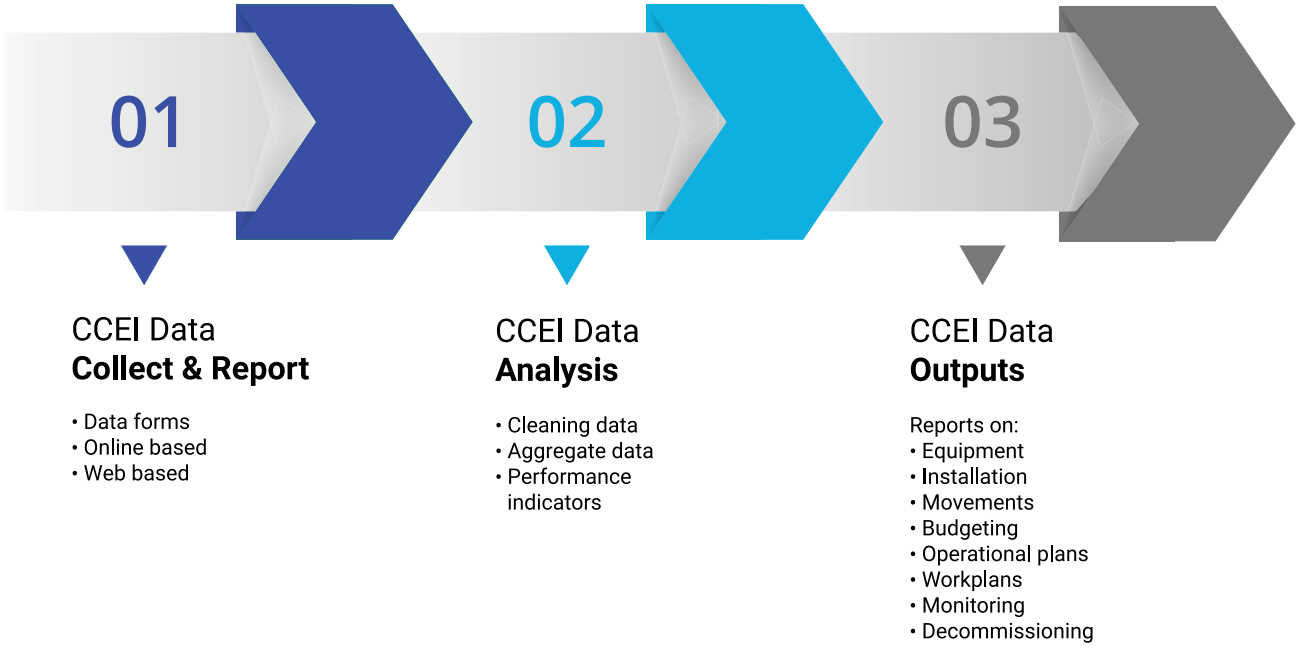
- TechNet-21 online platform: sections on CCE Management – technical resources, list of equipment with specs, brochures, training and maintenance guides. The platform is available in English and French. www.technet-21.org
- WHO Vaccine Management Handbook – Module 5: How to Develop a Repair and Maintenance System for Cold Chain Equipment (March 2017). https://www.who.int/immunization/documents/control/who_ivb_17.05/en/
- WHO Effective Vaccine Management (EVM) initiative: can guide you on the performance indicators that help achieve high-standard immunization programmes, in particular the sections related to CCE criteria. http://www.who.int/immunization/programmes_systems/supply_chain/evm/en/index3.html
- Effective Vaccine Management Handbook: written to provide decision-makers at the national and subnational levels with technical advice on key topics on CCE maintenance http://www.who.int/immunization/programmes_systems/supply_chain/evm/en/index5.html
- Cold Chain Support Package: provides logisticians and health workers with technical information on cold chain products and services on all types of CCE. https://www.unicef.org/supply/index_68367.html
- PATH Cold chain equipment inventory guidelines (April 2020): Improving the quality and accuracy of national cold chain equipment inventory data. https://www.path.org/resources/cold-chain-equipment-inventory-guidelines-improving-quality-and-accuracy-national-cold-chain-equipment-inventory-data/
- WHO Vaccine Cold Chain: https://www.who.int/immunization/documents/IIP2015_Module2.pdf

6. What are the steps involved when doing a CCE inventory?

When collecting CCEI information, there are three core processes involved, which all aim to achieve different goals:

1. **CCE data collection & reporting**
2. **CCEI data analysis**
3. **CCEI data outputs for action**

Figure 3: Three core processes



6.1 CCE data:

Why do we need to collect data?

Collecting data related to the CCE inventory will help you with each one of those functions to help strengthen your country's health services and immunization.

Who collects and reports the data?

- Data is collected at all health facility levels by local, district and national cold chain technicians (CCTs), supervisors, head nurses, managers, officers and partners.
- Different key actors will collect and report data depending on the health services level at which you work.
- If no inventory data has previously been recorded, a completely new data set needs to be collected and reported.
- If an initial inventory was recorded, it will become a routine activity in which the inventory only requires updating.

What tool can be used to collect and record data at the facility level?

- Excel inventory sheets
- Paper-based forms
- Local mobile applications

Your country's context must be taken into account when choosing a collection and reporting tool, and the tool must be compatible with your national analysis tool.

When is it collected and recorded?

- Data collection should be reported along with the vaccine inventory and immunization coverage data. All activities should be completed together on a monthly basis.
- A collection method must be defined according to your country's context, using the tools identified by the Ministry of Health.

How do we collect and report data?

A collection method must be defined when collecting data, for example:

- **Collecting key information for qualitative analysis**
- **Collecting numbers for quantitative analysis**
- **Or a mix of both, qualitative and quantitative**

- The training of the data collectors is key to achieving successful results.
- Question formulation is important in order for data that is useful and not confusing to be collected.
- Data standards must be defined according to the performance indicators.
- A collection protocol must be developed and used by all collectors to ensure consistency.

Figure 4: Data flow

6.2 CCE inventory data tools

Experience has shown that using a computer-assisted data tool instead of relying on paper-based questionnaires improves the quality of collected data[2] at the district and national levels. Recording data using computers or smartphones as opposed to conventional paper-based systems has many advantages.[3]

Choosing the right tool to record data is a country decision based on:

- Human resources capacity
- Technology capacity and its infrastructure
- Training capacity
- Level of leadership coming from management

The following tools are available:

Data for Action (D4A) by UNICEF:

- A mobile application developed by UNICEF to help with quick data collection using mobiles and tablets, analysis and real-time visualization for decision-making and actions. It's a survey type tool that allows flexibility to formulate questions that are related to their context and aim.

Features:

- Easily accessible from all smartphones and tablets via the App Store or Google Play
- User-friendly and easy to use to collect data at facilities, and can be run on an unlimited number of devices
- Flexible survey tool that uses multiple question types (single- or multiple-response, picture, geolocation feature, grid scale, ranking, barcode, etc.)
- Works with or without internet connection
- Store data securely on a UNICEF cloud space
- Data can be downloaded quickly and easily as a raw data set in either an Excel worksheet or SPSS (statistical package for the social sciences)
- D4A as a tool is compatible with almost all data systems, it can be linked to other dashboards or databases such as DHIS2
- Charts and graphs can be executed instantly
- Creates geographic visualization
- The number of survey questions is unlimited

Requirements:

To use D4A, you will need:

- Smartphones or tablets at facilities
- Reliable vehicle access and an adequate expenses budget for the collectors
- Questions that are formulated with expertise to collect meaningful data
- A data analyst focal point at the district and national levels
- Back-end expert support to be arranged at the global level to support the tool
- Training and knowledge to manipulate the data collected is crucial

Functionality:

The data generated by this tool will be presented in Excel or SPSS format. From the Excel file, you can run reports using Microsoft Access, Power BI or any other analytical tool to personalize your report.

D4A also allows you to quickly create:

- Pie or column charts
- Dashboards
- Real-time charts and pictures
- A map to show where the data was collected
- Survey Health confidence level indicators and where a sample size is calculated

Cold Chain Equipment Management (CCEM) by PATH:
https://path.azureedge.net/media/documents/TS_ccem_pos.pdf

Microsoft Access–based software developed by PATH with support from partners. It is used as an inventory and planning tool and helps with CCEI data recording and analysis. The software creates reports, geographic visualization and system modelling that adhere to national immunization policies and WHO/UNICEF cold chain planning algorithms and reference data.

2 Daniel Muhinja, Sisay Sinamo, Lydia Ndungu and Cynthia Nyakwama (2016). 'Open Data Kit Software to conduct nutrition surveys: Field experiences from Northern Kenya'. Field Exchange 53, November 2016. p67 (www.ennonline.net/fex/53/opendatakitsoftwarekenya, accessed 26 February 2019)

3 WHO – UNICEF (May 2019). Recommendations for data collection, analysis and reporting on anthropometric indicators in children under 5 years of age. (https://data.unicef.org/resources/data-collection-analysis-reporting-on-anthropometric-indicators-in-children-under-5/)

Features:

- Easy-to-follow user manual available
- Data collection questionnaires are already drafted and they come with a surveyor's guide
- It can support multiyear equipment planning from the data collected on CCE
- Creates geographic visualization and charts
- Pre-populated drop-down lists are included in the file
- It can easily be adjusted to a country context
- Additional CCEM functionalities have been developed to help national and sub-national iSC planners and managers quickly analyse and use these data
- It records multiple core data and analytical elements such as data management and cold chain capacity planning

Requirements:

To use CCEM, you will need:

- Initial training and refresher workshops
- Back-end expert support to be arranged at the global level to support the tool
- To update pre-populated drop-down menus on a regular basis
- A data analyst focal point at the district and national levels
- Tablets to collect and record inventory data
- Different paper-based forms to collect facility & refrigerator data
- Sufficient Internet bandwidth as the tool uses a lot of memory and might take a long time to download and save data
- Training and knowledge to manipulate the data collected
- To exercise caution at all times, as the algorithms are easily damaged

Functionality:

The data generated by this tool will be presented in Excel format. From the Excel file, you can run reports using Microsoft Access, Power BI or any other analytical tool to personalize your report.

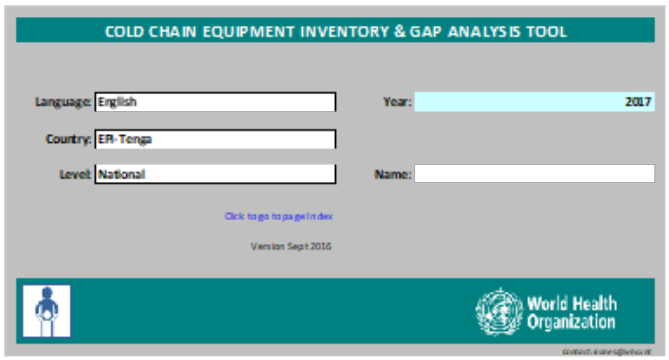
CCEM allows you to:

- Create dashboards
- Generate pie or column charts
- Produce different reports depending on the information needed or the audience
- Easily link equipment with their specifications

Cold Chain Inventory Gap and Analysis Tool (CCIGAT) by WHO: CCIGAT link

An Excel-based tool that supports vaccine and CCE inventory management. It produces graphs and tables that help determine gaps and needs.

The tool requires a collection of data originating from different sources such as administrative country information, health facilities infrastructure, programmatic data and vaccine stock; it also has a section dedicated to CCE inventory management. Initial data collection is quite comprehensive and once completed the database is easier to maintain/update. The tool produces graphs and tables that can help guide decisions related to equipment maintenance, developing investment cases and planning for service delivery.



Features:

- Allows cold chain capacity to be calculated when vaccination schedules are recorded
- Once the data is entered, certain cells automatically populate other tables and create detailed information
- Pre-populated drop-down lists are included in the file
- Can easily be adapted to a country context
- Creates in-depth tables and graphs when used by an Excel expert or data analyst officer

Requirements:

To use the CCIGAT tool, you will need:

- A desk computer or laptop to clean and aggregate data at the district and national levels
- To adapt paper-based forms to populate your country's CCIGAT tool
- To update pre-populated drop-down menus on a regular basis
- Support from trained collectors to record accurate data for the initial inventory exercise
- Enough bandwidth from the local internet provider
- Training and refresher workshops for the data collectors
- A data analyst position within the country

Functionality:

The data generated by this tool will be presented in Excel format. From the Excel file, you can easily run reports using Microsoft Access, Power BI or any other analytical tool to personalize your report.

CCIAGT allows you to:

- Create dashboards
- Generate pie or column charts
- Produce different reports depending on the information needed or the audience
- Create different planning scenarios according to the country's calendar
- Calculate storage capacity using different variables, such as integration of other products (e.g., Oxytocin, Ebola, Covid-19 vaccines)
- Conduct analyses according to availability of power sources
- Produce segmentation plans according to power sources and rehabilitation
- Create flexible reports according to your country's context

6.3 CCE inventory data analysis collection

Who conducts data analysis?

- In most countries, the national cold chain technician (CCT) acts as the lead in the analysis of the CCE inventory data. If there is no national CCT, then the responsibility falls to the Expanded Programme on Immunization (EPI) director or the manager of the country's Ministry of Health.
- Often, the lead will create a working group that oversees Cold Chain Management activities, including planning and budgeting. Together, they will analyse the data and the performance indicators. (PMT or National Logistics WG)
- Here is a document that describes the roles of health workers in relation to CCE: https://path.azureedge.net/media/documents/CCE-inventory-guidelines-4-23-20.pdf

What is the aim of conducting data analysis?

- It supports data presentation to specific audiences.
- It helps decision-makers to efficiently visualize a situation.
- It allows key performance indicators to be tracked.
- It supports the preparation work for budgeting and planning CCE life cycles.
- It informs evidence-based reports and recommendations on financial resources, human capacity and operational projects.

When is data analysis conducted?

- The CCE inventory is normally analysed once a year.
- Data should always be available in the inventory tool used by the country as it should be collected on a monthly basis along with the immunization coverage data.
- Following a special request from the government or partners, e.g.,CCE OP project.

6.4 Use of CCE inventory data analysis for action

Who uses data analysis?

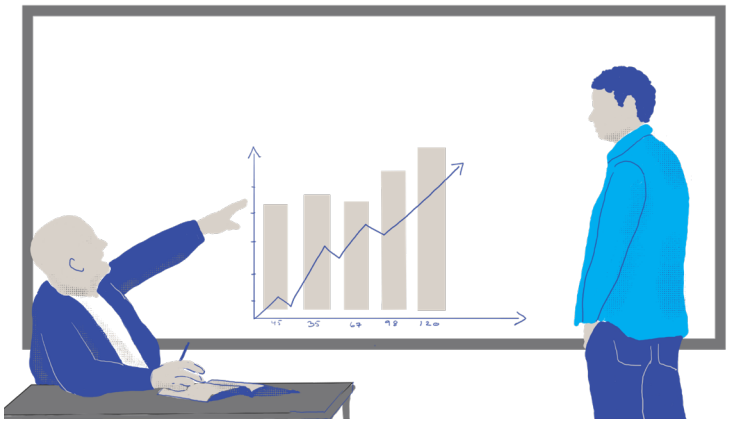
Different actors that work in the health services sectors use these analyses to either make decisions or plan strategic actions, such as:

- Government decision-makers
- Country focal points that work in health services and immunization programmes
- Report writers that generate evidence-based analysis, programme strategies and advocacy
- Other UN agencies, international NGOs, think tanks and academics and individuals with the necessary insight to prompt action to improve the lives of women and children

Why do we use CCE inventory data?

When the right data is in the right hands at the right time, decisions can be better informed, more equitable and more likely to protect children's rights.

Providing decision-makers with useful information on CCE helps in planning health and immunization activities, purchasing, maintenance, training and managing stock.



We use CCEI data to:

- Achieve better results
- Ensure effective management planning of CCE capacity for major activities, for example:
  - Vaccine storage for routine immunization activities
  - Targeted immunization campaigns or catch-up activities in certain areas
  - Conducting successful outreach sessions

- Optimize the functionality, reliability and continuous operation of CCE at all levels of the health services and immunization programmes in the country
  - What investment in new CCE is needed for the coming years?
  - Are planned preventive maintenance (PPM) schedules being adhered to?
  - Track CCE warranty periods and performance status
  - Track movement of equipment within a country or a district
  - Does data analysis help with prioritization of time and resources?
  - Which CCE needs repair or maintenance and where is it located?
  - Which areas require additional CCE capacity?
  - Do particular models of CCE perform better or have longer lifespans?
- Support decision-making related to operational activities
  - Where should a country prioritize remote temperature-monitoring devices?
  - Where should training be targeted?
  - Where should supervision be improved?
  - Where should there be additional maintenance resources?
  - Is the equipment still under warranty?
- Create work plans with short- and long-term goals and milestones such as:
  - Annual CCE capacity work plan to inform planning of immunization campaigns or catch-up activities
  - Introduction of new vaccines
  - Integration of other health commodities (e.g., oxytocin)
  - Equipment decommissioning activities
  - Maintenance according to age and functionality of equipment
  - Procurement of new units and spare parts

How do we use CCE inventory data for action?

- Using analysis tools, you can easily create graphs, tables and recommendations. That is why choosing the right tool for your country is important.
- Work plans can be built from data analysis at the district and national levels. It helps the creation of supervisory plans and activities, such as identifying weaker areas where training could be beneficial.
- CCE inventory data can inform key actors on key indicators:
  - CCE functionality results (percentage of functional CCE, percentage of obsolete CCE)
  - CCE age categories (<=5years, 5–10years, >=15years, Non-specified)
  - CCE capacity at all health services levels
  - Number of units that need maintenance in a given year
  - Number of units that need to be replaced according to estimated lifespans
  - Number of high- and low-temperature alarms
  - Rate of compliance with PPM schedules
  - Service response rates for CCE availability and downtime for a certain period
  - Number of repairs performed over a certain period
  - Status of decommissioned CCE

7. CCE inventory data management feedback mechanism for the health workers that supported the recording of data

Establishing a feedback mechanism to collect people's opinions in parallel to the CCE inventory data management guide will be beneficial to gain the trust of health workers when collecting data for the management team to analyse. When health workers feel like their opinion is heard and acted on, it helps to optimize their adherence to the process and fosters accurate reporting.

Once a year, during supervision activities, CCT managers should:

- Update the stakeholders at all health services levels on what the results were and where the data they collected were used, so they feel like their participation made a difference.
- Circulate a questionnaire amongst their peers and collect feedback on the activities.
- Following the collection of feedback, an analysis should be completed by the National CCT or EPI manager and shared with all stakeholders as a summary report along with recommendations for corrective actions.