Software and Global Health: Information systems for the vaccine cold chain

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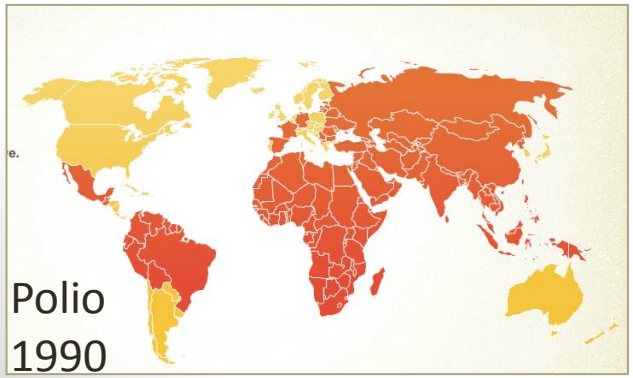
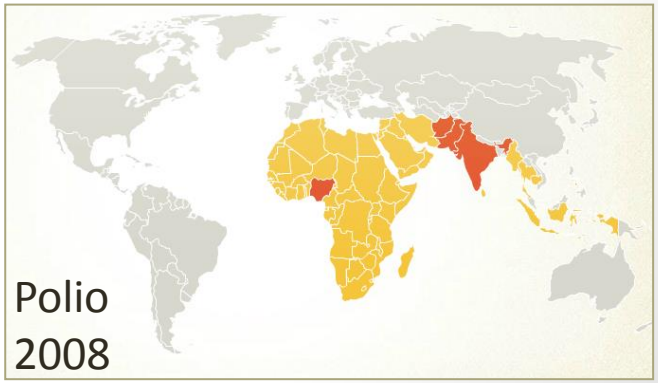
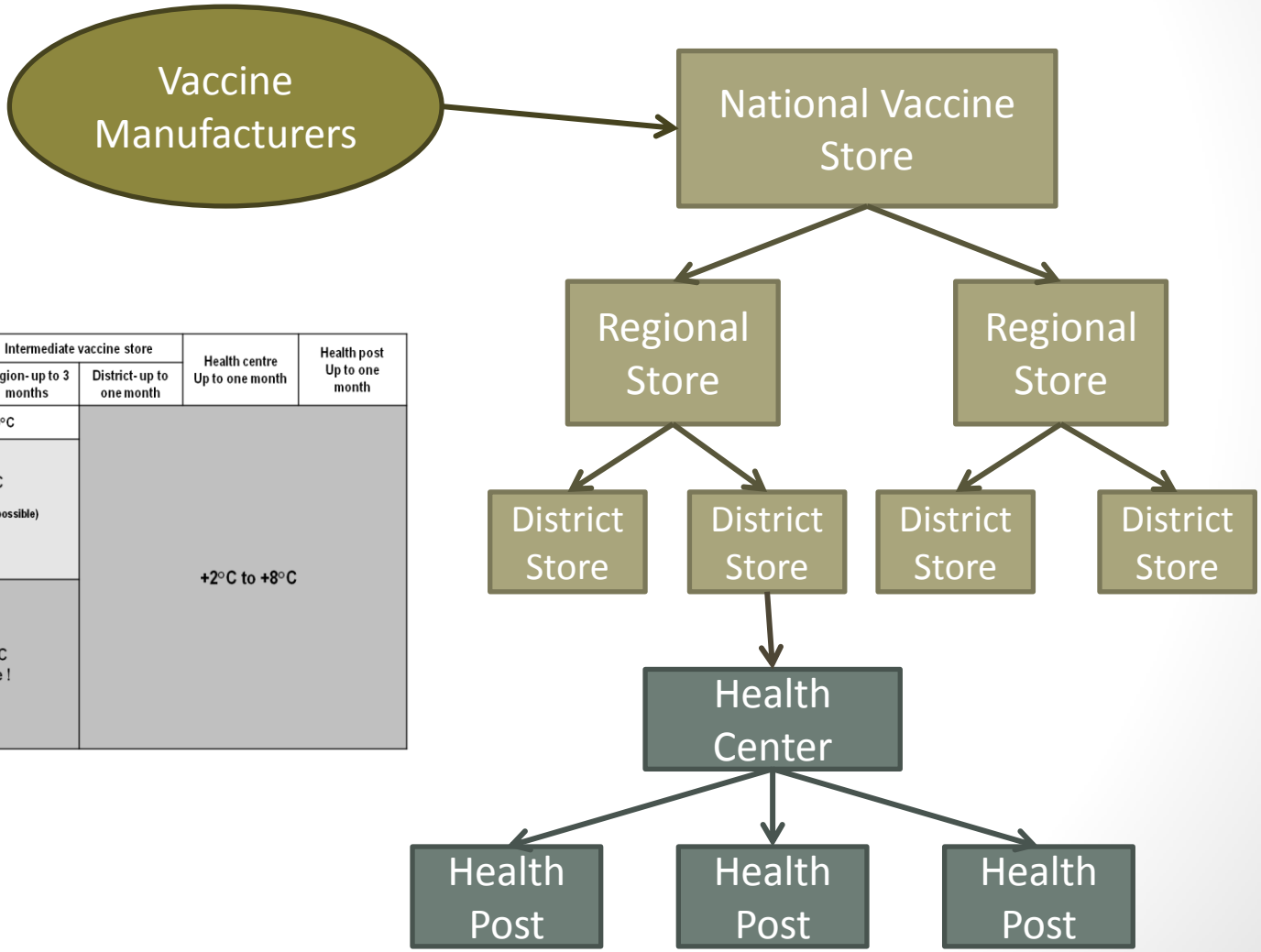

Polio
1990


Polio
2008

Vaccine Cold Chain Structure

	Primary vaccine store Up to 6 Months	Intermediate vaccine store		Health centre Up to one month	Health post Up to one month
		Region- up to 3 months	District- up to one month		
OPV	-15°C to -25°C		+2°C to +8°C		
BCG	2°C to +8°C (-15°C to -25°C also possible)				
Measles, MR, MMR					
YF					
Hib freeze-dried					
Meningococcal A&C					
HepB	+2°C to +8°C Never Freeze !				
IPV					
DT, DTP, DTP Hep B					
Hib liquid					
Td					
TT					



Cold Chain


JAPON


MINSA
MINSA
CLINICAS MOVILES
DONADAS POR LA HERMANA
REPUBLICA BOLIVARIANA
DE VENEZUELA

Cold Chain

Cold chain equipment software

Old vs. New Vaccines

4,100 doses
Polio and Measles
$635

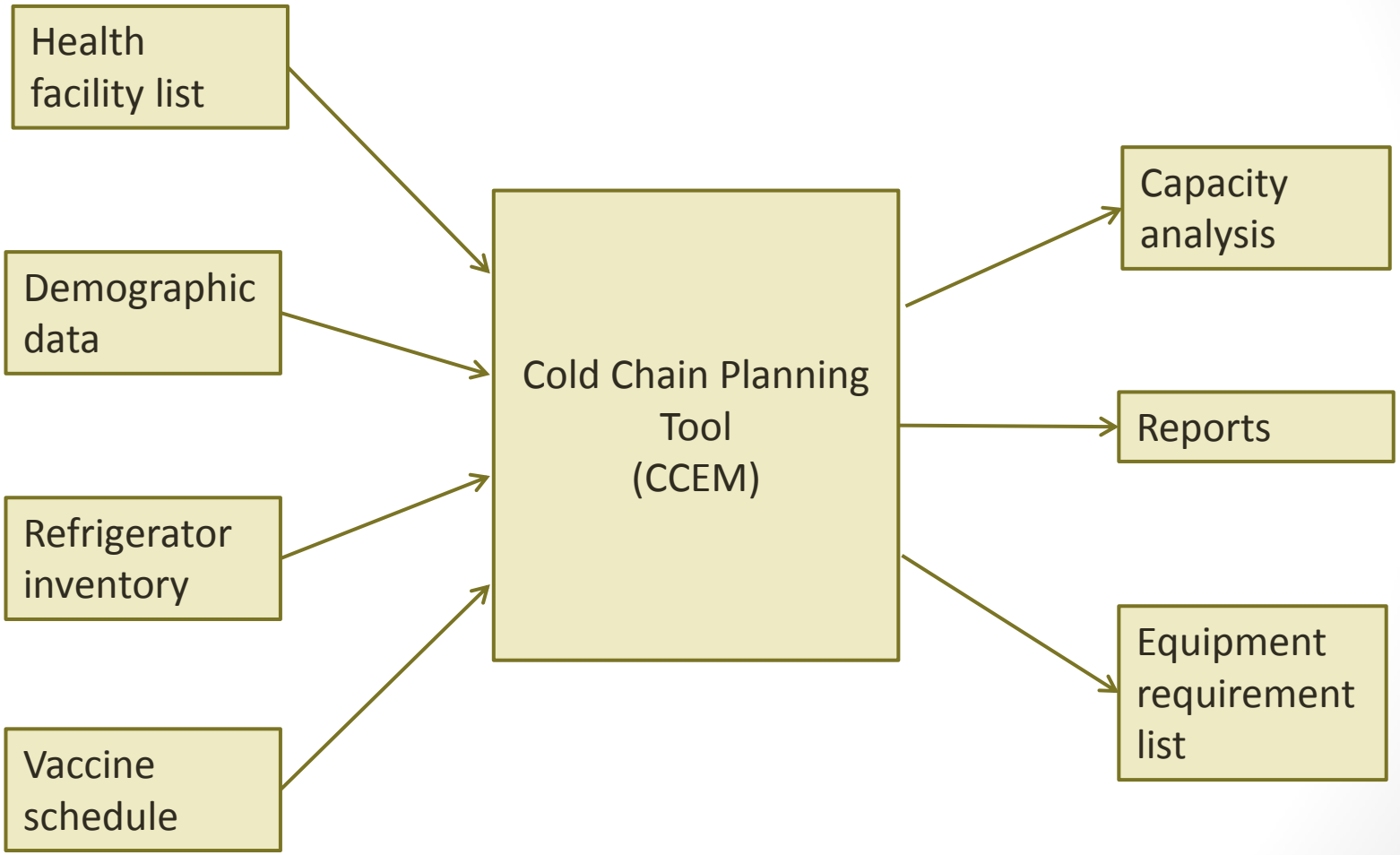
625 doses
Rotavirus
$4687

Cold chain inventory

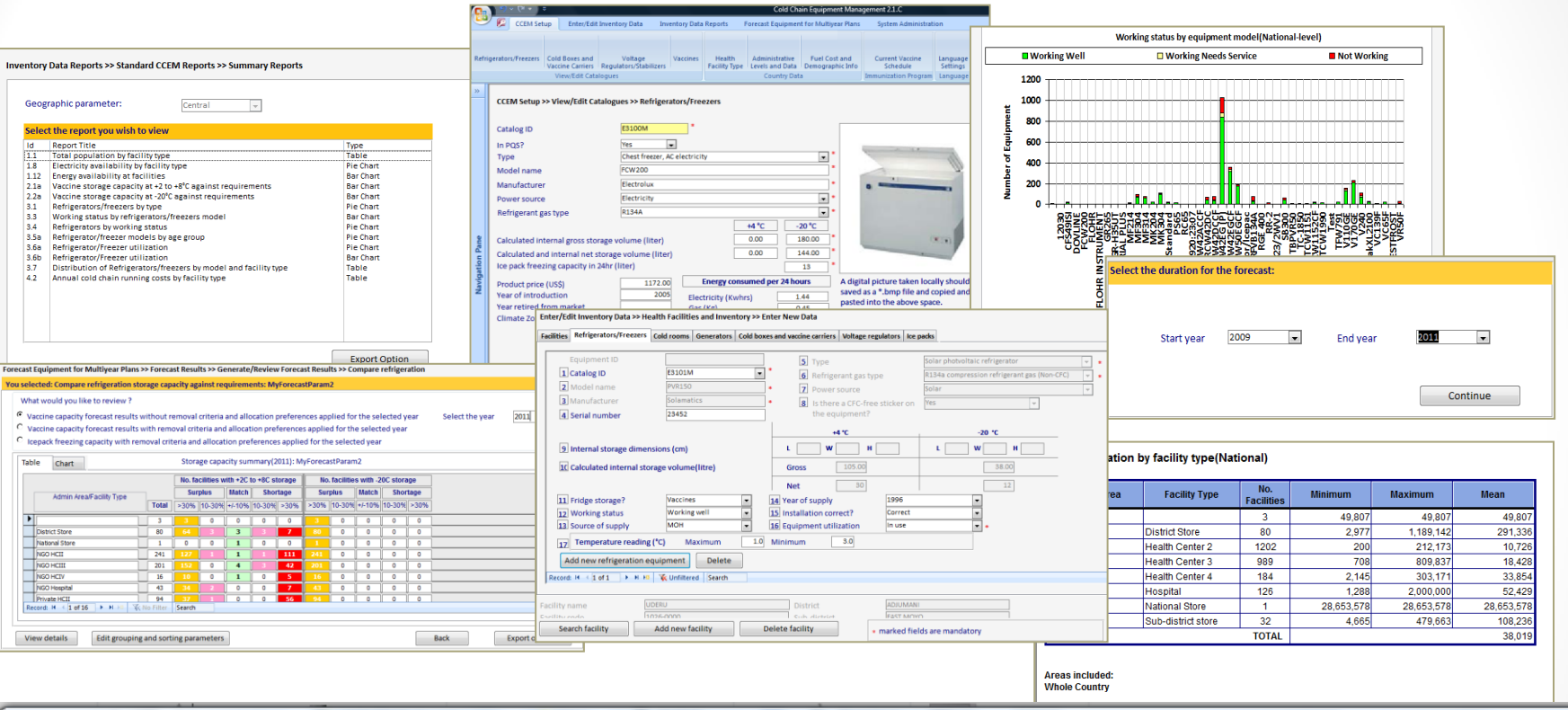
- What is the status of a country's cold chain?
- How many refrigerators?
- What types are they?
- How old?
- Are they working?
- Are they big enough for the required vaccines?
- Where are they?

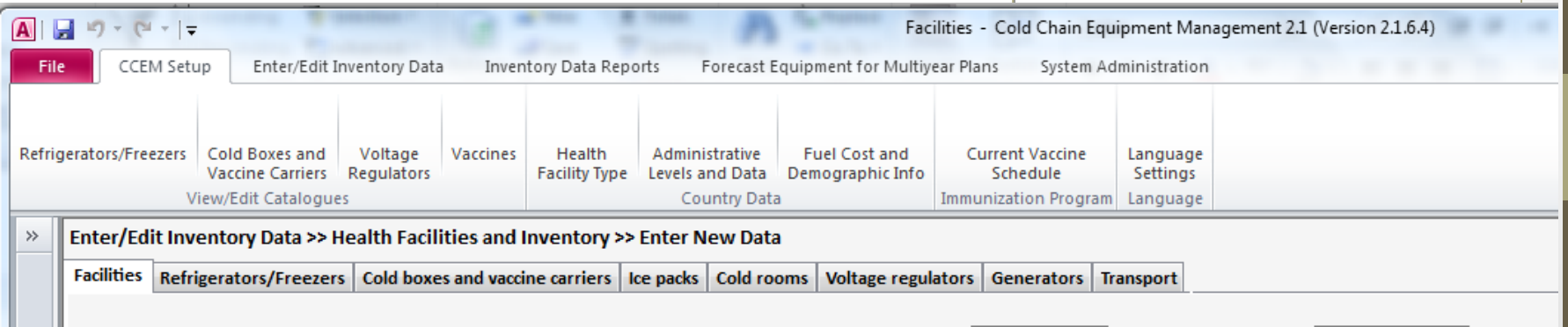
Country A: 5306 facilities, 4946 refrigerators
Country B: 827 facilities, 1426 refrigerators
Country C: 2846 facilities, 3153 refrigerators
Country D: 1605 facilities, 3080 refrigerators

Inventory Based Cold Chain Capacity Analysis

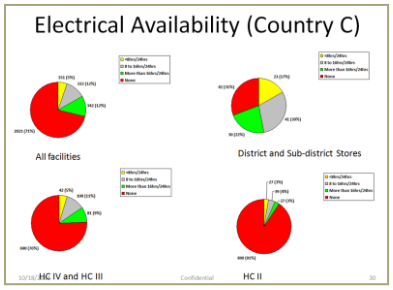


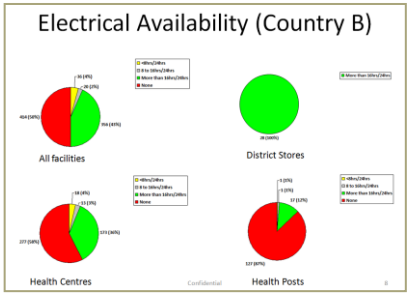
Cold Chain Equipment Manager (CCEM) Software

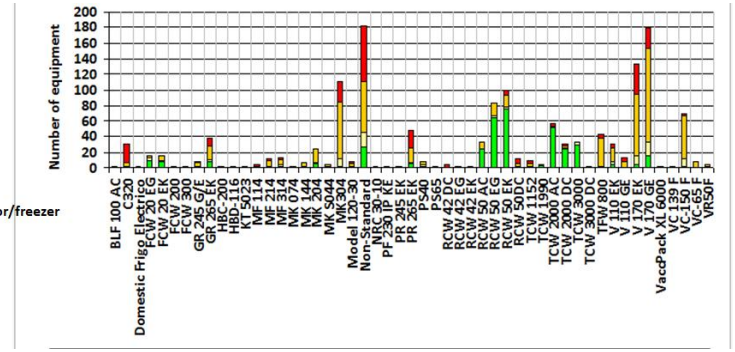


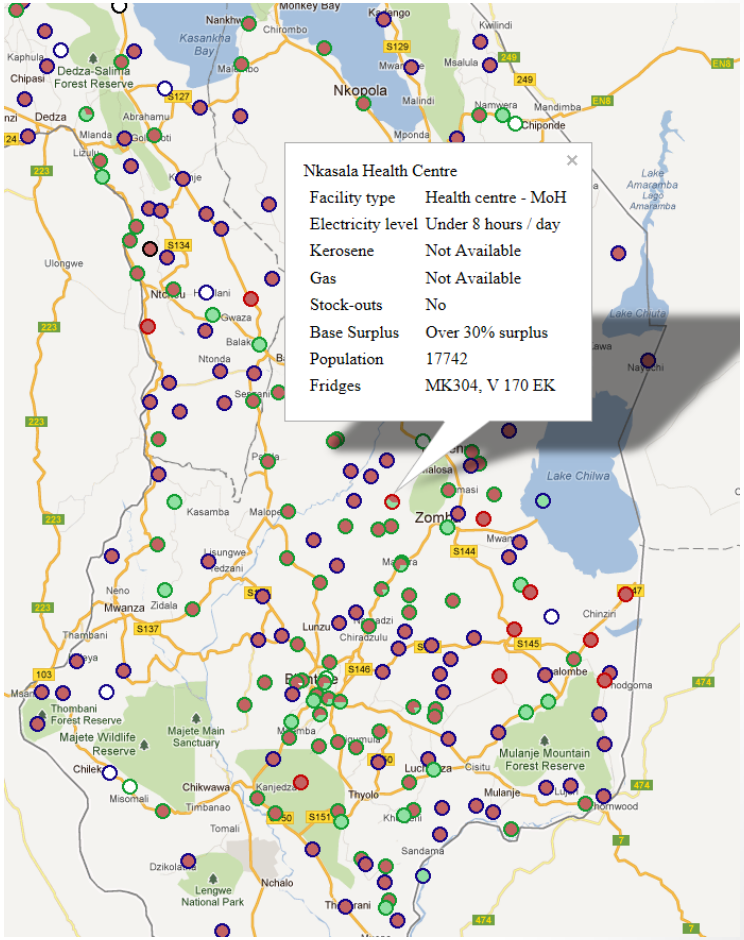


Reports


Electrical Availability (Country C)
All facilities
District and Sub-district Stores
HC IV and HC III
HC II


Electrical Availability (Country B)
All facilities
District Stores
Health Centres
Health Posts


Number of equipment
Refrigerator/freezer models
BLF 100 AC
C320
Domestic Frigo Electrico
FCW 20 EG
FCW 20 EK
FCW 200
FCW 300
GR 245 G/E
GR 245 K/E
H8C-200
H8D-116
KT 5023
MF 114
MF 214
MK 074
MK 144
MK 204
MK 5044
MK304
Model 120-30
Non Standard
PF 230 iP
PF 230 iP KE
PR 245 EK
PR 265 EK
PS40
PS65
RCW 42 DC
RCW 42 EG
RCW 42 EK
RCW 50 AC
RCW 50 EG
RCW 50 EK
RCW 3152
TCW 1990
TCW 2000 AC
TCW 2000 DC
TCW 3000
TCW 3000 DC
V 110 EK
V 110 GE
V 170 EK
V 170 GE
VaccPack XL 6000
VC 130 F
VC-65 F
VR50F


Nkasala Health Centre
Facility type Health centre - MoH
Electricity level Under 8 hours / day
Kerosene Not Available
Gas Not Available
Stock-outs No
Base Surplus Over 30% surplus
Population 17742
Fridges MK304, V 170 EK
Nkopola
Dedza-Salima Forest Reserve
Majete Wildlife Reserve
Majete Main Sanctuary
Thombani Forest Reserve
Mulanje Mountain Forest Reserve
Lengwe National Park
Lake Chiuta
Lake Chilwa

CCEI Data Standards

- Goal: Agree on standards to allow tools to interoperate
- Wide range of tools available
- Data integration problem is central
- Need for multiple software tools

wCCEI Laos

1 - HEALTH FACILITY QUESTIONNAIRE

1. Facility code:

Administrative levels and facility information

2. Province:

3. District:

4.Name of health facility:

5. English name of health facility:

6. Type of health facility:
Mark only ONE box
- ☐ National vaccine store
- ☐ Province vaccine store
- ☐ District vaccine store
- ☐ Provincial hospital
- ☐ Referral hospital
- ☐ Health centre A
- ☐ Health centre B

Health facility immunisation activities

7. Total population in area served by facility:

8. Facility coverage (per cent of population receiving immunization services from facility):

9. Number of villages reached by facility (Only for Health centre):

10. Vaccine storage type: *Mark only ONE box*
- ☐ Depot
- ☐ Delivery
- ☐ Depot and delivery
- ☐ No storage

11. Vaccine delivery type: *Mark only ONE box*
- ☐ Static
- ☐ Outreach
- ☐ Static and outreach
- ☐ No delivery

Health facility energy sources available to power cold chain equipment

11. Electricity source: *Mark only ONE box*
- ☐ Grid
- ☐ Generator
- ☐ Grid and Generator
- ☐ None

12. Grid electricity availability per day: *Mark only ONE box*
- ☐ More than 16 hours
- ☐ 8 to 16 hours
- ☐ 4 to8 hours
- ☐ Less than 4 hours
- ☐ None

13. Gas :*Mark only ONE box*
- ☐ Available
- ☐ Irregular
- ☐ Not available
- ☐ Unknown

14. Kerosene:*Mark only ONE box*
- ☐ Available
- ☐ Irregular
- ☐ Not available
- ☐ Unknown

Cold chain logistics information

15: Vaccine supply interval (weeks):

16: Vaccine reserve stock requirement (weeks):

17: Mode of vaccine supply: *Mark only ONE box*
- ☐ Delivered
- ☐ Collected
- ☐ Both delivered and collected
- ☐ None

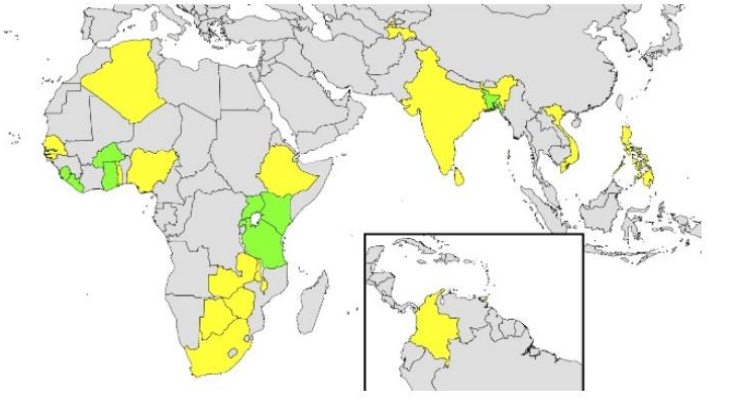
18: One way road distance to closest supply point (in KM):

19: Main supply point:

20: Secondary supply point:

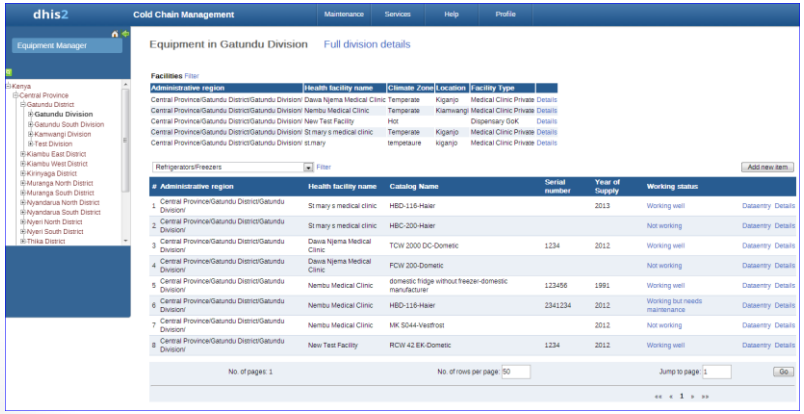
HISP / DHIS2

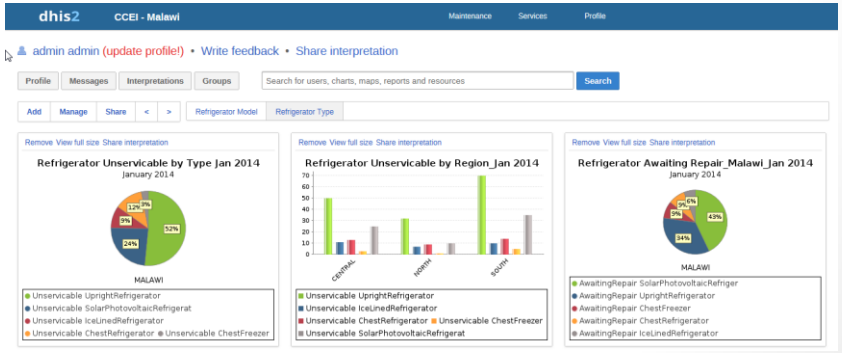
- HISP: International effort with hubs in Norway, India, Vietnam, South Africa
- DHIS2: Health indicator reporting software
  - Web based, to data base back end
- Wide scale deployment
  - Roughly thirty countries, including nationwide use in some countries
  - State reporting in roughly half the states of India
- http://www.hispindia.org/
- http://dhis2.org/



Incorporating CCEM into DHIS2

- Much better architecture
- Add to existing system, as opposed to introducing a new system
- Implementation of inventory component and reports by HISP India
- Working prototypes available



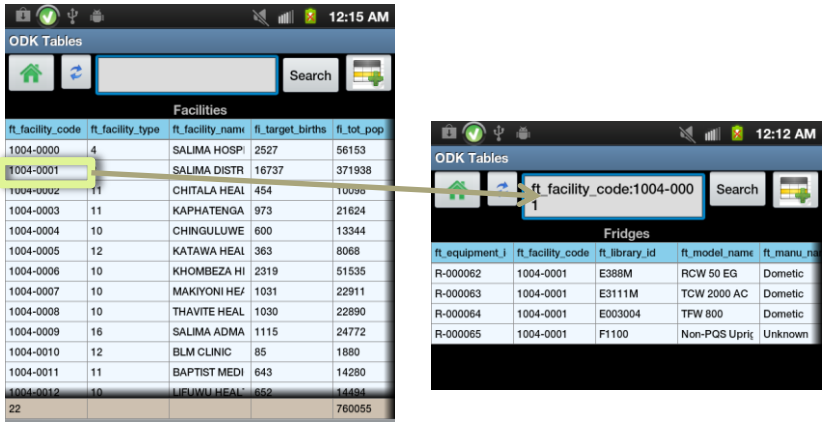


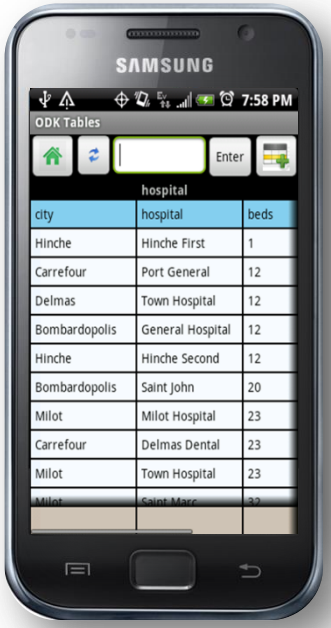
Unifying cold chain inventory tools

- Wide range of cold chain inventory tools are used
- Is it possible to bridge between the tools
  - Deal with the reality of Health Information System software
  - Support migration to contemporary software tools
- General approach
  - Cold chain inventory model with conversion/visualization tool
- One button import/export

ODK Tables

- Cold chain data sets natural match for tables
- Use cases for ODK Tables
  - Inventory construction
  - Facility visits
- Benin data set implemented in Tables





Temperature monitoring

- Real time reporting of vaccine refrigerator temperatures
- Key for sustainable use of temperature monitoring system is a back end that is linked to a national system

(Simple) Health System Modeling

- CCEM relies on very simple models
  - Storage requirement = doses X volume per dose
- The challenge for application like CCEM is to make the modeling easy to use.
- Simulation based games solve the same interface problems that come up in CCEM.
  - Assignment of assets to locations on a map
  - Setting conditions over regions
  - Ease of use / learnability essential

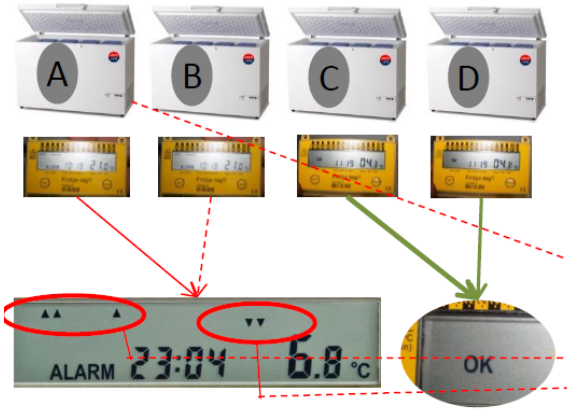
Reminders and Alerts

cWEEI - ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ
ຄຳແນະນຳການສົ່ງຂໍ້ຄວາມສັ້ນ (SMS) ເພື່ອລາຍງານການເຕືອນອຸນຫະພູມ ຈາກອຸປະກອນຕິດຕາມອຸນຫະພູມ 30 ຫົວໜ່ວຍ

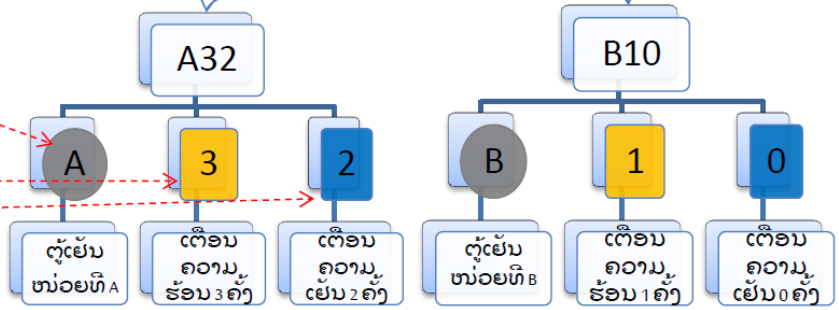
ສະເພາະຈຸດທີ່ມີຕູ້ເຢັນຫຼາຍໜ່ວຍ
(ຂັ້ນແຂວງ ແລະ ເມືອງ)

ຈະສົ່ງຂໍ້ຄວາມສັ້ນ (SMS) ແບບໃດ ເມື່ອອຸປະກອນສະແດງ ການເຕືອນ "Alarm"

ສົ່ງ SMS ທຸກໆ
ອັນ ຈັນ ທ່າອຶດຂອງ
ເດືອນ



ສົ່ງ SMS ☛ FT A32B10 ໄປທີ່ເບີ 020 XXXX



ເຕືອນ (Alarm):
ສົ່ງ SMS ລາຍງານ
ຕູ້ເຢັນ 1 ແລະ 2

"OK"
ບໍ່ຕ້ອງສົ່ງ SMS ສຳລັບ
ຕູ້ເຢັນ 3 ແລະ 4

ຈະສົ່ງຂໍ້ຄວາມສັ້ນ (SMS) ແບບໃດ ເມື່ອອຸປະກອນສະແດງ "OK"

ສົ່ງ SMS ☛ FT 0 ໄປທີ່ເບີ 020 XXXXXXX

☛ ຖ້າຕູ້ເຢັນສະແດງຄຳວ່າ OK, ໃຫ້ສົ່ງ SMS ວ່າ FT0 ເພື່ອບອກ
ວ່າບໍ່ມີການເຕືອນໃດໆ

Countries


CHINA
CHINA
Mekong
Phôngsali
BURMA
VIETNAM
Louang Namtha
Louangphrabang
Xiangkhoang
Gulf of Tonkin
VIENTIANE
Ban Napé
Mekong
Savannakhét
THAILAND
Saravan
Pakxé
0 100 200 km
0 100 200 mi
CAMBODIA


ETHIOPIA
SOUTH SUDAN
Lodwar
Mandera
SOMALIA
Marsabit
UGANDA
Wajir
Maralal
KENYA
Bungoma
Kitale
Eldoret
Isiolo
Meru
Busia
Nyahururu Falls
Nanyuki
Equator
Kisumu
Nakuru
Garissa
Kericho
Nyeri
Embu
Kisii
Murang'a
Thika
Nairobi
Machakos
Lamu
INDIAN OCEAN
Voi
Malindi
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Mombasa
Tanga
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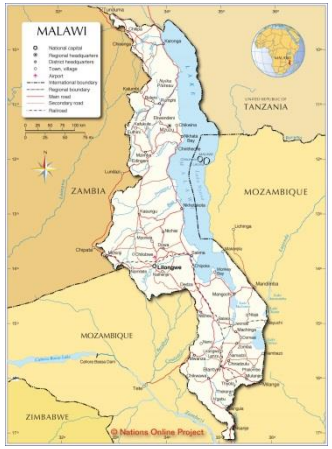
BURKINA FASO
Bolgatanga
BENIN
White Volta
Tamale
Black Volta
TOGO
CÔTE D'IVOIRE
Sunyani
Lake Volta
Mount Afadjato
Kumasi
Ho
Obuasi
Koforidua
Volta
ACCRA
Tema
Cape Coast
Takoradi
Gulf of Guinea
0 50 100 km
0 50 100 mi


Sokoto
Kebbi
Zamfara
Katsina
Jigawa
Yobe
Borno
Kano
Kaduna
Bauchi
Gombe
Niger
Adamawa
Federal Capital Territory
Plateau
Kwara
Nasarawa
Oyo
Taraba
Ogun
Osun
Ekiti
Kogi
Benue
Ondo
Edo
Anambra
Ebonyi
Delta
Imo
Abia
Cross River
Bayelsa
Rivers
Akwa Ibom
PRRINN-MNCH Focal States


Pakistan
CHINA
AFGHANISTAN
PAKISTAN
INDIA
IRAN
BALOCHISTAN
Arabian Sea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