Diagnostic Network Optimization & Laboratory Information Management Systems in Cameroon

Integrated Diagnostic Consortium Meeting
Washington D.C
September 12-13 2019

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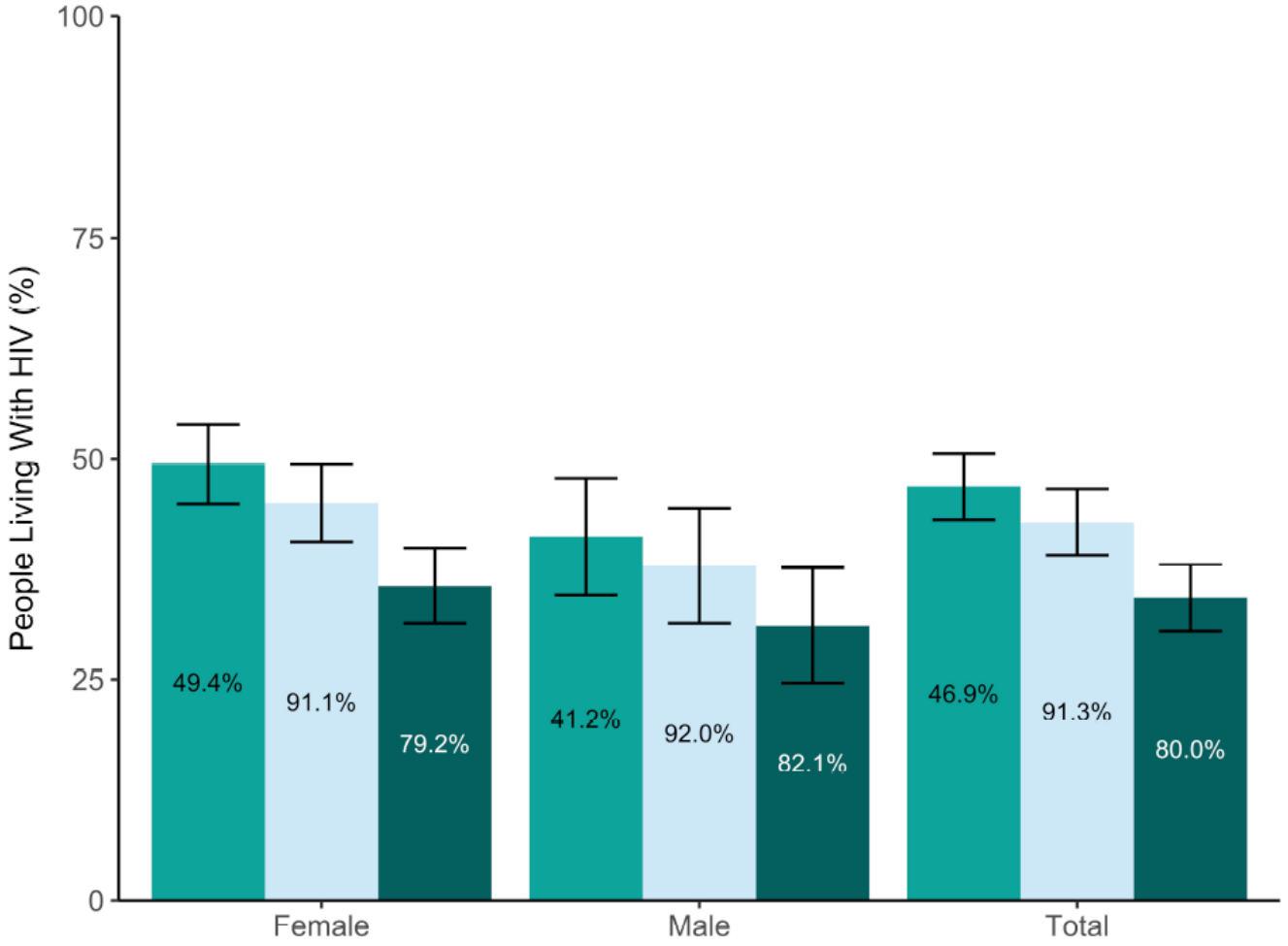
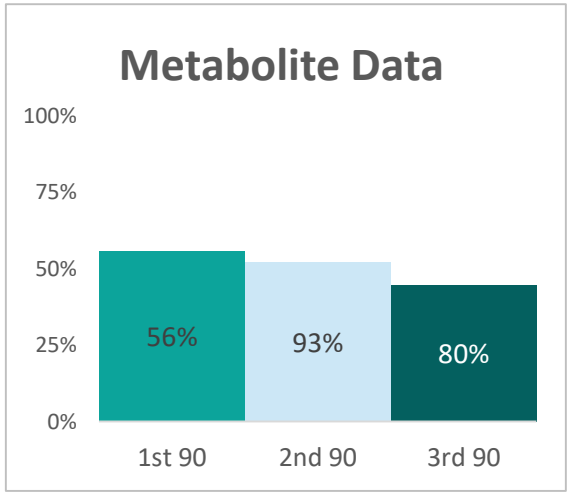
PEPFAR Unitaid USAID GLOBAL HEALTH SUPPLY CHAIN PROGRAM Procurement and Supply Management Elizabeth Glaser Pediatric AIDS Foundation CLINTON HEALTH ACCESS INITIATIVE unicef

Outline

90-90-90 Results from CAMPHIA

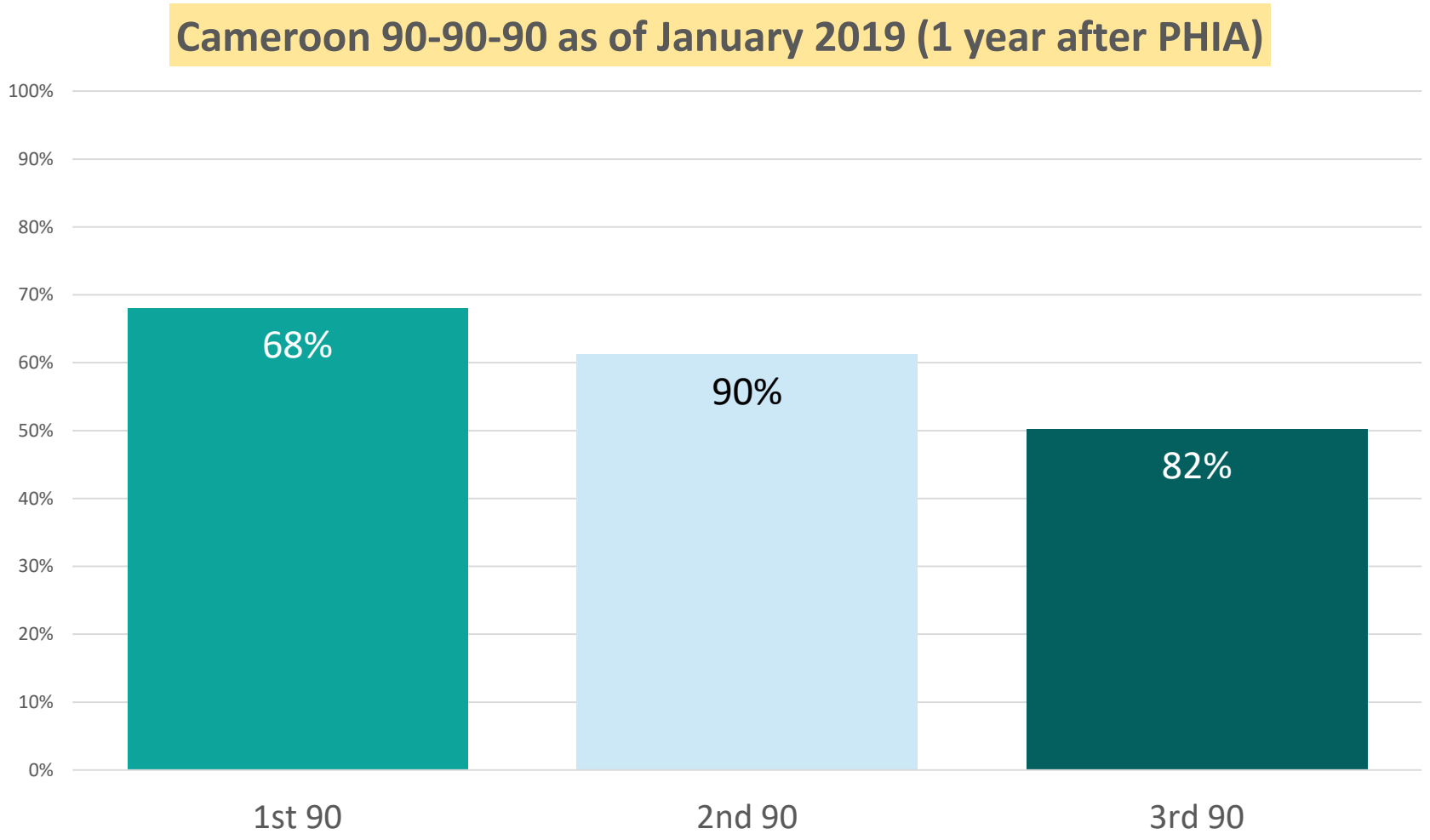




Diagnosed
On Treatment*
Virally Suppressed*

* The CAMPHIA began fieldwork in June 2017 and concluded in January 2018.

90-90-90: One Year After CAMPHIA



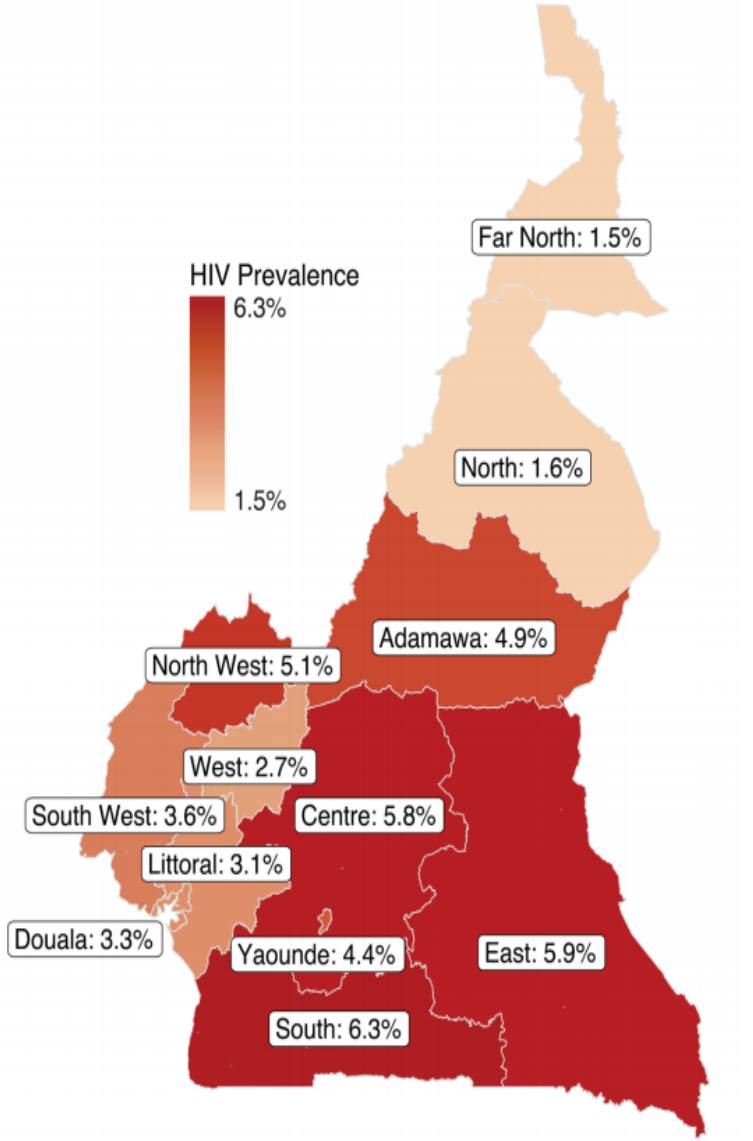
PEPFAR
U.S. President's Emergency Plan for AIDS Relief

HIV Prevalence, Burden and Unmet Need by Region

HIV Prevalence by Region

Among adults ages 15-64 years, HIV prevalence among adults varies by region, ranging from 6.3 percent in the South Region to 1.5 percent in the Far North Region.

Region	HIV Prevalence (%)	95% CI
Adamawa	4.9	3.1-6.7
Centre	5.8	4.8-6.8
Douala	3.3	2.5-4.0
East	5.9	4.5-7.3
Far North	1.5	1.0-2.1
Littoral	3.1	1.2-4.9
North	1.6	1.0-2.1
North West	5.1	3.4-6.7
South	6.3	5.4-7.3
South West	3.6	2.4-4.9
West	2.7	1.8-3.6
Yaounde	4.4	3.2-5.6



HIV Burden and Unmet Need by Region

Region	PLHIV *	Current on Treatment	Current Coverage	Gap to 100% Coverage	Gap to 91% Coverage
Adamawa	23,043	14,174	62%	8,869	6,795
Centre	133,157	77,149	58%	56,008	44,024
East	35,971	20,498	57%	15,473	12,236
Far North	27,979	16,882	60%	11,097	8,579
Littoral	101,529	57,772	57%	43,757	34,619
North	29,816	16,236	54%	13,580	10,897
North West	62,661	36,626	58%	26,035	20,396
South	26,851	13,260	49%	13,591	11,174
South West	60,590	25,289	42%	35,301	29,848
West ***	26,893	22,075	82%	4,818	2,398
Total	528,490	299,961	57%	228,529	180,965

*All numbers in the table are both adults and children; the prevalence rates in the map are adults only

Updates on TB and Healthcare Services

TB situation[2]

- Incidence of **95/100,000** in 2018
- **84% (1069/1272)** of pre-treatment cases tested on GeneXpert in 2018 are MDR cases
- TB Lamp is used as primary TB diagnosis for children and adults, presumed TB with negative microscopy

Health Care Services

- ART services are offered at **379 facilities**[1]
- There are over **5,000 health facilities** in Cameroon[1]
- PMTCT and EID services are offered at **2,060 facilities**[1]
- **254 facilities** offer TB testing (including microscopy and treatment centers) 10 of which are MDR TB centers[2]

*Source: *Cameroon DHS 2018, **Spectrum projections [1]NACC 2017 Annual report; [2]Cameroon National TB program 2018*

PART II: DNO UPDATES

Objectives and Processes for Diagnostic Network Optimization

Main Objectives

1) Ensure existing and newly procured devices are strategically placed to maximize utilization
2) Optimize the referral network to reduce TAT and generate efficiencies.

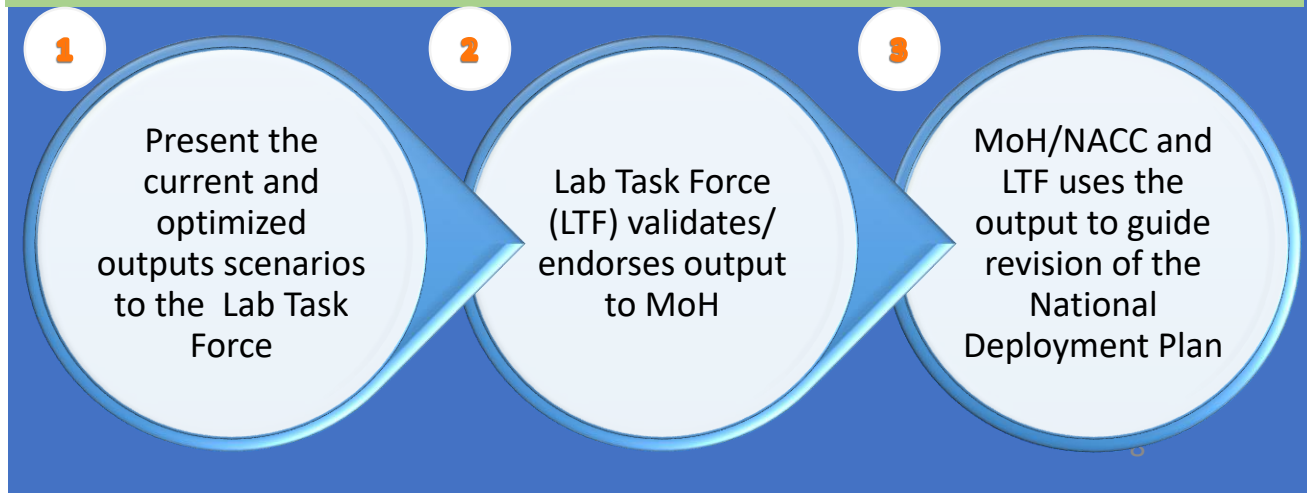
Specific objectives

- Identify and map all the existing laboratories (conventional platforms and POC devices) for the 10 Regions;
- Strengthen integrated testing on existing platforms for HIV (EID/VL), TB and Hepatitis
- Provide guidance to MOH for deployment of new devices
- Improve on the existing quality assurance network

Who is involved in the process

Tasks	Lead	Verification	Notes	Coordination
Master Data Compilation	GHSC-PSM	CHAI & EGPAF	Components for the data have been contributed by NACC, GHSC-PSM, CHAI, EGPAF, CIS	NACC/ NPHL/DLMEP/ CDC
Master Data Cleaning	EGPAF	GHSC-PSM & CHAI		
Visualization from cleaned data	CHAI	GHSC-PSM & EGPAF		

Decision making process



EID, VL & TB Diagnosis-Conventional and Point of Care

Region	Conventional Platform				Point of care platform			
	Type of platform (Number)	Positioning and fuctioning (F or NF)*	Type of test carried out	Potential tests	Type of platform (#)	Positioning and fuctioning (F or NF)*	Type of test carried out	Type of potential tests
Adamaoua					Alere-Q (1)	HR Ngaoundere (F)	EID	EID
					GeneXpert (1)	HR Ngaoundere (NF)	TB	EID, TB, VL
Centre	Abbott m2000rt (7)	CPC (F), CIRCB (F), HGOPY (F) Nkolondom (F), CHE (NF), CRESAR (F) LNSP (F)	EID, VL	EID, VL	GeneXpert (5)	CPC (F) et HMY (F) CME (F), CHE (F), HGOPY (F)	TB-RIF EID	EID, TB, VL EID, TB, VL
	Quiagen (3)	CHU (NF), HGOPY (NF), CHE (NF)		EID, VL	TB-Lamp (4)	HJY (F), CPC (F), HD Bafia (F), Mbalmayo (F)	TB	TB
	Biocentric-Diasorin (2) Applied Biosystem (2)	CPC (F), CRESAR (F), LNSP (F)	EID, VL	EID, VL	Alere-Q (5)	HD Cite Verte (F), CASS Nkoldongo (F), Obala, Biyem-Assi, Efoulan, Mbalmay	EID	EID
Est					GeneXpert (1)	DRSP-Est (F)	TB-RIF	EID, TB, VL
Extreme-North					GeneXpert (1)	HR Maroua	TB-RIF	EID, TB, VL
Littoral	Abbott m2000rt (2)	HLD (F), Lab Tag (F)		EID, VL	GeneXpert (4)	DRSP-Litt (F) HD Nylon (F), HLD (F), Mboppi (F)	TB-RIF EID	TB-RIF EID, TB, VL
	LC 96 (Roche) (2) Sysmex	HLD (F), HGD (NF) Litto Labo (F)	 VL	VL VL	Alere-Q (3)	Deido DH, Nkongsamba RH, Bonassama DH,	EID	EID
	Qiagen	Biopharma Douala (F)	VL	VL				
North	LC 96 (Roche)	CPCAG (F)	VL	VL	GeneXpert (1)	CPCAG (F)	TB-RIF	EID, TB, VL
	ABI 7500	CPCAG (F)	VL	VL	Alere-Q	RH Ngaoundere	EID	
North West	Abbott m2000rt (1)	TB-Ref Lab (F)	EID, VL	EID, VL	GeneXpert (8)	TBRL (F), H. Njinikom (F), BBH (F), H. Shisong (F), HD Nkambe (F), H. Mbingo (F), HD Wum (F) et HD Ndop	TB-RIF EID (some)	EID, TB, VL
	Biocentric-Diasorin (1)	TB-Ref Lab (F)	EID, VL	EID, VL	Alere-Q (3)	Nkwen Baptist (F), Shisong, Azire	EID	EID
West	Abbott m2000rt (1)	St Vincent Dschang (F)	VL	EID, VL	GeneXpert (1)	HR Bafoussam (NF)	TB-RIF	EID, TB, VL
South					TB-Lamp (1) Alere-Q	HR Ebolowa (F) HR Ebolowa	TB EID	TB, EID, VL EID
South West	Abbott m2000rt (1)	EID Lab Mutengene (F)	EID, VL	EID, VL	GeneXpert (1) Alere-Q (2)	HR Limbe (F) HR Buea, PGH-Kumba	EID, TB EID	EID, TB, VL EID

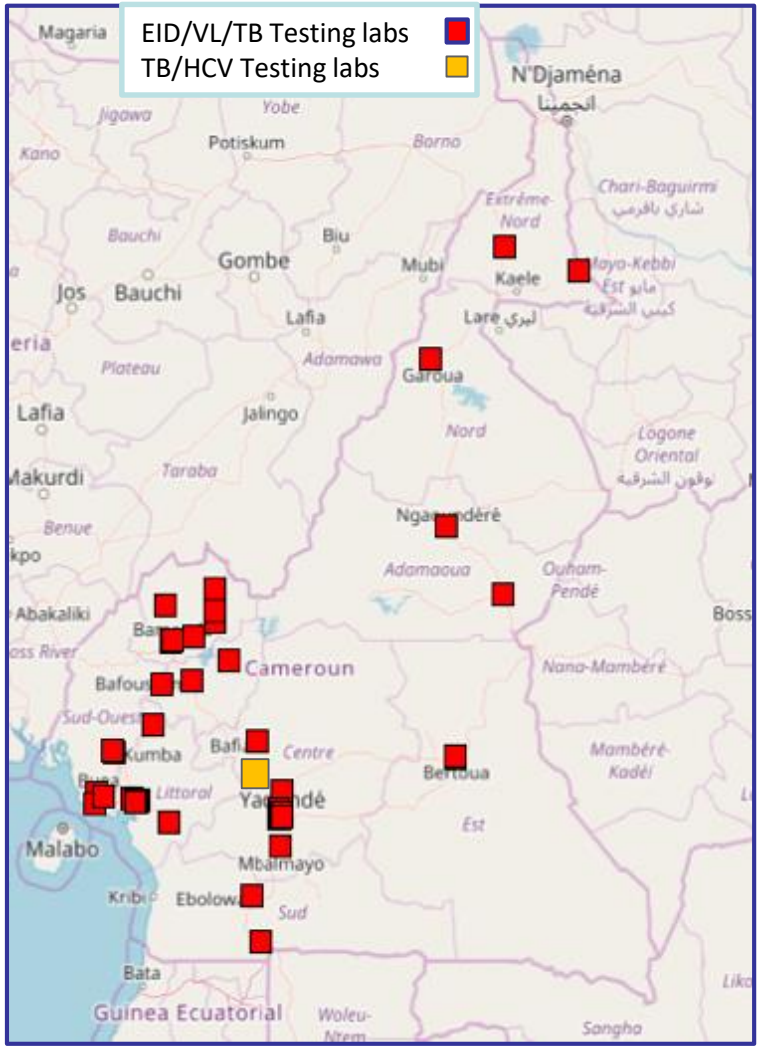
EID and VL Testing Footprint

Number of Platforms				
Abbott	OPP	m-Pima	GX-4	TB-Lamp
10	05	25	29	27

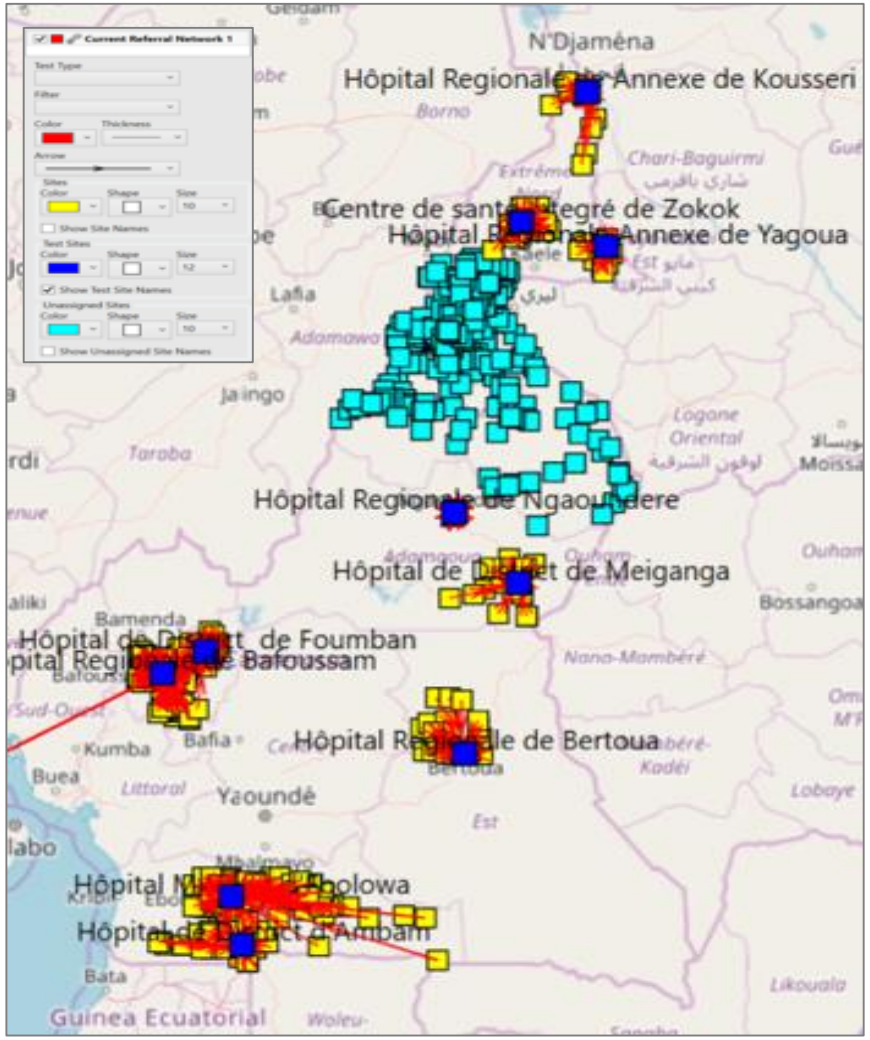
Number of Testing Labs		
EID	VL	TB
04	10	254*

Low Coverage for EID and VL

- **Long TAT**
- **Limited Access to Testing**
- **Stock Outs of Test Kits**
- **Equipment Down Time**
- **Platform Distribution**



EID/VL/TB/HCV device footprint in the country – both POC/near POC and Conventional systems



CHAI has successfully mapped out and defined a mini hub and spoke referral network for 10 hubs covering 183 spokes

*dation), maps developed from labEQIP; CHAI EID TAT analysis Jan2016—Feb 2017, * There are 254 diagnosis (including microscopy) and treatment centers in the country,*

Outcome of 2018 DNO exercise- Impact on Laboratory Network and Supply Chain

CAMEROON HIV Viral Load SUPPLY PLAN

Period: Jan - Dec 2019

Q3 2019 Date: June 04, 2019

Government of Cameroon
Global Fund (through NACC)
PEPFAR (USAID GHSC-PSM Procurement)
Expertise France (project OPP-ERA of UNITAID)
CHAI/UNICEF
EGPAF

RDD: Requested Delivery Date

EDD: Estimated Delivery Date

ADD: Agreed Delivery Date

For Inquiries

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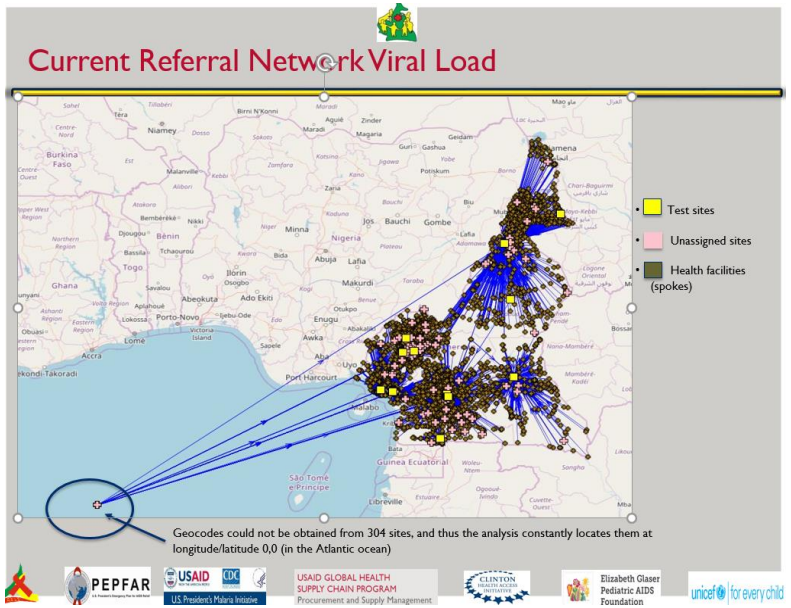
Equipment/Technology								FY19 Orders from GHSC-PSM						Gap to be filled for FY19		Proposed Procurement Plan for			
Catalogue no.	**Abbott RealTime HIV-1 assay**	Unit of Measure (UoM)	Pack Size (No. of tests/UoM)	Total Needs (forecast) for 2019	Stock on Hand on 31 Jan 2019	AMC (Data of Aug 2018 - Jan 2019)	MOS	Quantity (Order 1)	Status	Date Received	Quantity (Order 2)	Status	EDD	Remaining Quantity to Order	Final Adjusted Gap to cover	Quantity (Order 1)	Status	EDD	

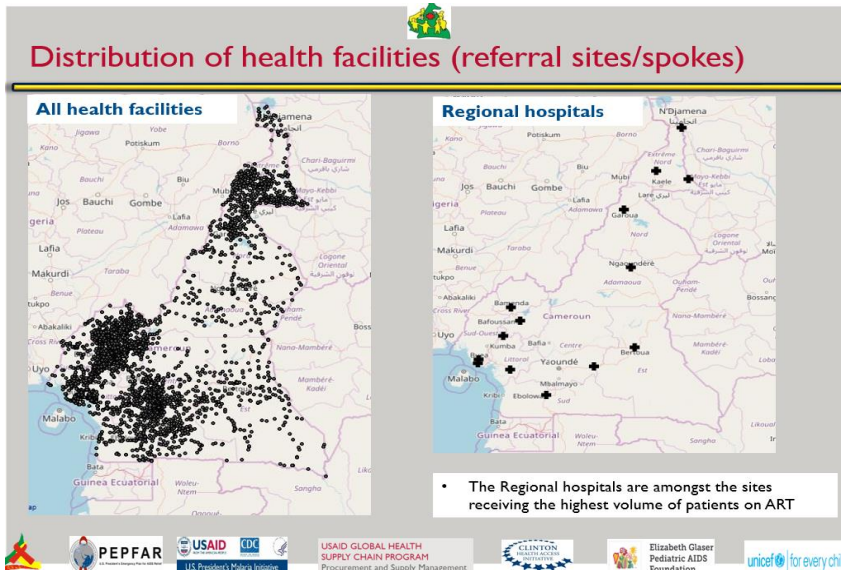
- DNO has also generated information to complete an in-depth mapping of Health facilities -> reference labs and ref. labs -> ref. labs defining back up labs
- We have determine the actual utilization rates of platforms and through this we continuously optimize our national quantification and supply plan

DNO next steps

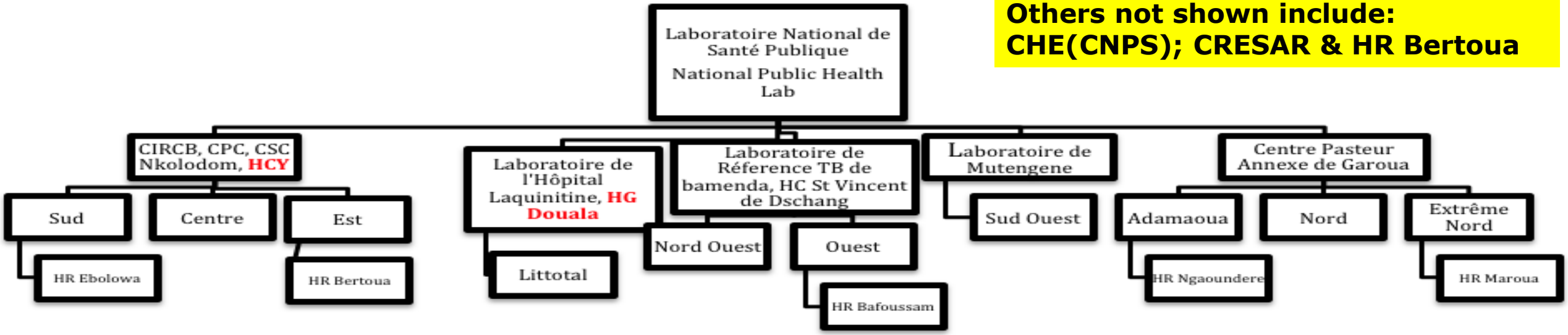
1. Organize a workshop in September 2019 to endorse scenario mix for both conventional and POC arrangements
2. Develop framework to inform scale up of additional devices for continuous

Network of Viral Load Reference Laboratories





Currently 14 National VL Ref labs. Others not shown include: CHE(CNPS); CRESAR & HR Bertoua



Estimated Viral Load Equipment Utilization Rate - 2017

Instrument Platform-FY 17	QTY (A)	Specimen Type	# of Staff	Est. Max. Throughput /8hrs (B)	Est. # Days/yr (250 dys-WHO rec.) (C)	Estimated Capacity
Abbott sp/rt	6	Plasma	2	138	240	198720
Abbott rt/manual	3	Plasma	2	93	240	66960
roch fluoro 96	4	Plasma	2	126	240	120960
ABI	3	Plasma	2	126	240	90720

Estimated Annual Capacity for Viral Load Testing (A x B x C) **= 477,360**

Est. % Utilization Capacity= FY17 VL tested/Capacity = 47,397/477,360 **= 9.9%**

Est. Un-Utilized Capacity = 90.1%

Viral Load and EID Equipment Utilization Rate - 2018

Test Sites (Reference Laboratories)		Projected testing per year based on current average testing/day	Total Testing Potential per year based on potential capacity (throughput of machine)	Current equipment utilization rate for VL Testing
1	CIRCB	12096	26784	45.16%*
2	CPC (Abbott)/OPP	18756	108960	17.21%
3	Nkolondom (Abbott)	2568	44640	5.75%
4	Laquintinie (Abbott)/OPP	12396	64320	19.27%
5	CPCAG (OPP)	5796	19680	29.45%
6	TBRL B'da (Abbott)/OPP	22596	21792	103.69%*
7	NEIDRLabm Mut. (Abbott)	33300	35712	93.25%*
8	Dschang (Abbott)	3468	44640	7.77%
9	LNSP / CHEssos (Abbott)***	0	44640	0.00%
10	CRESAR (Abbott)	4428	44640	9.92%*
11	Hôpital Regional Bertoua**	0	0	0.00%
12	Hôpital Central Yaounde**	0	0	0.00%
	Sub-Total	***115404***	***455808***	***25.32%***
	POC Test sites			
1	Hôpital Regionale de Bafoussam	396	1920	20.63%
2	Hôpital Regionale de Ngaoundere	396	1920	20.63%
3	Hôpital de District d'Ambam	396	1920	20.63%
4	Hôpital Regionale Annexe de Yagoua**	0	1920	0.00%
	Sub-Total	***1188***	***7680***	***15.47%***
	Grand-Total	**116592**	**463488**	**25.16%**

- As of August 31, 2018, the current VL test trend shows, only 25.32% (115404 tests) and 15.47% (1188 tests) of the potential throughput (capacity) of the conventional test platforms (reference laboratories) and POC sites respectively will be used by December 31, 2018, despite the platforms having a potential (based on maximum throughput) to test 463,488 tests.
- The 2018 ART population (PLHIV) stands at 283,471 while the VL test target (49% of the PLHIV) is137,584 tests

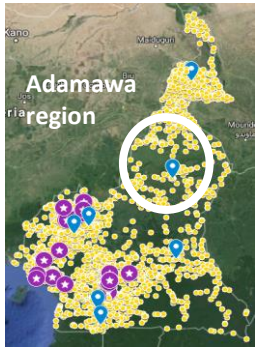
* ***These labs equally test for EID on the same platform, and the final utilization rate of the equipment for VL and EID testing will be a combination of the testing rate and testing potential for both tests, as this sums up to the monthly coverage of 22 working days. This is summarized in Table 3 below.***

** ***Sites to begin testing by close of FY2018***

*** ***NPHL and CHEssos are separate labs, but with CHEssos to take over the commodity allocation and test volumes/targets of NPHL***

Region Snapshot: Adamawa Region

Brief Overview



Situated in the Grand North along side the Far North and North regions respectively. There are approx. **179** health facilities in the region of which **150** offer PMTCT services, and EID has expanded from < **20** sites in 2012 to **68** sites in 2017. The region has no conventional testing capacity and relies solely on CIRCB for EID testing services and CPCAG for VL. In 2017 MOH procured and installed a GeneXpert device at the RH used at the time only for TB testing. Following MOH approval in 2018 the Xpert device was fully integrated to include EID/VL testing. In addition an Alere q device was installed in Meiganga DH used for EID. There is a great need to further expand access to testing via POC diagnostics in the region.

Priority Areas

- Improve access to diagnostics using POC
- Operationalize TB/HIV integration
- Optimize the lab network

Current Challenges

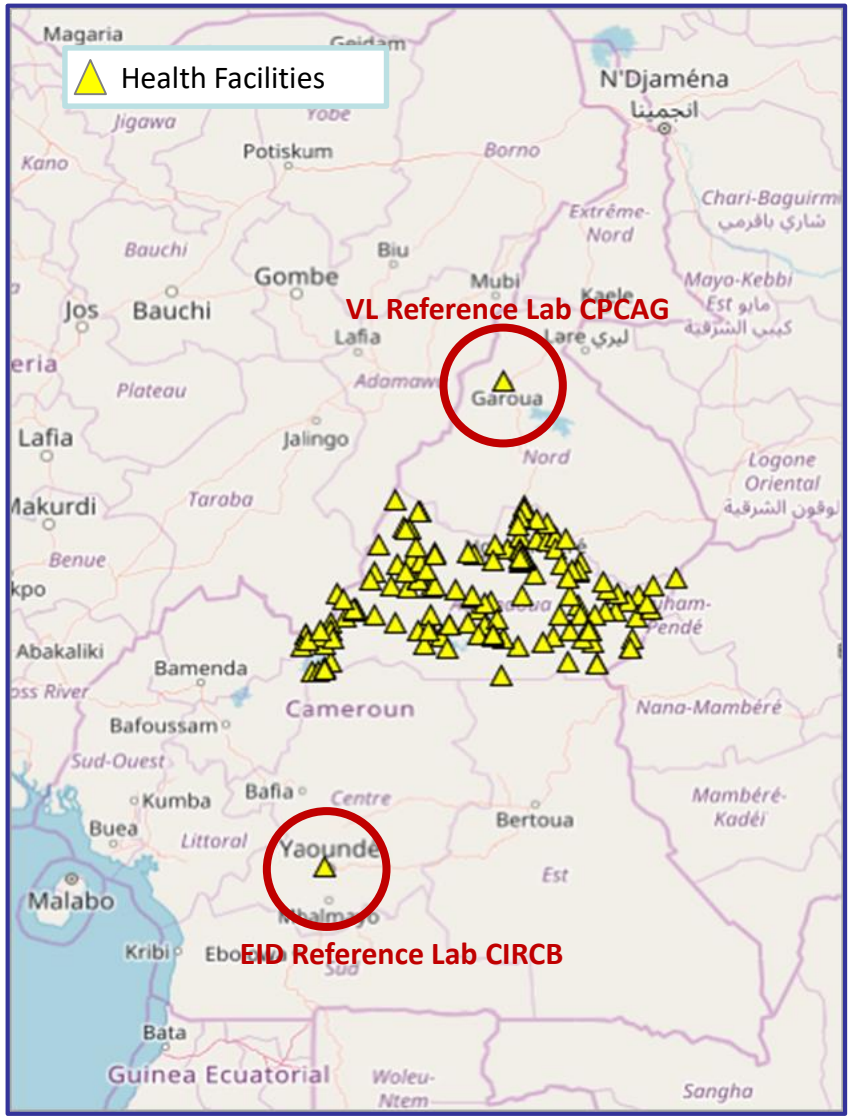
- Currently underserved in terms of devices
- Adhoc ST system, which is inefficient overlong distances

Health Facilities	
Sites collecting EID samples	68
PMTCT sites	150

Number of Platforms				
Abbott	OPP	GX-4	Alere Q	Samba
00	00	01	01	00

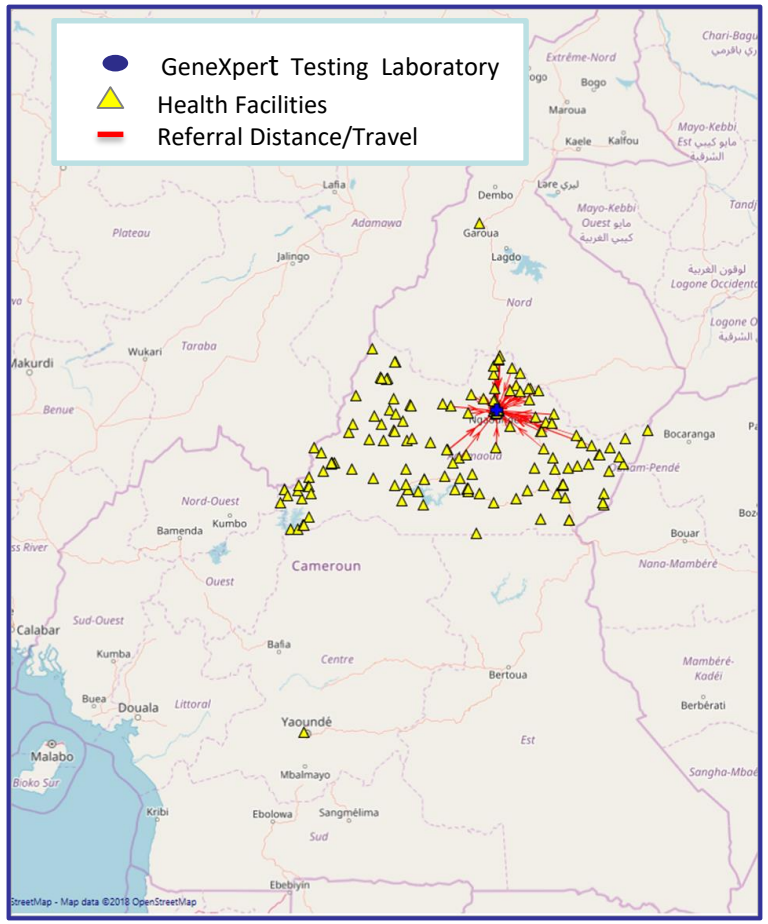
Funding	GF for conventional, Unitaid and GF for POC and near POC PEPFAR for EQA

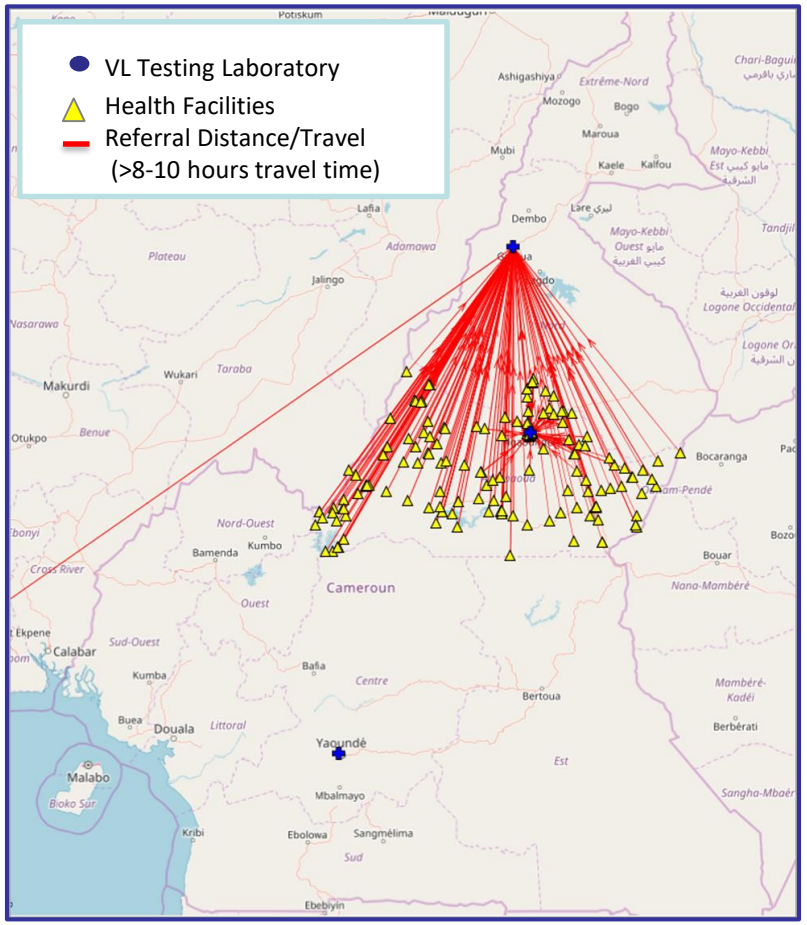
Source: PMTCT Progress report No 12; NACC 2017 Annual report

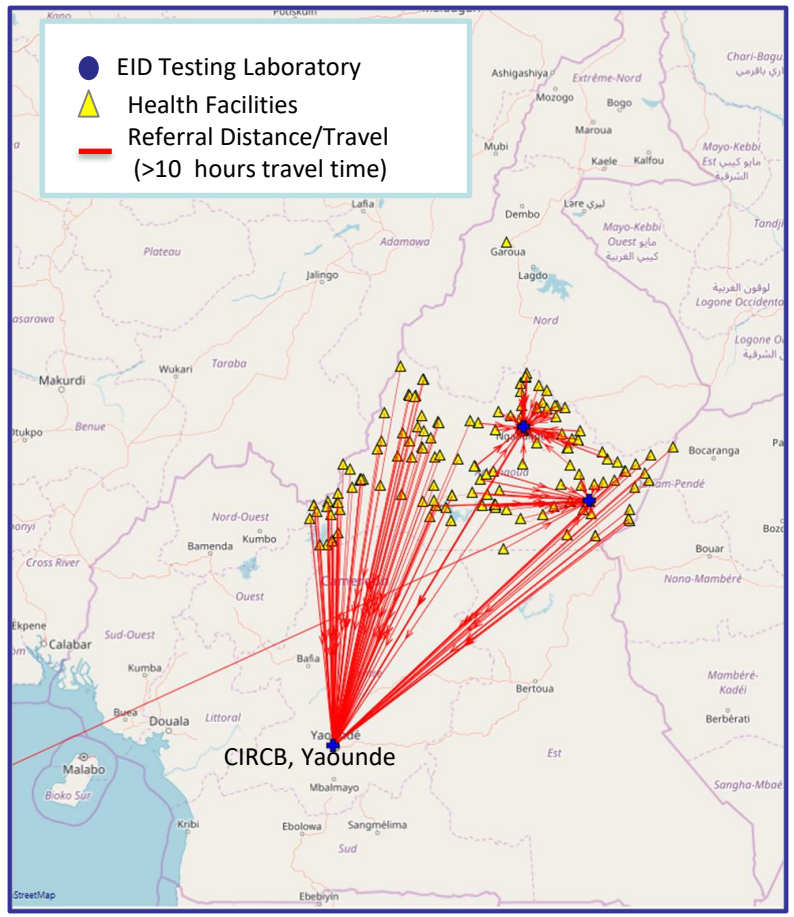


Source: National molecular mapping for integrated diagnostics 2018 (pending validation), maps developed from labEQIP

Current Scenario of TB,EID and VL Lab referral network: Adamawa Region







TB referral network. Map showing sites referring samples to HD Ngaoundere for processing on GeneXpert. Only portion of sites are currently collecting and referring TB samples to Testing lab

VL referral network. Currently most sites continue to send samples to CPCAG in Garoua for processing apart from the RH Ngaoundere which provides onsite POC VL testing on the GeneXpert device

EID referral network. majority of sites send DBS samples to CIRCB (approx. > 1000km away) for processing. Major challenge is long TAT for result return. In 2018 CHAI/UNICEF introduced POC testing on the POC (Alere q) and near POC (GeneXpert)

Source: National molecular mapping for integrated diagnostics 2018 (pending validation), maps developed from labEQIP

PART III: LIMS UPDATES

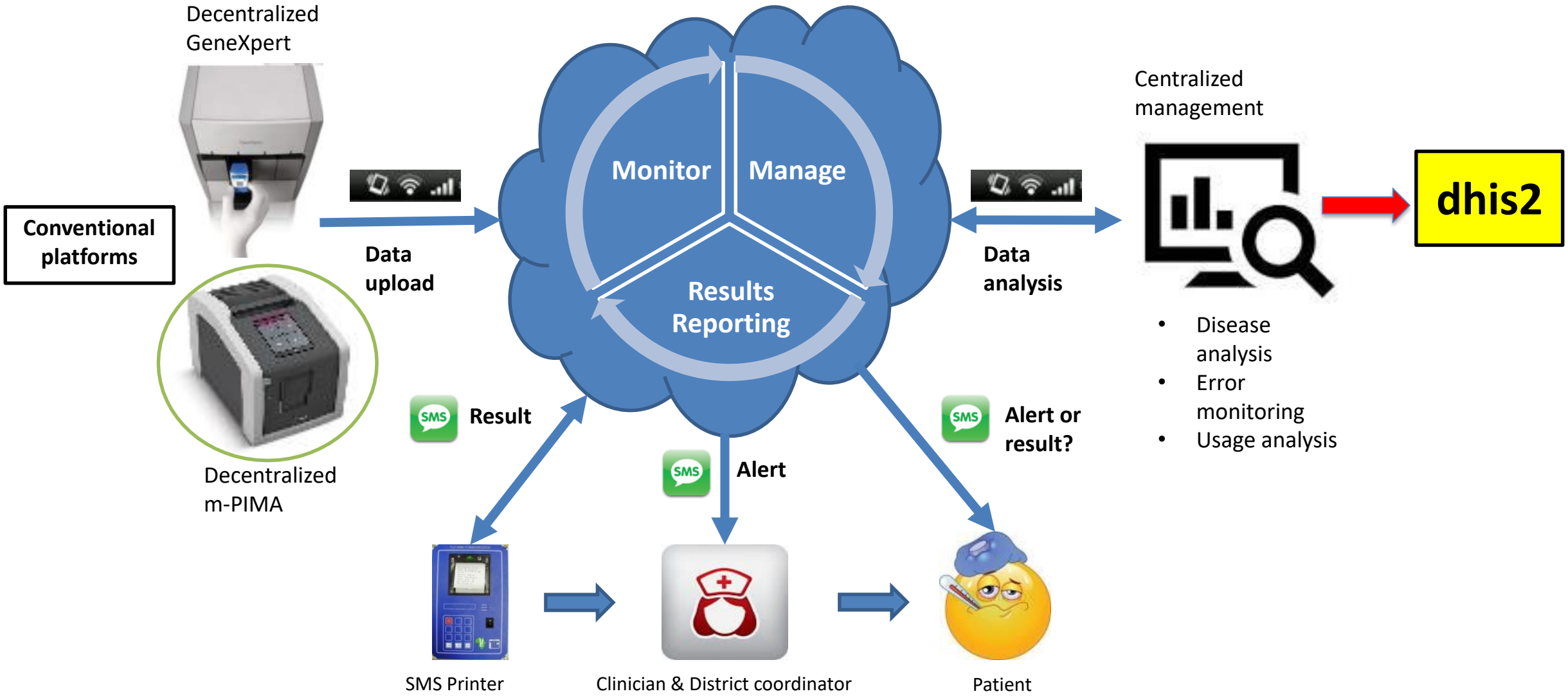
Objectives of putting in place an EID/VL dashboard

- Data Harmonization and coordination at the National Level for Timely Interventions and Decision Making

- To provide real time visibility of key laboratory and treatment indicators as captured in the requisition forms received by the laboratories to generate harmonized reports and provide timely corrective actions and mitigations

- To Enhance Inter- and Intra-Laboratory Sample Tracking From Collection to Return of Results

LIMS? - Flexible, Scalable, Multifunctional and low Cost



Updates of LIMS in Cameroon

- **2012 – 2014**
  - ✓ CDC/PEPFAR support to NACC to setup a national LIMS
  - ✓ First round of indicators selection and validation
  - ✓ EID and VL Request Forms drafted
  - ✓ LIMS Demo presented to MoH and partners
  - ✓ Failure to implement
- **2014 – 2016**
  - ✓ dhis1 introduced
- **2017 – 2018**
  - ✓ dhis2 introduced
  - ✓ Revised and harmonize EID/VL Request Forms
  - ✓ Validated key indicators to capture on dash board
  - ✓ LIMS survey tool developed
  - ✓ Assessment of LIMS in reference labs completed
- **2019**
  - ✓ Exchange visit to Kenya
  - ✓ Restitution meeting at NACC

LIMS Assessment Outcomes

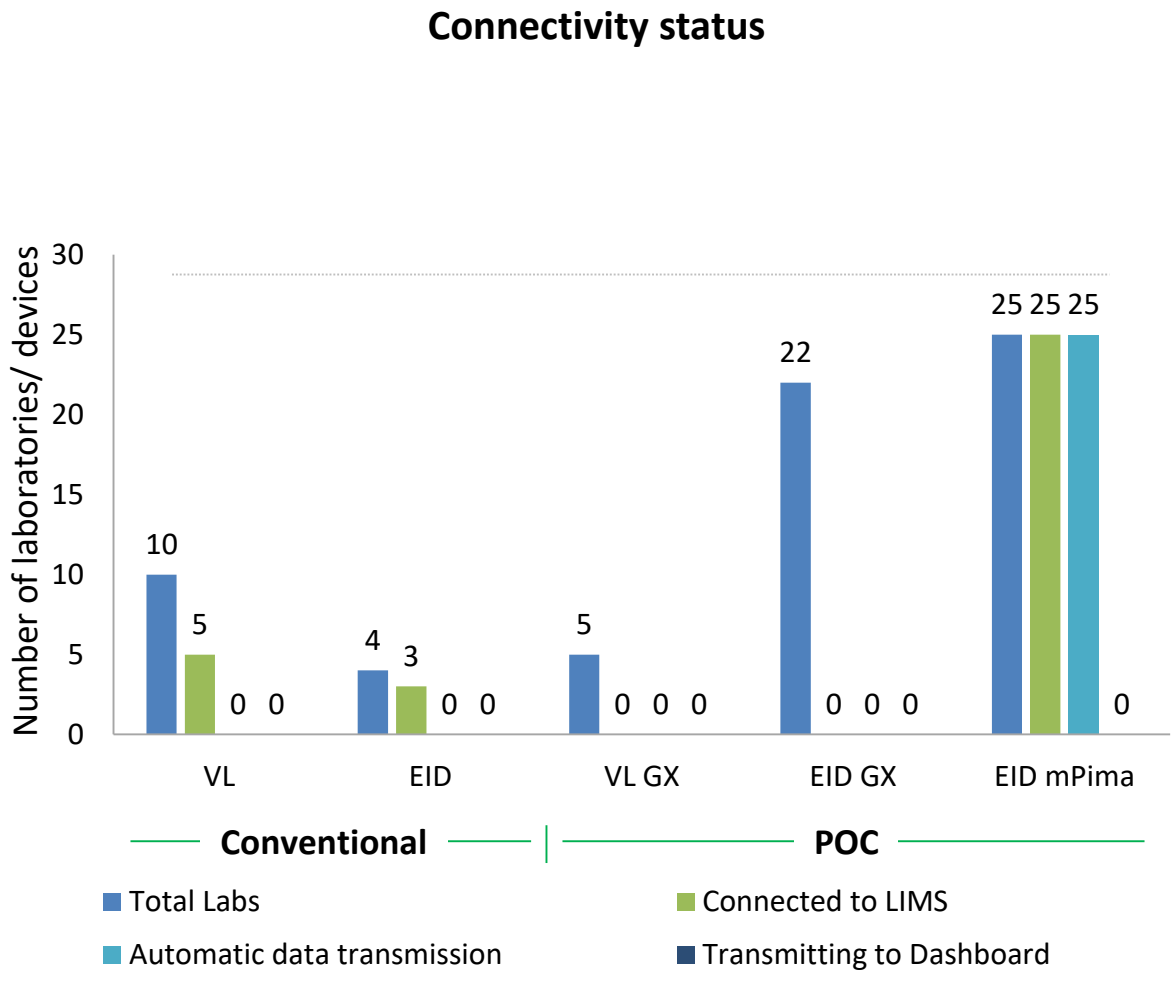
LIMS

Availability :	☑ Yes (Full/Partial) ☐ None
Name :	DISA at NEID Lab, DREAM LIMS at Nkolondom and Dschang, CIRCB, CRESAR, CPC
Supported assay :	HIV VL, EID, Others
Interoperability :	TBD
LIMS Type :	☑ Open Source One time payment ☐ Paid-to-service subscription
POC Connectivity:	EID: Data Point

Centralized Dashboard

Availability:	☐ Yes ☑ No
Timelines:	Functional Dashboard : **Q4 2019**
	100% VL data visibility on Dashboard : **TBD**
	100% EID data visibility on Dashboard : **TBD**
Public URL:	N/A

Laboratories

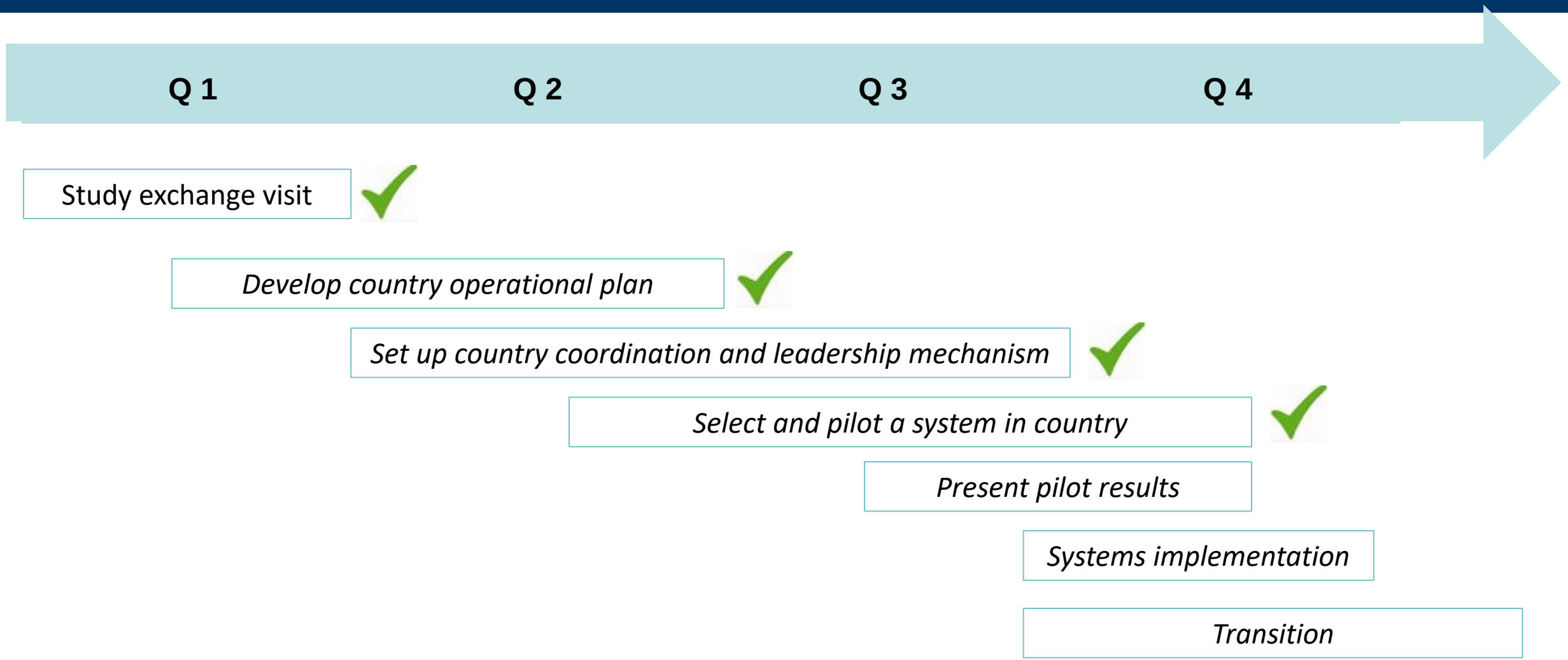


**For POC, bar graph shows number of devices and Automatic data transmission represents devices connected to POC Dashboard*

Challenges in LIMS, Dashboards Implementation

1. No/limited technical capacity
2. Fragmented systems for data management at labs – dhis2, BLIS, DISA, DREAM –LIS, Excel-based: Need for a standard system at all labs
3. There is no connectivity between platforms
4. No link between health facilitates and testing laboratories as such facilities cannot track their samples or results in real time
5. Data is not available or partially available at central level to enable real time to inform policy makers
6. dhis2 captures aggregated data and cannot process large data sets plus it relies on data input by health care providers

LIMS Roadmap for Cameroon - 2019



Study exchange visit to Kenya

Kenya Benchmarking: Government Ownership and Strong Support From Partners are Critical to Ensure Successful and Sustained Implementation

Meeting with CDC Labs Country Director – Kenya

Kenya National Data Center

Server installed at KEMRI

HIV EID and VL Dashboard hosted at NPHRL

PEPFAR supports essentially everything in Kenya
– STS, data management, HR capacity, QA, and recently HIV-DR testing

Next steps: CHAI to Pilot the system across one Ref lab, and CDC/PEPFAR to scale up to the remainder 9 ref labs as well as set up the national server in country to host country data

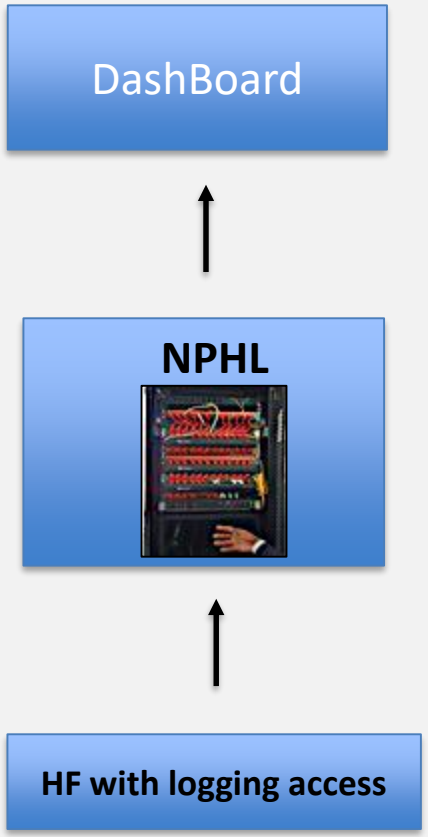
Phase 1 - LIMS

- Set up a team of developers to build both software and hardware systems
- Ensure the team understands the sample and laboratory work flow in detail
- Customize CHAI's LIMSLITE software to Cameroon context
- Get support from CHAI IT team

http://34.253.117.172/limslite/UserLogin.aspx

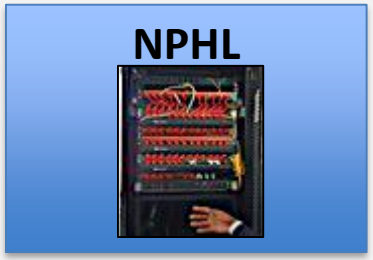
http://34.253.117.172/LISDashboard

Phase 2 – Pilot 3 months



Phase 3 Scale up 1st wave

- Present results of the pilot phase
- Replicate similar systems across the remainder labs without an existing LIMS
- Set up individual servers across each lab
- Create individual IP addresses for remote access
- Develop the facility log in interface and test



Phase 4a Scale up 2nd wave

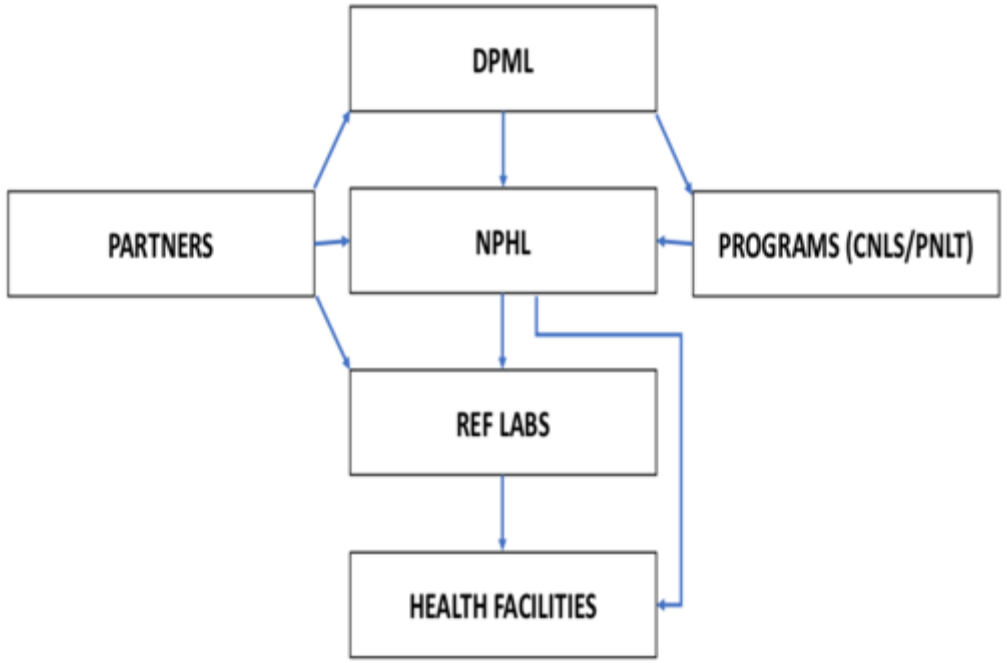
- Set up the national data center – server (create virtual backups) to host country data
- Develop links for labs with existing LIMS (05) to share agreed on data with the dashboard

Phase 4b

- Set up PocLABS software and operationalize the system
- Install on all POC devices starting with CHAI/UNICEF focus regions

Key considerations for developing a road map for Cameroon -1

1. Strong Coordination mechanism
2. Strong Systems for Ref. Labs; Health Facilities & Data Storage



Resource Mapping and Partners support

USG Team	Funding support from CDC/OGAC
MOH	Coordination and infrastructure set-up
CHAI	Software and dashboard development and installation set up, technical assistance
Other partners	Global Fund TA

Technical and Functional support

Organization	CHAI, USG and MOH
Technical staff capacity	Yes

Key considerations for developing a road map for Cameroon – 2

2 Infrastructure resource requirement

Reference Laboratory	infrastructure: - internet, local network, server, computers Software - document lab workflow - Manual system in the Lab (HFs)
National Data center	Infrastructure - Stable power source - cooling system - computer system Software - Web server - Database

3 Outstanding HR and financial resource requirement

- Budget required for staffing
  - ✓ CHAI can support TA for set up in one lab that can be replicated to all labs
  - ✓ IT/technical lead is required for 12 months full time
  - ✓ May require infrastructure (hardware & software)
- Other requirements
  - ✓ Infrastructure for other labs (hardware and software)
  - ✓ Data entry clerks for all labs
  - ✓ Internet connection running cost

Similar to Kenya, Cameroon has set out to improve and strengthen their national EID and VL systems and put in place a dashboard whose data is hosted in country on a national server

DHIS 2

Dashboard

Summary data from dashboard is pushed into DHIS 2

Software + Database

National data center (synchronize databases from the labs), queries & summaries, reporting to feed the dashboard
Data replicated virtually 3X or more

Virtualize all data and create multiple back ups

LAB1 LAB3 LAB6 LAB8

LAB2 LAB4 LAB5 LAB7

LAB10

LAB9

Software + Database

02 of the 10 ref labs in Kenya already had an existing LIMS

HF with logging access

Offsite login - Local Cyber to log in sample details

HF with no logging access

Each lab has its own server and can operate independently even if the national server system breaks down

Preliminary work to initiate the pilot phase (Phase 1)

Cameroon Assessment of NPHL Data Center

Server 1 used for PACS (a system to manage sample sorting)

Server 2 used for surveillance in and around the lab

Running diagnostics at a remote work station computer to test local net work through Ethernet

LIMSlite software installed at NPHL after assessment was completed: initial tests runs by CHAI software engineer

Installation completed successfully at server 1

Failure to connect with remote workstation – explaining to NPHL staff error message and possible approach to rectify the error

IV – Immediate Next steps

1. CHAI will customize LIMSlite Software to Cameroon Context
2. Follow up with NPHL to Diagnose local network issues and upload LIMSlite
3. Engage MOH to Endorse Pilot
4. Conduct in-house demo for MOH with CHAI team
5. Train NPHL Team and Start Pilot Effectively
6. Expand to Xpert site 1 month after pilot at NPHL


Hope for the Future
US ANGELS
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THANK YOU!