Cold Chain Equipment Planning with CCEM

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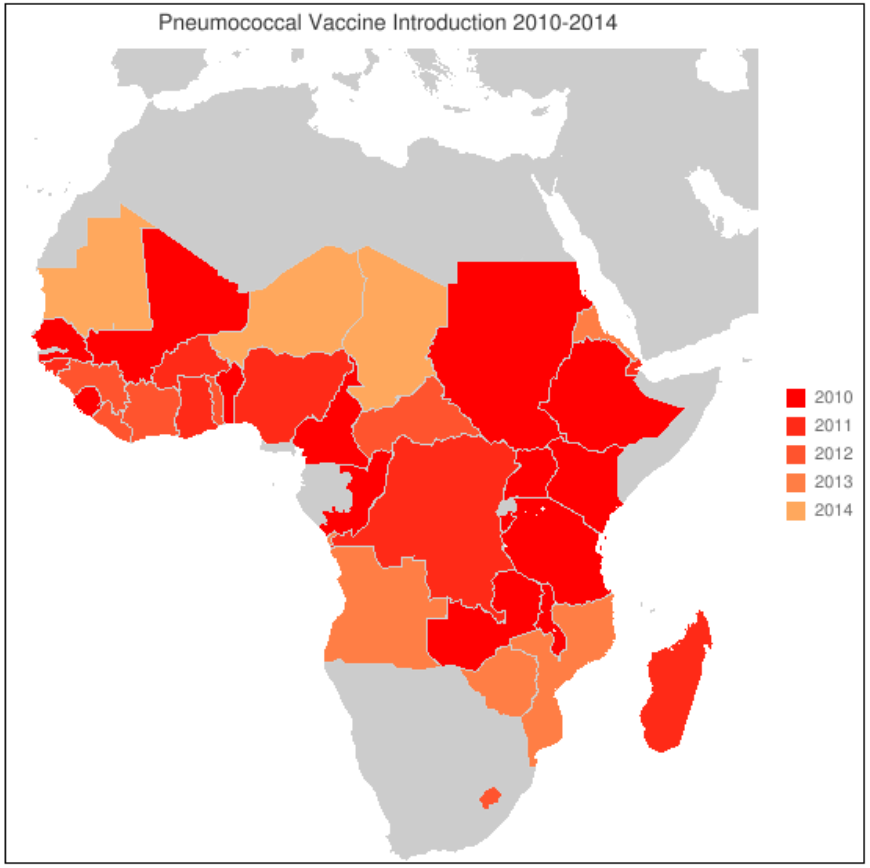
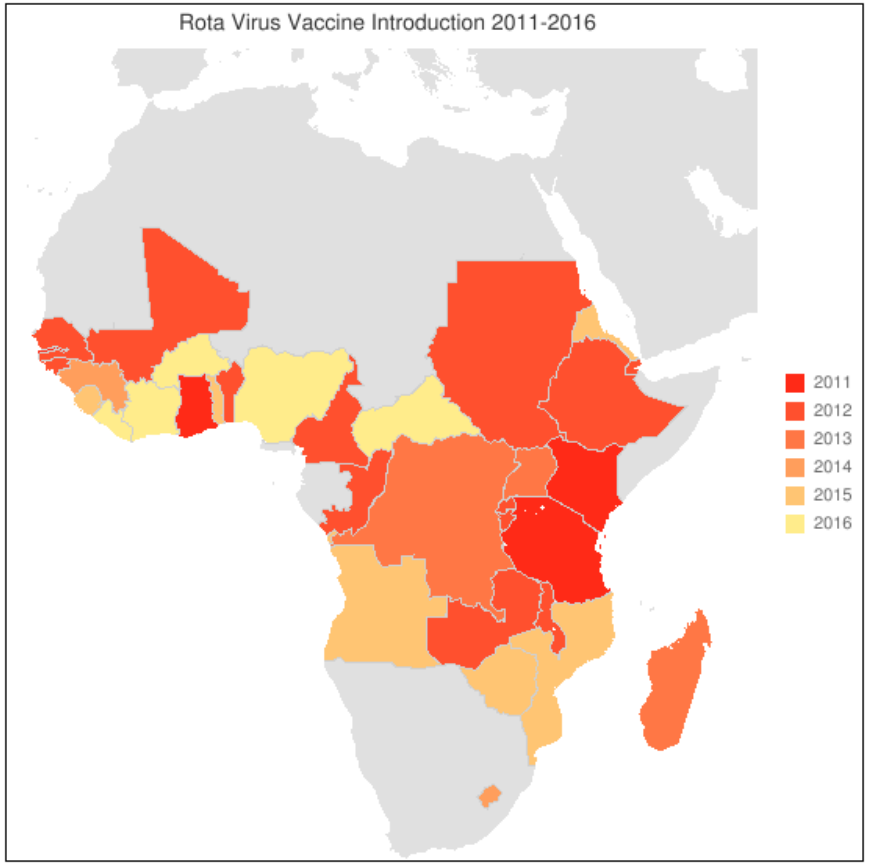
PATH

Vaccine Introduction Timeline





IVAC VIMS report, March 2010

Old vs. New Vaccines

4,100 doses
Polio and Measles

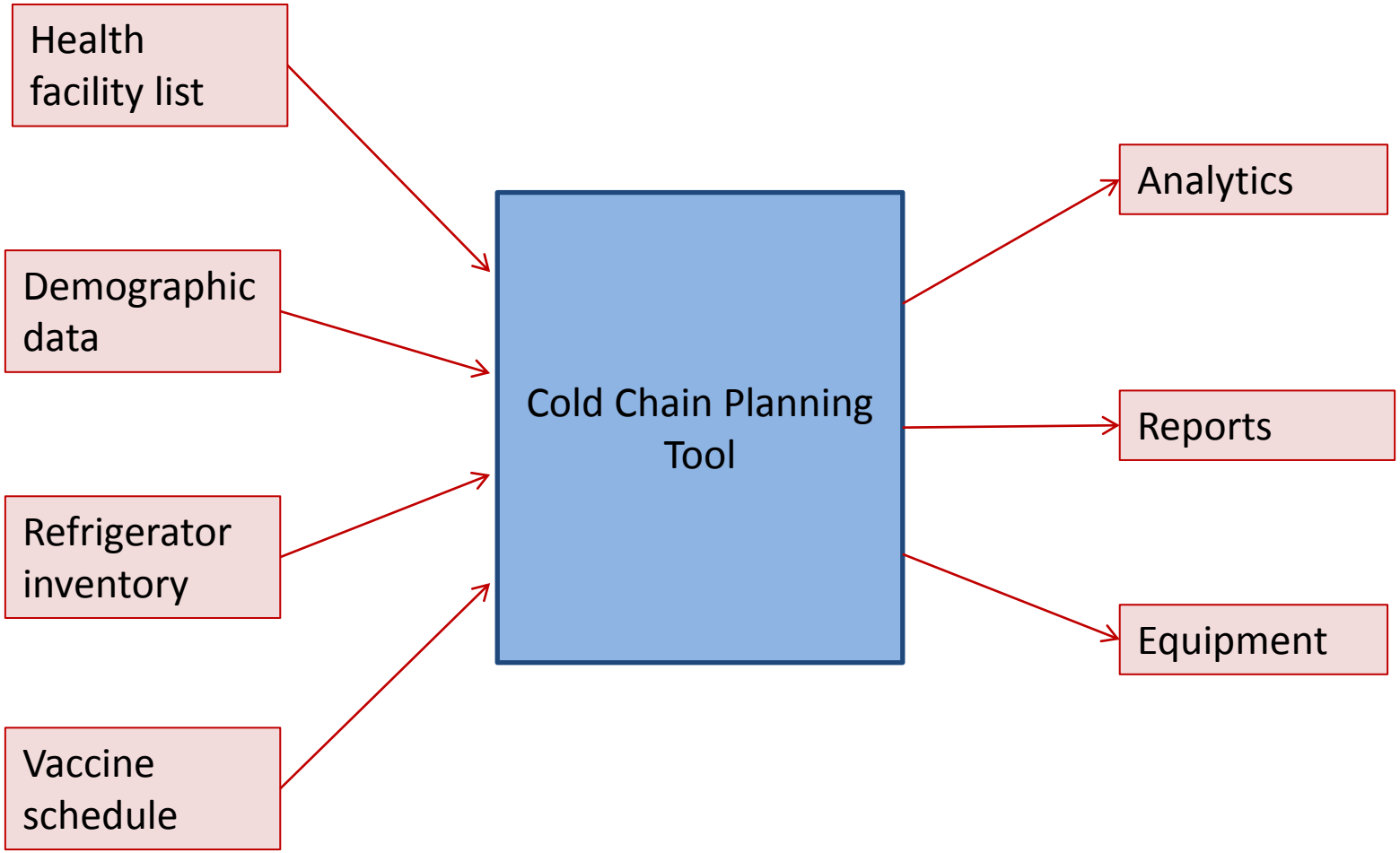
625 doses
Rotavirus

Does a country have sufficient cold chain capacity for new vaccines?

- Preparation for introduction of new vaccines
  - Assess cold chain capacity
  - Make cold chain capacity visible
  - Develop a plan for meeting capacity needs
- Approach
  - Inventory of cold chain equipment
  - Analytics and modeling
- Software
  - CCEM, Cold Chain Equipment Manager

Cold Chain Inventory

Inventory Based Cold Chain Capacity Analysis

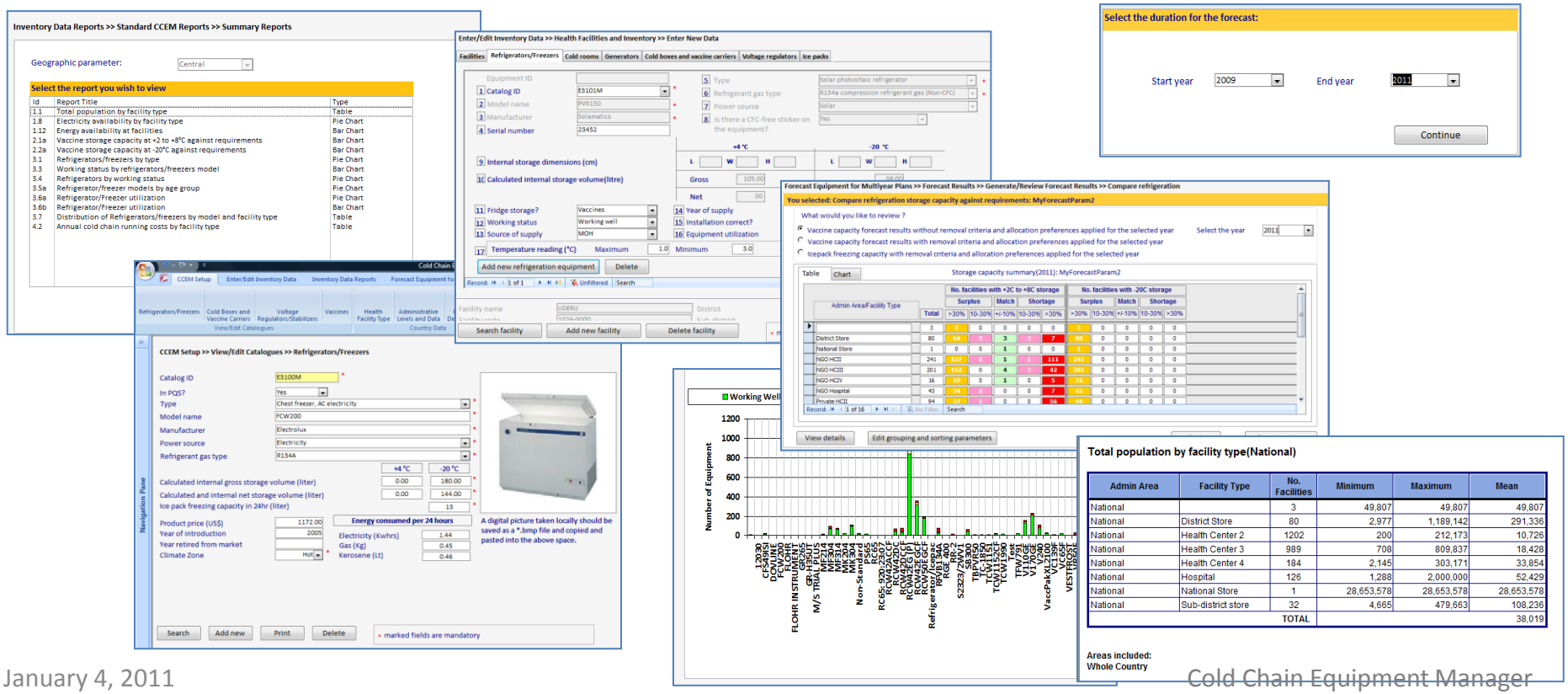


CCEM History

- 2006 CCEM development starts at the TechNet Consultation in Mexico
- 2007 CCEM piloted in collaboration with Uganda EPI team, WHO/IST, and UNICEF/TACRO.
- 2009 CCEM migrated to MS Access 2007, with a new user interface and stability enhancements
- 2010 Release of CCEM at TechNet Consultation in Kuala Lumpur
- 2011 Cold Chain Planning in Kenya on new national inventory (tentative)

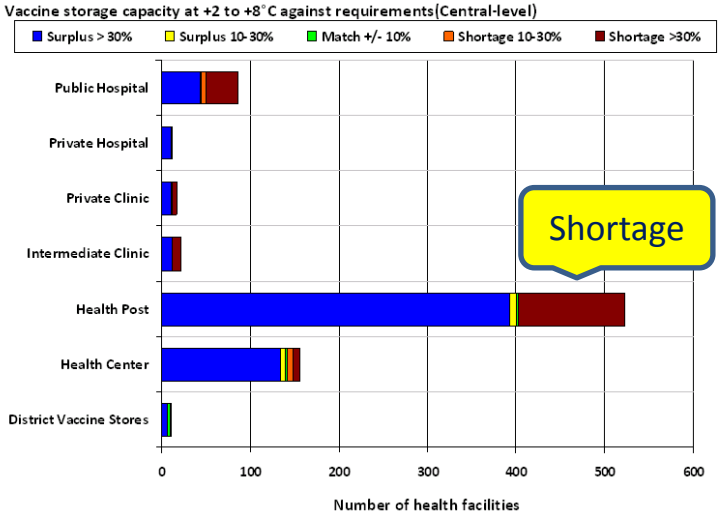
CCEM Application

- Cold chain inventory
- Analysis and modeling tools
- Components: Catalogs, data entry, reports, forecasting



Does the country have sufficient cold chain space for current vaccines?

- Compute capacity requirements for each facility
- Compare with available capacity



Capacity status by facility type

What is the impact of the introduction of a new vaccine on available cold chain capacity?

- Add a new vaccine to the national schedule
- Identify capacity shortages created by new vaccine
- Determine facilities that need to add equipment to meet the shortages

Admin Area/Facility Type	Total	No. facilities with +2C to +8C storage				
		Surplus		Match	Shortage	
		>30%	10-30%	+/-10%	10-30%	>30%
Central Vaccine Stores	1	1	0	0	0	0
District Vaccine Stores	11	11	0	0	0	0
Health Center	157	145	3	0	0	9
Health Post	523	403	0	1	0	119
Intermediate Clinic	22	13	0	0	0	9
Private Clinic	17	13	0	0	0	4
Private Hospital	13	11	0	0	0	2
Public Hospital	86	49	4	0	0	33

Before PCV7

Admin Area/Facility Type	Total	No. facilities with +2C to +8C storage				
		Surplus		Match	Shortage	
		>30%	10-30%	+/-10%	10-30%	>30%
Central Vaccine Stores	1	0	1	0	0	0
District Vaccine Stores	11	7	0	3	1	0
Health Center	157	134	5	3	6	9
Health Post	523	393	7	2	1	120
Intermediate Clinic	22	13	0	0	0	9
Private Clinic	17	12	0	0	1	4
Private Hospital	13	11	0	0	0	2
Public Hospital	86	44	1	0	5	36

After PCV7

How much would it cost to add equipment to address capacity shortages?

- Assign equipment to facilities with insufficient capacity
- Equipment assigned based on available energy and cost
- Policies can set equipment options for regions and facility types

You selected: Multi-year new equipment allocation table: 5 year allocation removal

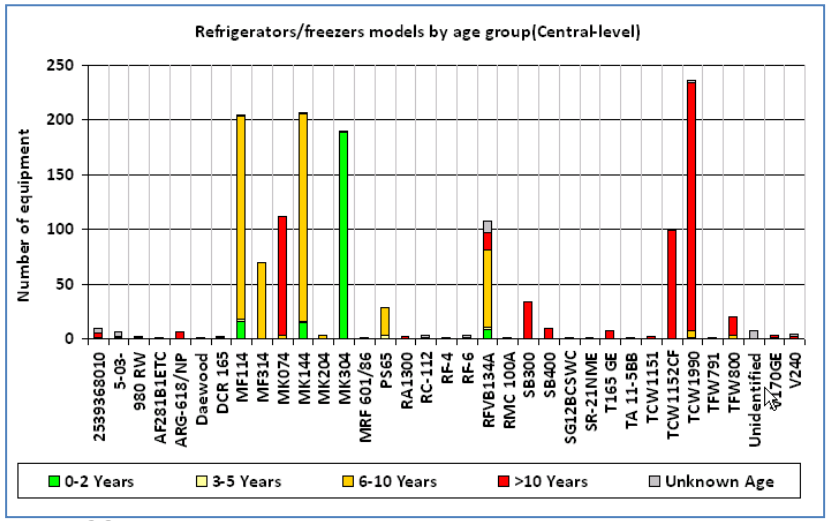
Review multiyear new equipment allocation table by:

- Equipment types
- Equipment types and models

Equipment		2010		2011		2012		2013		2014		5-Year Totals	
Model	Type	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US
MK 074	Icelined refrigerator			47	43,710	316	293,880			197	183,210	560	520,800
MK 144	Icelined refrigerator	49	43,267									49	43,267

What is the impact of retiring cold chain equipment?

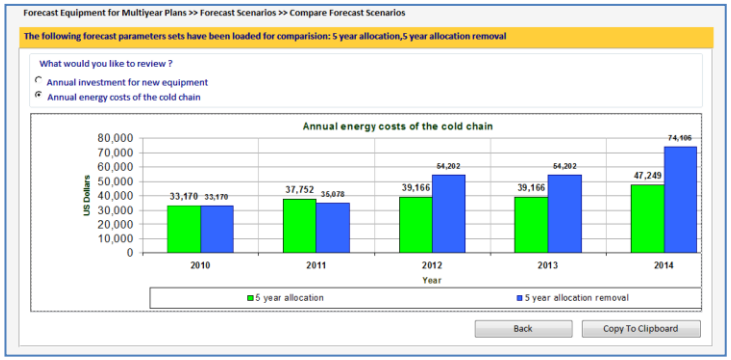
- Remove equipment based on age, type, energy source, region, and facility type
- Evaluate capacity or energy cost



Admin Area/Facility Type	Total	No. facilities with +2C to +8C storage: Surplus >30%	Surplus 10-30%	Match +/-10%	Shortage 10-30%	Shortage >30%
Central Vaccine Stores	1	1	0	0	0	0
District Vaccine Stores	11	6	1	2	1	1
Health Center	157	126	5	2	1	23
Health Post	523	238	0	0	0	285
Intermediate Clinic	22	8	0	0	0	14
Private Clinic	17	5	0	0	0	12
Private Hospital	13	4	0	0	0	9
Public Hospital	86	23	1	0	0	62

How many refrigerators are needed over the next five years?

- Multiyear planning based on:
  - Introduction of Vaccines
  - Vaccine Campaigns
  - Equipment introduction and removal
    - Equipment type, region, facility type, energy source, age
  - Population growth
- Products
  - Capacity analysis by facility
  - Equipment lists for each year
  - Comparison across scenarios



Where CCEM is today

- Application and supporting materials available online at www.path.org.
- Kenya EPI team to deploy CCEM for cold chain inventory and planning
- Planning for regional technical workshop with the WHO regional team for ESAR (Feb 2011)

Acknowledgements

Kenya Ministry of Health

USAID FROM THE AMERICAN PEOPLE

unicef

UNIVERSITY OF WASHINGTON 1861

World Health Organization

Republic of Uganda
Ministry of Health

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Software Downloads: www.path.org
http://www.path.org/publications/detail.php?i=1569

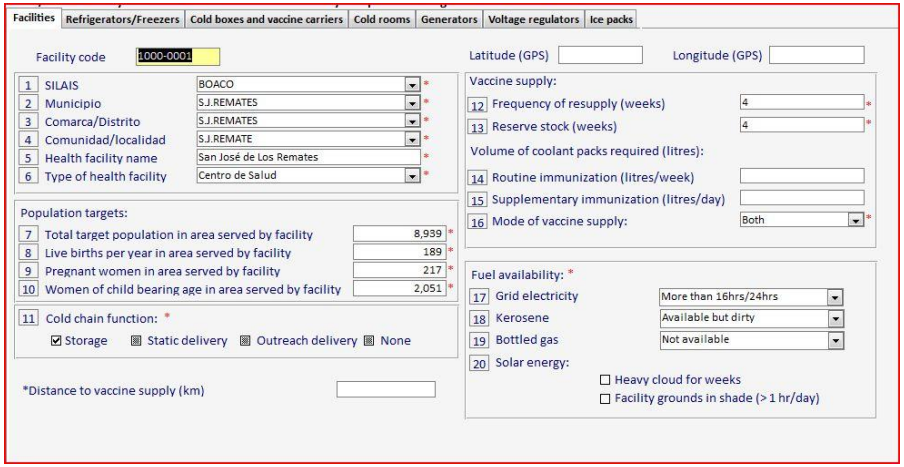
CCEMinfo@.path.org

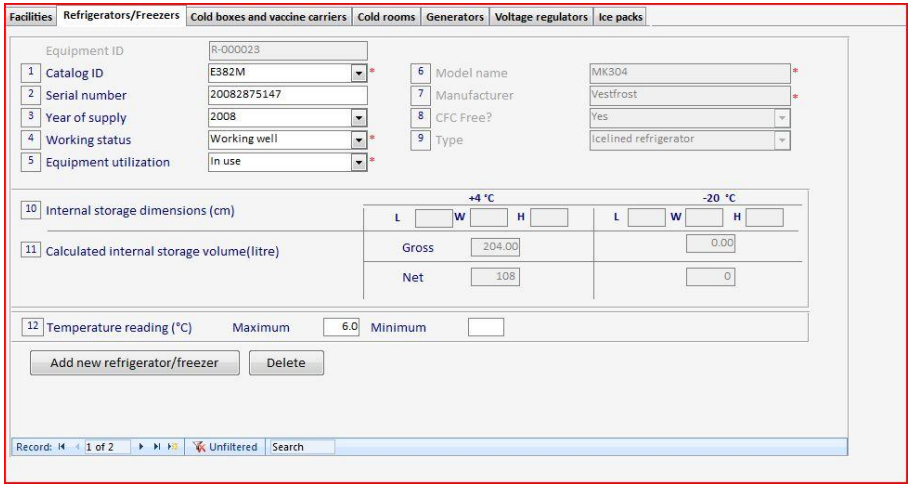
EXTRA SLIDES

COLD CHAIN INVENTORY ISSUES

CCEM Core Data Elements

1. Administrative hierarchy
   - Country, Province, Region, District, Subdistrict
2. Facilities and vaccine stores
   - Facility info
     - Cold chain function
     - Power sources
     - Vaccine supply
   - Demographics: Population, Live births
3. Refrigerator Inventory
   - Equipment available at each facility





Inventories

- National Inventory
  - Train enumerators
  - Visit each facility, record information on paper forms
  - Data entry clerks use CCEM to enter data

14 July 2010

2 - REFRIGERATOR & FREEZER QUESTIONNAIRE

EQUIPMENT RECORD _____ OF _____ (Fill in a form for each piece of cold chain equipment at health facility.)

Administrative levels and facility identification

1. Province:
2. District:
3. Division:
4. Sub-location:
5. Name of health facility:

Refrigerator or freezer information

6. Catalogue ID:

Catalogue ID is found in the Equipment Identification Guide. If equipment is not identified, also fill in questions #11-16.

Fill in questions #11-16 when equipment ID is not found in the Equipment Identification Guide.

11. Model name:

7. Serial number:

12. Manufacturer:

8. Year of supply:

13. Is there a CFC-free sticker on the equipment?
- ☐ Yes
- ☐ No

9. Working status:
Mark only ONE box
- ☐ Working well
- ☐ Working, needs service
- ☐ Not working

14. Internal storage dimensions: *(cm, if available)*

+4°C			-20°C		
L	W	H	L	W	H

10. Equipment utilisation:
Mark only ONE box
- ☐ In use
- ☐ Not in use, available for allocation
- ☐ Not in use, not available for allocation

Verify directly with health facility representative this equipment is available for allocation.

15. Calculated internal storage volume: *(litres, if available)*

+4°C		-20°C	
Gross	*Net*	*Gross*	*Net*

16. Refrigerator/Freezer Type:
Mark only ONE box
- ☐ Compression Refrigerator
- ☐ Compression Freezer
- ☐ Icelined Refrigerator
- ☐ Solar photovoltaic Refrigerator
- ☐ Kerosene Absorption Refrigerator
- ☐ Gas Absorption Refrigerator
- ☐ Kerosene Absorption Freezer
- ☐ Gas Absorption Freezer

Contact information

Person in charge of immunisation: _____
Title: _____
Telephone number: _____
Email: _____

Surveyor information

Surveyor's name: _____
Signature: _____
Date (dd/mm/yyyy): _____

Cold Chain Inventory Equipment Identification Guide

Equipment Identification Guide

E003002 Haier, HBD-116, Chest refrigerator, AC electricity	**E003004** Dometic, TFW800, Chest freezer, AC electricity	**E3100M** Electrolux, FCW 200, Chest freezer, AC electricity	**E3110M** PT. Dilihan Glory, DOVLINE, Chest refrigerator, AC electricity

Trade offs for inventory based planning

- Advantages
  - Improved management with cold chain inventory
    - Allocation of equipment
    - Matching equipment to available power sources
    - Avoiding over allocation of equipment
  - Planning at different levels based on data
  - Transparency
- Disadvantages
  - Initial inventory cost
  - Inventory updates
  - Transparency

Inventory Updates

- Current model: update entered manually into the main application
- Regions may maintain their own databases, and then merge them with feed forward files to national database
- Future work
  - Distributed updates to inventory database
  - Multiple input mechanisms: web, cell phone

CCEM with incomplete data

- Application results depend on data completeness
- But . . .
  - Application can be restricted to geographic levels or facility levels or regions
  - Workarounds available for missing or incomplete data
  - Depending on analysis needs, some data may be omitted

COLD CHAIN CAPACITY ANALYSIS

Basic capacity calculations

- For each vaccine:
  - Compute number of doses needed
    - Covered Populations X Doses reqd X coverage
  - Account for wastage
    - Divide by (1 – wastage pct)
  - Determine weeks of supply
    - Supply interval + Reserve stock period
  - Compute doses on hand
    - Multiply by weeks of supply divided by 52
  - Convert to volume
    - Multiply by CCM per dose

Other approaches to capacity analysis

- Compute capacity requirements based on population
  - Guidelines for number of refrigeration devices for different facilities types
- Historical data
- Sampling based assessments

Other cold chain tools

- Cold Chain Logistics Planning Tool
  - Excel based tool for computing capacity. Same capacity calculation is used
- EVM: Effective Vaccine Management Initiative
  - Country assessment tool including sampling to evaluate cold chain capacity
- VSSM: Vaccine Supplies Stock Management
  - Stock management tool, not for capacity analysis

ADDITIONAL USE CASES AND FEATURES FOR CCEM

Reporting

Inventory Data Reports >> Standard CCEM Reports >> Summary Reports

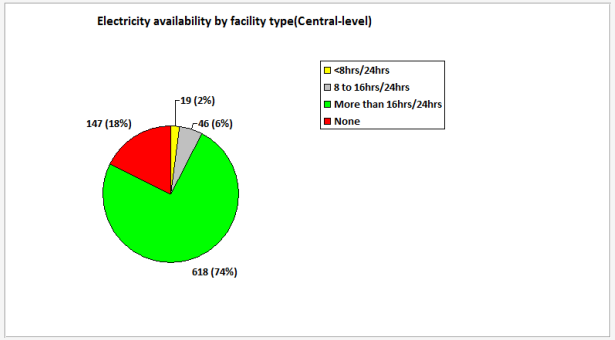
Geographic parameter: Central

Select the report you wish to view

Id	Report Title	Type
1.1	Total population by facility type	Table
1.8	Electricity availability by facility type	Pie Chart
1.12	Energy availability at facilities	Bar Chart
2.1a	Vaccine storage capacity at +2 to +8°C against requirements	Bar Chart
2.2a	Vaccine storage capacity at -20°C against requirements	Bar Chart
3.1	Refrigerators/freezers by type	Pie Chart
3.3	Working status by refrigerators/freezers model	Bar Chart
3.4	Refrigerators by working status	Pie Chart
3.5a	Refrigerator/freezer models by age group	Pie Chart
3.6a	Refrigerator/Freezer utilization	Pie Chart
3.6b	Refrigerator/Freezer utilization	Bar Chart
3.7	Distribution of Refrigerators/freezers by model and facility type	Table
4.2	Annual cold chain running costs by facility type	Table

Export Option

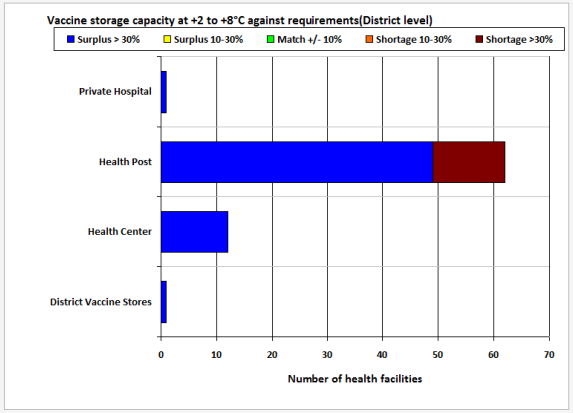
Inventory Data Reports >> Standard CCEM Reports >> Summary Reports



Areas Included:
Whole Country

Facilities included:
All facilities

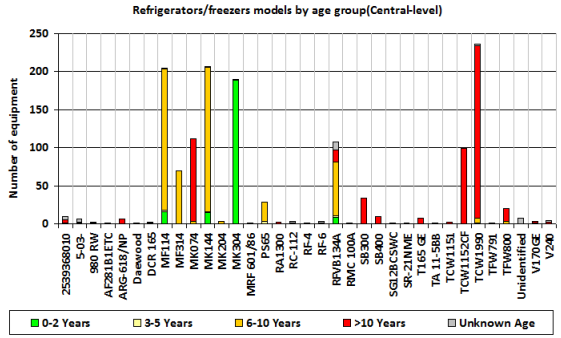
Inventory Data Reports >> Standard CCEM Reports >> Storage Capacity



Areas Included:
TILLAMOOK

Facilities included:
All facilities

Inventory Data Reports >> Standard CCEM Reports >> Cold Chain Equipment



Areas Included:
Whole Country

Facilities included:
All facilities

Total population by facility type(Central level)

Admin Area	Facility Type	No. Facilities	Minimum	Maximum	Mean
Central	Central Vaccine Stores	1	5,742,311	5,742,311	5,742,311
Central	District Vaccine Stores	11	145,657	1,401,303	378,076
Central	Health Center	157	1,091	442,636	26,830
Central	Health Post	523	395	129,914	4,684
Central	Intermediate Clinic	22	1,456	6,000	3,145
Central	Private Clinic	17	1,347	13,768	3,914
Central	Private Hospital	13	802	7,000	3,588
Central	Public Hospital	86	424	38,334	7,970

Areas included:
Whole Country

CCEM 2.1.5.2_demo.A

Forecasting

CCEM Setup | Enter/Edit Inventory Data | Inventory Data Reports | Forecast Equipment for Multiyear Plans | System Administration

Create New Removal Criteria | Edit Existing Removal Criteria | Equipment Removal Criteria
Create New Allocation Preferences | Edit Existing Allocation Preferences | Equipment Allocation Preferences
Create New Vaccine Schedule | Edit Existing Vaccine Schedule | Vaccine Schedules
Create New Forecast Parameters | Edit Existing Forecast Parameters | Forecast Parameters
Generate/Review Forecast Results | Forecast Results
Compare Forecast Scenarios | Forecast Scenarios

Navigation Pane

Forecast Equipment for Multiyear Plans >> Forecast Results >> Generate/Review Forecast Results

Select one:
- 5 year allocation
- 5 year allocation removal
- Baseline
- Health Post Allocation
- Remove TCW HC over 10
- rjaTest
- Vaccine Introductions PCV7 Rota

Summary of forecast parameter set:

Years in the forecast:

Year	Removal criteria in effect	Allocation preferences in effect	Vaccine schedule

All Facilities with Shortfall. Threshold (%)
Annual population growth rate (%)
% freight, insurance, clearing cost
Energy cost for running cost reports:
- Price of electricity (Kwhrs)
- Price of gas (Kg)
- Price of kerosene (Lt)

Include SIA's in capacity requirement calculation?

Storage requirements will be calculated using frequency of resupply (weeks) and reserve stocks (weeks) as specified by Health facility type in CCEM setup.

Generate forecast

Forecast Equipment for Multiyear Plans >> Forecast Results >> Generate/Review Forecast Results >> Compare refrigeration

You selected: Compare refrigeration storage capacity against requirements: Baseline

What would you like to review ?
- Vaccine capacity forecast results with removal criteria and allocation preferences applied for the selected year
- Ice pack freezing capacity with removal criteria and allocation preferences applied for the selected year

Select the year: 2010

Table | Chart

Storage capacity summary(2010): Baseline

Admin Area/Facility Type	Total	No. facilities with +2C to +8C storage: Surplus >30%	Surplus 10-30%	Match +/-10%	Shortage 10-30%	Shortage >30%	No. facilities with -20C storage: Surplus >30%	Surplus 10-30%	Match +/-10%	Shortage 10-30%	Shortage >30%
Central Vaccine Stores	1	1	0	0	0	0	0	0	1	0	0
District Vaccine Stores	11	11	0	0	0	0	11	0	0	0	0
Health Center	157	148	0	0	0	9	157	0	0	0	0
Health Post	523	404	0	1	1	117	523	0	0	0	0
Intermediate Clinic	22	13	0	0	0	9	22	0	0	0	0
Private Clinic	17	13	0	0	0	4	17	0	0	0	0
Private Hospital	13	11	0	0	0	2	13	0	0	0	0
Public Hospital	86	53	0	0	0	33	86	0	0	0	0

Record: 1 of 8 | No Filter | Search

View details | Edit grouping and sorting parameters | Back | Export options

Vaccine storage status in facilities of type : Central Vaccine Stores

Facility Code	Facility name	District	Municipality	Parish	Community	Cold Room Capacity (Litres) +2C/+8C	Cold Room Capacity (Litres) -20C	Refrigerators/Freezers Capacity +2C/+8C	Refrigerators/Freezers Capacity -20C	Storage Requirements +2C/+8C	Storage Requirements -20C	Refrigeration equip Capacity With +2C/+8C
1085-0000	Oregon Vaccine :	MARION	SALEM	SALEM	SALEM	44248.96	22124.48	615.00	1400.00	6684.05	23779.79	

Summary of forecast parameter set: Vaccine Introductions PCV7 Rota

Years in the forecast:2010 to 2012

Year	Removal criteria in effect	Allocation preferences in effect	Vaccine schedule
2010	<none>	<none>	<Current Country Schedule>
2011	<none>	<none>	Country with Pneumo
2012	<none>	<none>	Country with Pneumo and Rc

All Facilities with Shortfall. Threshold (%)	10
Annual population growth rate (%)	0
% freight, insurance, clearing cost	37
Energy cost for running cost reports:	
Price of electricity (Kwhrs)	0.08
Price of gas (Kg)	2.16
Price of kerosene (Lt)	0.85
Include SIA's in capacity requirement calculation?	No

Storage requirements will be calculated using frequency of resupply (weeks) and reserve stocks (weeks) as specified by Health facility type in CCEM setup.

Generate forecast

Refrigerators meeting the following criterias will be removed:

Equipment from refrigerator that meet the following criteria will be removed:
Year of supply < 2001
Model name = TCW1990
Type of facility = Health Center

List of facility types with model preferences added:

Facility type	Model preferences added?
Health Post	Yes

Model preferences for selected health facility Type:

Catalog ID	Model	Manufacturer
E003005	HBC-70	Haier
E003009	MK S044	Vestfrost
E003010	MK 074	Vestfrost
U002	Domestic Frigode	Manufacturer Global

Multiyear Scenarios

Summary of forecast parameter set: 5 year allocation removal

Years in the forecast:2010 to 2014

Year	Removal criteria in effect	Allocation preferences in effect	Vaccine schedule
2010	<none>	Alloc ILR North	<Current Country Schedule>
2011	TCW Health Center over 10 years	Alloc ILR South	<Current Country Schedule>
2012	Remove over 10	Alloc ILR	Country with Pneumo
2013	<none>	Alloc ILR	Country with Pneumo
2014	<none>	Alloc ILR	Country with Pneumo and Rc

All Facilities with Shortfall. Threshold (%)	10
Annual population growth rate (%)	2
% freight, insurance, clearing cost	37
Energy cost for running cost reports:	
Price of electricity (Kwhrs)	0.08
Price of gas (Kg)	2.16
Price of kerosene (Lt)	0.85
Include SIA's in capacity requirement calculation?	No

Storage requirements will be calculated using frequency of resupply (weeks) and reserve stocks (weeks) as specified by Health facility type in CCEM setup.

Equipment Lists and Transactions

Facility Code : 1003-0004
Facility Name : Hospital José Nieboroski
Facility Type : Public Hospital

District: : BENTON
Municipality: : CORVALLIS
Parish: : CORVALLIS
Community: : CORVALLIS

Equipment allocated for this facility:

Library ID	Model Name	Manufacturer	Power Source Used	Product Price (US$)	Number Allocated	Total Cost
E003010	MK 074	Vestfrost	Electricity	930	1	930

Facility Code : 1005-0000
Facility Name : El Papayal
Facility Type : Health Post

District: : BENTON
Municipality: : SILETZ
Parish: : SILETZ
Community: : S. LORENZO

Equipment allocated for this facility:

Library ID	Model Name	Manufacturer	Power Source Used	Product Price (US$)	Number Allocated	Total Cost
E003010	MK 074	Vestfrost	Electricity	930	1	930

Facility Code : 1005-0002
Facility Name : El Riito
Facility Type : Health Post

District: : BENTON
Municipality: : SILETZ
Parish: : SILETZ
Community: : S. LORENZO

Equipment allocated for this facility:

Library ID	Model Name	Manufacturer	Power Source Used	Product Price (US$)	Number Allocated	Total Cost
E003010	MK 074	Vestfrost	Electricity	930	1	930

Facility Code : 1005-0003
Facility Name : Los Cocos
Facility Type : Health Post

District: : BENTON
Municipality: : SILETZ
Parish: : SILETZ
Community: : S. LORENZO

Equipment allocated for this facility:

Library ID	Model Name	Manufacturer	Power Source Used	Product Price (US$)	Number Allocated	Total Cost
E003010	MK 074	Vestfrost	Electricity	930	1	930

Forecast Equipment for Multiyear Plans >> Forecast Results >> Generate/Review Forecast Results >> Equipment Transaction

You selected: All equipment transactions by facility : 5 year allocation removal

What would you like to review ?

- List of all equipment transactions by facility for the selected year
- List of all equipment transactions by facility up to the selected year

Select the year: 2012

Facility Code	District	Municipality	Parish	Community	Facility Type	Refrigeration Equipment					
						Library ID	Model Name	Manufacturer	No. Existing	No. Tagged for Removal	No. Allocated
1039-0005	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E357M	MK144	Vestfrost	1	0	
1039-0006	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E003010	MK 074	Vestfrost			1
1039-0006	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E362M	TCW1990	Dometic	1	1	
1039-0007	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E396M	MF114	Vestfrost	1	0	
1039-0007	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E357M	MK144	Vestfrost	1	0	
1039-0008	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E003010	MK 074	Vestfrost			1
1039-0008	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E375M	MK074	Vestfrost	1	1	
1039-0009	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E396M	MF114	Vestfrost	1	0	
1039-0009	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E357M	MK144	Vestfrost	1	0	
1039-0010	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E396M	MF114	Vestfrost	1	0	
1039-0011	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E003010	MK 074	Vestfrost			1
1039-0011	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E362M	TCW1990	Dometic	1	1	
1039-0013	YAMHILL	SANTIAM	SANTIAM	SANTIAM	Health Post	E377M	RFVB134A	Sun Frost	1	0	
1040-0000	YAMHILL	SILVERTON	SILVERTON	SILVERTON	Health Center	E398M	MF314	Vestfrost	1	0	
1040-0000	YAMHILL	SILVERTON	SILVERTON	SILVERTON	Health Center	E382M	MK304	Vestfrost	1	0	
1040-0000	YAMHILL	SILVERTON	SILVERTON	SILVERTON	Health Center	E362M	TCW1990	Dometic	1	0	
1040-0001	YAMHILL	SILVERTON	SILVERTON	SILVERTON	Health Post	E377M	RFVB134A	Sun Frost	1	0	
1041-0001	CLACKAMAS	SISTERS	SISTERS	SISTERS	Health Post	E357M	MK144	Vestfrost	1	0	
1041-0001	CLACKAMAS	SISTERS	SISTERS	SISTERS	Health Post	E396M	MF114	Vestfrost	1	0	
1041-0002	CLACKAMAS	SISTERS	SISTERS	SISTERS	Health Post	E375M	MK074	Vestfrost	1	1	
1041-0002	CLACKAMAS	SISTERS	SISTERS	SISTERS	Health Post	E003010	MK 074	Vestfrost			1
1041-0003	CLACKAMAS	SISTERS	SISTERS	SISTERS	Private Hospital	E362M	TCW1990	Dometic	1	1	
1041-0005	CLACKAMAS	SISTERS	SISTERS	SISTERS	Health Post	E396M	MF114	Vestfrost	1	0	
1041-0005	CLACKAMAS	SISTERS	SISTERS	SISTERS	Health Post	E357M	MK144	Vestfrost	1	0	
1041-0006	CLACKAMAS	SISTERS	SISTERS	SISTERS	Health Center	E398M	MF314	Vestfrost	1	0	

Record: 1 of 1451 Unfiltered Search

Multiyear costs

You selected: Multi-year new equipment allocation table: 5 year allocation removal

Review multiyear new equipment allocation table by:

- ○ Equipment types
- ◉ Equipment types and models

Equipment		2010		2011		2012		2013		2014		5-Year Totals	
Model	Type	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US	Qty	Cost $US
MK 074	Icelined refrigerator			47	43,710	316	293,880			197	183,210	560	520,800
MK 144	Icelined refrigerator	49	43,267									49	43,267

Forecast Equipment for Multiyear Plans >> Forecast Results >> Generate/Review Forecast Results >> Energy Consumption

You selected: Energy consumption costs of the cold chain: 5 year allocation removal

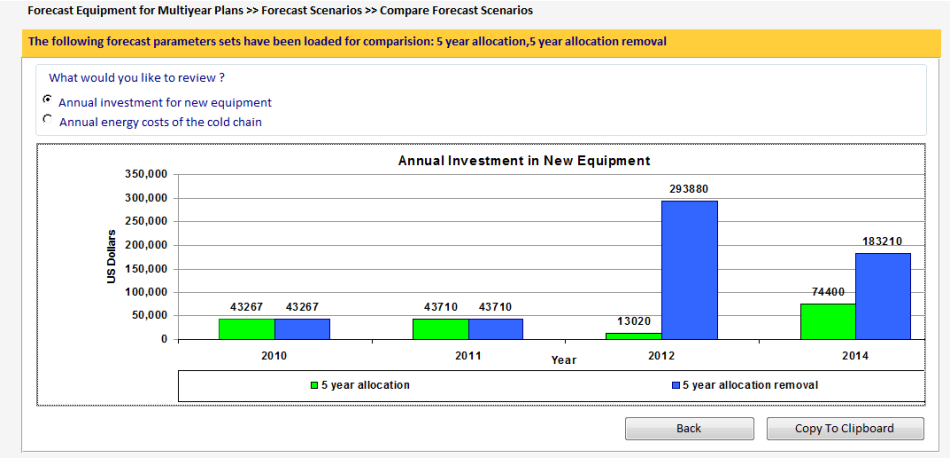
Equipment running cost:

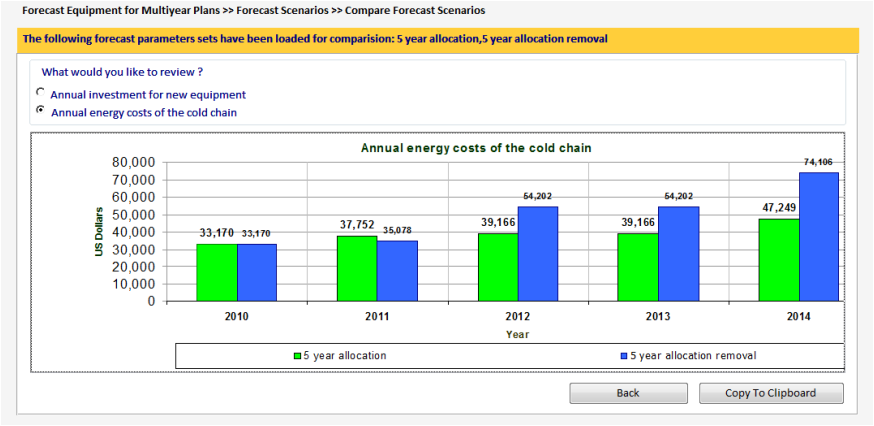
- ○ by facility type
- ◉ by administrative area
- ○ by administrative area and facility type

Admin area: District

Area	2010			2011			2012			2013	
	Cost of Gas consumption	Cost of Kerosene	Cost of Electricity	Cost of Gas consumption	Cost of Kerosene	Cost of Electricity	Cost of Gas consumption	Cost of Kerosene	Cost of Electricity	Cost of Gas consumption	Cost of Kerosene
BENTON	$0.00	$0.00	$1,176.07	$0.00	$0.00	$1,120.01	$0.00	$0.00	$916.59	$0.00	$0.00
CLACKAMAS	$0.00	$0.00	$2,149.87	$0.00	$0.00	$2,037.74	$0.00	$0.00	$2,426.10	$0.00	$0.00
DESCHUTES	$0.00	$0.00	$1,496.50	$0.00	$0.00	$1,384.37	$0.00	$0.00	$4,264.08	$0.00	$0.00
HARNEY	$0.00	$0.00	$2,913.19	$0.00	$0.00	$2,688.94	$0.00	$0.00	$4,748.12	$0.00	$0.00
JEFFERSON	$0.00	$0.00	$4,131.42	$0.00	$0.00	$3,963.23	$0.00	$0.00	$6,022.94	$0.00	$0.00
MARION	$0.00	$0.00	$7,381.67	$0.00	$0.00	$6,540.71	$0.00	$0.00	$13,503.16	$0.00	$0.00
POLK	$0.00	$0.00	$31.24	$0.00	$0.00	$31.24	$0.00	$0.00	$31.24	$0.00	$0.00
SHERMAN	$0.00	$0.00	$958.34	$0.00	$0.00	$1,508.47	$0.00	$0.00	$1,871.72	$0.00	$0.00
TILLAMOOK	$630.72	$0.00	$2,446.85	$630.72	$0.00	$2,855.17	$630.72	$0.00	$3,050.68	$630.72	$0.00
UNION	$1,261.44	$0.00	$647.36	$1,261.44	$0.00	$748.40	$1,261.44	$0.00	$722.70	$1,261.44	$0.00
WALLOWA	$0.00	$0.00	$2,192.04	$0.00	$0.00	$2,439.08	$0.00	$0.00	$2,442.00	$0.00	$0.00
WASCO	$0.00	$0.00	$2,401.85	$0.00	$0.00	$2,964.11	$0.00	$0.00	$3,815.11	$0.00	$0.00
YAMHILL	$0.00	$0.00	$3,351.20	$0.00	$0.00	$4,904.27	$0.00	$0.00	$8,495.87	$0.00	$0.00

Comparing Forecasts





Spanish available (French in progress)

Configuraciones de CCEM >> Ver / Editar Catálogos >> Cajas Frías y Porta Vacunas

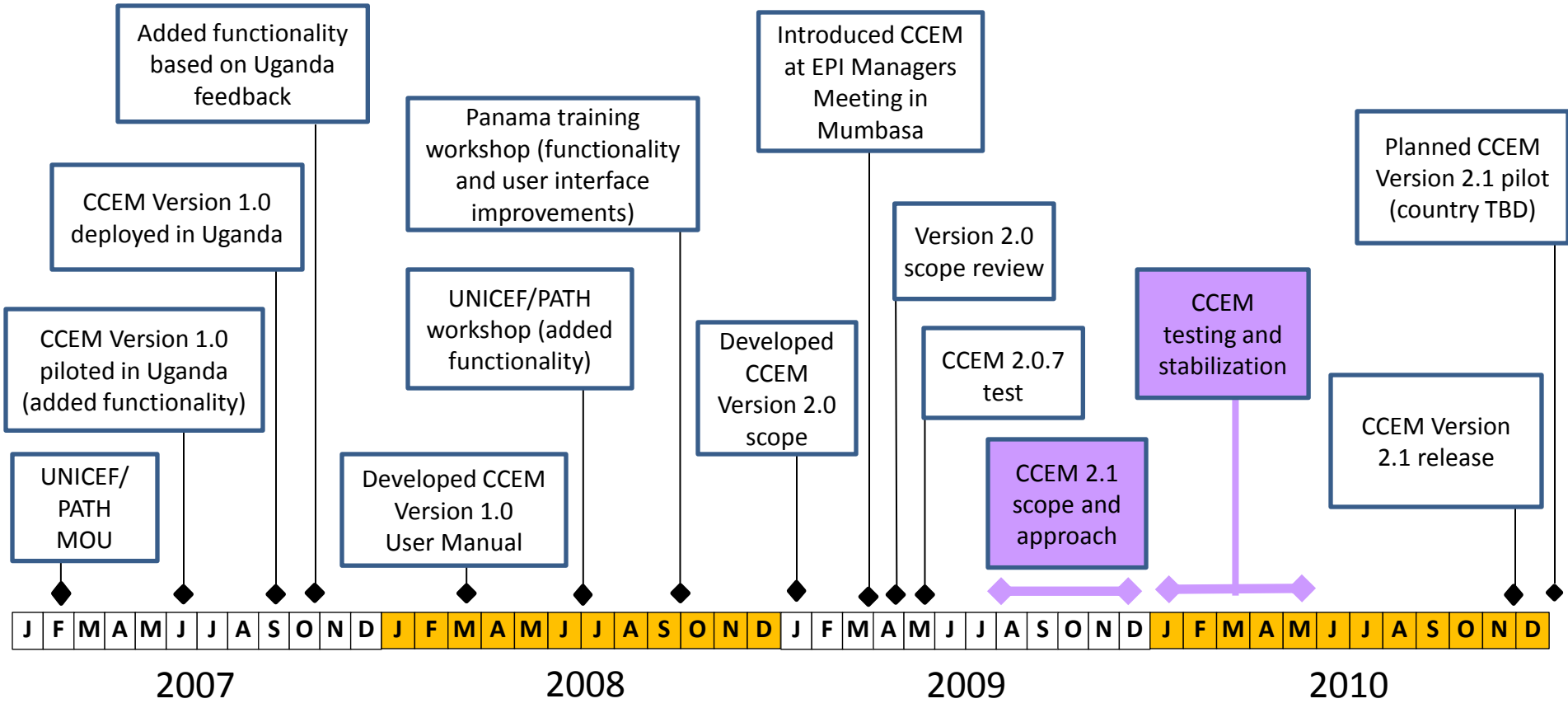
ID del catálogo	E004001 *
Tipo	Portador Día *
Fabricante	Coldpack *
Modelo	Antifreeze Backpack Vaccine Carrier *
Capacidad neta de almacenamiento de vacunas (litro)	3.0 *
Dimensiones externas (cm)	38x27x26
Dimensiones internas (cm)	34x19x20
Dimensiones del almacenamiento de vacunas (cm)	
Vida fría sin aperturas (horas a +43C)	31.0
Coste ($EE.UU.)	40.64
Volumen de cada bolsa de hielo utilizada (litro)	.6
Número de bolsas de hielo utilizadas	8
Volumen total de las bolsas de hielo (litro)	5.6

DEVELOPMENT AND DEPLOYMENT OF CCEM

CCEM History

- 2006. CCEM development starts at the TechNet Consultation in Mexico City with the idea that an equipment inventory and planning tool would support systematic management of the cold chain. *(Dr. Fernando Perez, MOH Peru)*
- 2007. In collaboration with Uganda EPI team, WHO/IST, and UNICEF/TACRO, CCEM is piloted.
- 2009. CCEM is migrated to MS Access 2007, with a new user interface and deploying software engineering principles.

CCEM roadmap



Software Development Challenges

- Challenges and experiences from developing CCEM are not unique
- Lessons from CCEM
  - Developing software is hard!
  - Software engineering tools helped
    - Issue tracking
    - Configuration management
    - Test cases
  - Absolutely critical to have strong public health input and domain knowledge
  - Important to figure out how to bridge between public health and computing technology

WISH LIST FOR COLD CHAIN PLANNING TOOLS

Web based inventory tool

- Replace MS Access with a relational database
  - Robust facilities for access and back up
- Provide access to inventory, reporting, and forecasting through a web application
- Allow standard solutions for updates
- Facilitate sharing of data across multiple levels of health system
- Access control to limit external viewing of information

Update Mechanisms

- Multiple levels of update
  - Web interface for updates, so internet connected devices can be used
  - Mobile device updates to support reporting from facilities
- Other mobile tools for cold chain supervision

Customization

- Extensibility for data elements collected and maintained by countries
  - Strong interest in adapting information at the country level
- Allow additional analytics to be implemented with a scripting engine
- Tie into a geographic information system

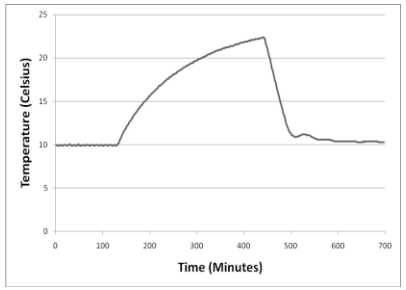
Migration of CCEM 2 to new architecture

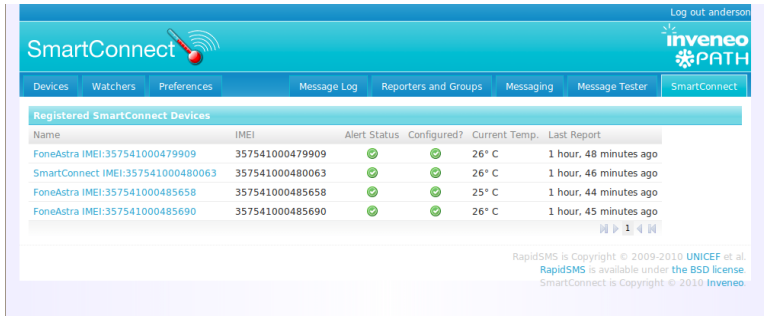
- Prior to development, stakeholder buy in and develop strategy for compatibility with other tools
- For CCEM, ensure that existing data formats can be transferred with import / export tools
- Development strategy
  - Create web based database, which can export to CCEM
  - Migrate analysis and reporting tools to work directly with the database

COLD CHAIN MONITORING

FoneAstra

- Attachment to low cost cell phone to allow temperature monitoring
- University of Washington developed device
- Regularly report temperatures by SMS to server



Temperature Monitoring

- Receive temperatures reports by SMS
- Allow monitoring of large number of machines
- Receive Alerts
- Identify problem equipment that is not triggering alerts
- Field test in Albania with Optimize