Scaled use of Cloud, Mobile and Internet Technology in Public Health Diagnostics/Laboratories

Early Infant Diagnosis of HIV– technology use at scale

Point of Care Technologies—use of connectivity

Raleigh, June 3rd 2013

jhungu@clintonhealthaccess.org

Summary

- **Early Infant Diagnosis (EID) Program – Kenya**
  - **2012 background**
  - **EID information system (Result delivery, Program data)**
- Demonstration on use of mobile and internet in EID
  - National & Lab dashboards
  - Health facility dashboard
- Point of Care Technologies
  - the challenges and solutions
  - the opportunity for mobile and internet technologies

Early Infant Diagnosis, Kenya, in 2012

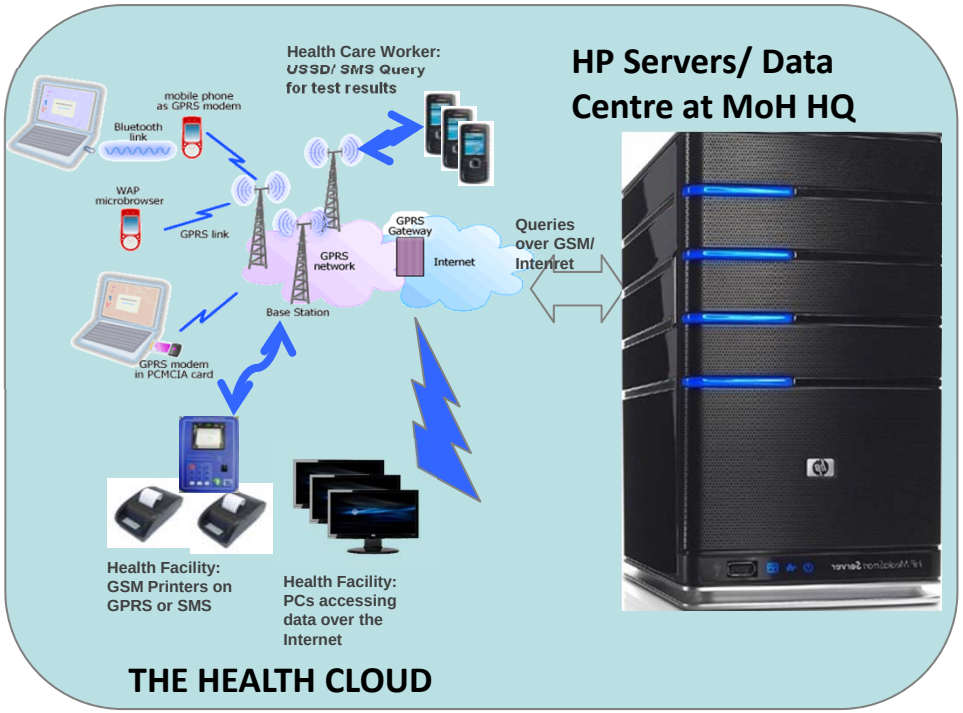
LABORATORY	SPONSOR	FACILITIES SERVICED	% OF FACILITIES	SAMPLES DONE	% OF TOTAL
KEMRI CVR HIV LAB - NAIROBI	KEMRI	955	41.3%	21,947	37.0%
CDC KISIAN - KISUMU	CDC	683	29.5%	19,005	32.0%
KEMRI ALUPE - BUSIA	KEMRI	242	10.5%	4,621	7.8%
WRP - KERICHO	WRP	299	12.9%	6,779	11.4%
AMPATH – ELDORET	AMPATH	61	2.6%	4,848	8.2%
CPGH – MOMBASA	CPGH	72	3.1%	2,117	3.6%
TOTAL		**2312**	**100%**	**59,317**	**100%**

Source: http://www.nascop.org/eid/labperformace.php?year=2012 **, NASCOP**

- Lab Logistics nightmare responding to hundreds of health facilities each week
- Program data aggregation –the opportunity of national data aggregation at 6 locations in the country

The Building of "The Ecosystem" in the Kenya example

PPPs inevitable to achieve innovation at scale



The Health Cloud—the future

- Data Centre infrastructure accessible via internet and GSM networks (SMS/USSD, mobile apps)
- Ability to deploy 100s of virtual servers (100s of different solutions) on any platform—the basis of interoperable systems, systems that exchange data for health delivery
- *This Cloud allows for the innovations of the GoK-University partnerships to deploy to national scale with quick turnaround*

Government-University Partnerships

- Strathmore University recognized the need to engage students on real problems during university training
- GoK-MoH has case problems that universities while training students can solve

Innovation Funds: HP & Rockefeller Foundation

- Seed resources to help build ecosystems and to bring a few projects to scale

Bilateral/Multilateral Donors

- Provide resources to scale solutions
- MoH with University Partnerships problem solve and deploy concepts and scale

Access to Enterprise Technology

- HP provided $1m in technology for the backbone infrastructure for the EID which is being leveraged for other solutions
- Safaricom—access to messaging service (SMS/USSD), data

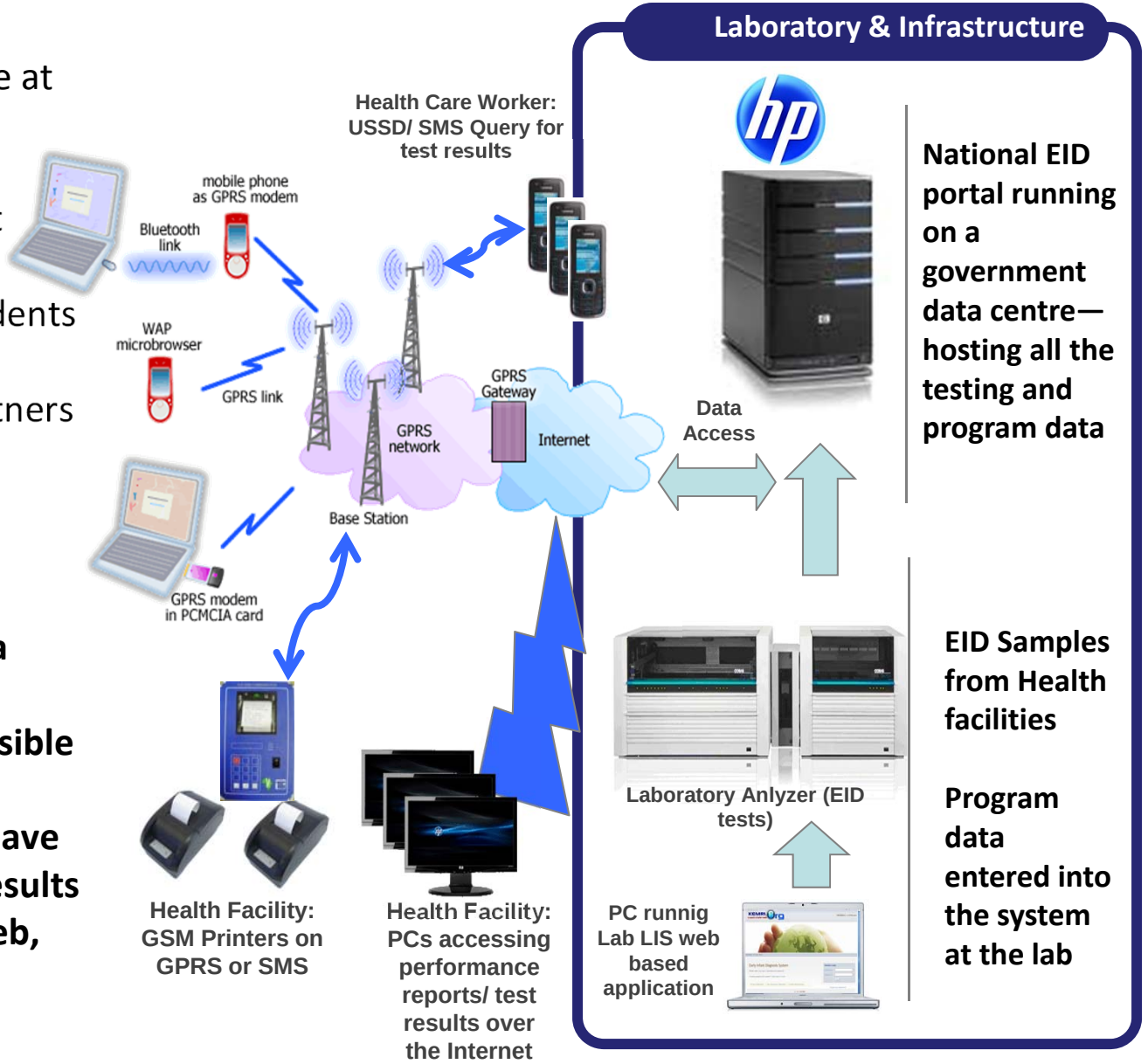
Kenya PPP delivered national EID portal www.nascop.org/eid

GoK-MoH, USAID/PEPFAR, CDC, CHAI, Hewlett Packard, Safaricom, Strathmore University

- HP built a basic data centre at NASCOP & at the testing laboratories (KEMRI)
- Safaricom setup up a short code service for SMS
- Strathmore University students built the application
- PEPFAR implementing partners rolled out the EID program countrywide

RESULTS

- **Real time EID/PMTCT data available for the whole country, test results accessible of mobile, web, email**
- **Health facilities (>2,000) have access to all data & test results over SMS, mobile web, web, email in near *real time***



EID in Kenya—a solution at national scale leveraging cloud

Using the internet, mobile phones and SMS/GPRS printers to support program implementation

	Information Requirements	Triggers	Technology
Sample Transport (Pre-Analytic)	• Logistics support • Notification of delivery to lab and ref # • >1week TAT from collection to sample delivery notification	Automated on sample receipt	
Lab Processing (Analytic)	• Program data capture from sample requisition onto local web based LIS • Sample triage into PCR worksheets by LIS • Test results captured from analyzer (Roche CAP/CTM or Abbott RT2000) and matching with program data automatically • LIS synchronizes daily over the internet with the national dataset (http://www.nascop.org/eid)	During lab testing	
Results Delivery (Post-Analytic)	• Notification of results availability to health facility electronically • Delivery of results via electronic and paper means (SMS printer, email, courier, web) • HCW @ POC has toll free SMS access to test results	Automated on availability of test result	
Program data delivery (Post-Analytic)	• Automatic publishing of program (PMTCT, logistics) data to facility and national program on the web in real time (at the same time with test results) • Publishing of all retrospective test results for access anytime • Real time program analytics online by facility/region/national	Automated web publishing with every complete batch of samples	

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  - **Lab dashboard**
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Demonstration

- National Portal: http://www.nascop.org/eid
  - National dashboards on program data
  - Health facility dashboard and results download
- Laboratory dashboard: http://41.215.40.130:8585/EID
  - View sample capture
  - View results dispatch

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  - **the challenges and solutions**
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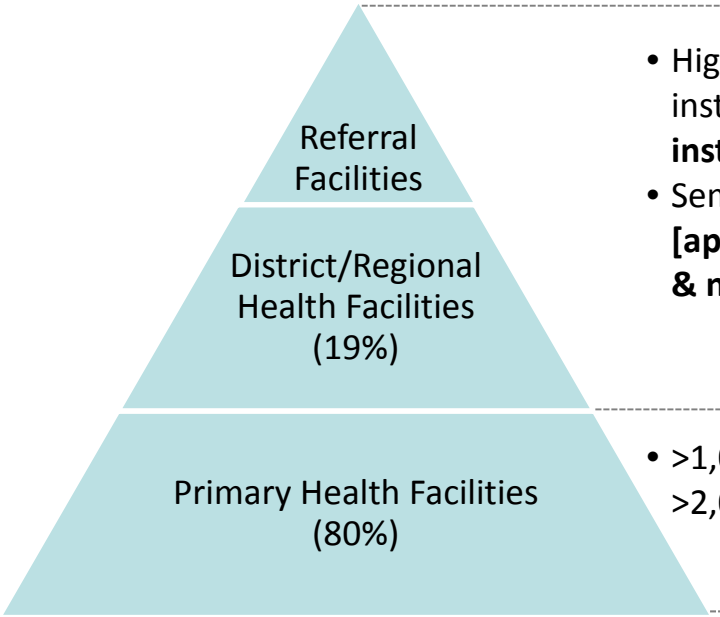
Point of Care Technologies – a different ball game at scale

Deployed at the lowest level of the public health system

Kenya: Illustrative



	Installed CD4 and PCR Instruments	HR & Resource Base
Referral Facilities	• High throughput automated instruments **[approx 10 instruments for EID & 10 for CD4]** • Semi-automated instruments **[approx. 100 instruments for CD4 & none for EID]**	• Highly skilled workforce: scientists, doctors, clinical officers, lab technicians • Supply chain support staff: store keepers, logisticians • Health records staff: District Health information officers • Resources: vehicles, phones, fuel etc
District/Regional Health Facilities (19%)		
Primary Health Facilities (80%)	• >1,000 CD4 POC instruments & >2,000 EID POC instruments soon	• 1 or 2 nurses at a dispensary • 2 nurses and 1 clinical officer/ lab tech at Health Centres • Very little resources

POC Deployment Challenges—justification for new innovations

- Supply chain uses "push method" to primary health facilities—not ideal for POCT—while HR and other resources are too thin to allow for an effective "pull" mechanism
- Managing supply chain & procurement of commodities for thousands of machines (health facilities) with little consumption information is difficult
- Service and maintenance for thousands of instruments is a different from that of conventional centralized systems—it requires greater planning and innovation
- Management of testing network and continuous training a challenge at scale

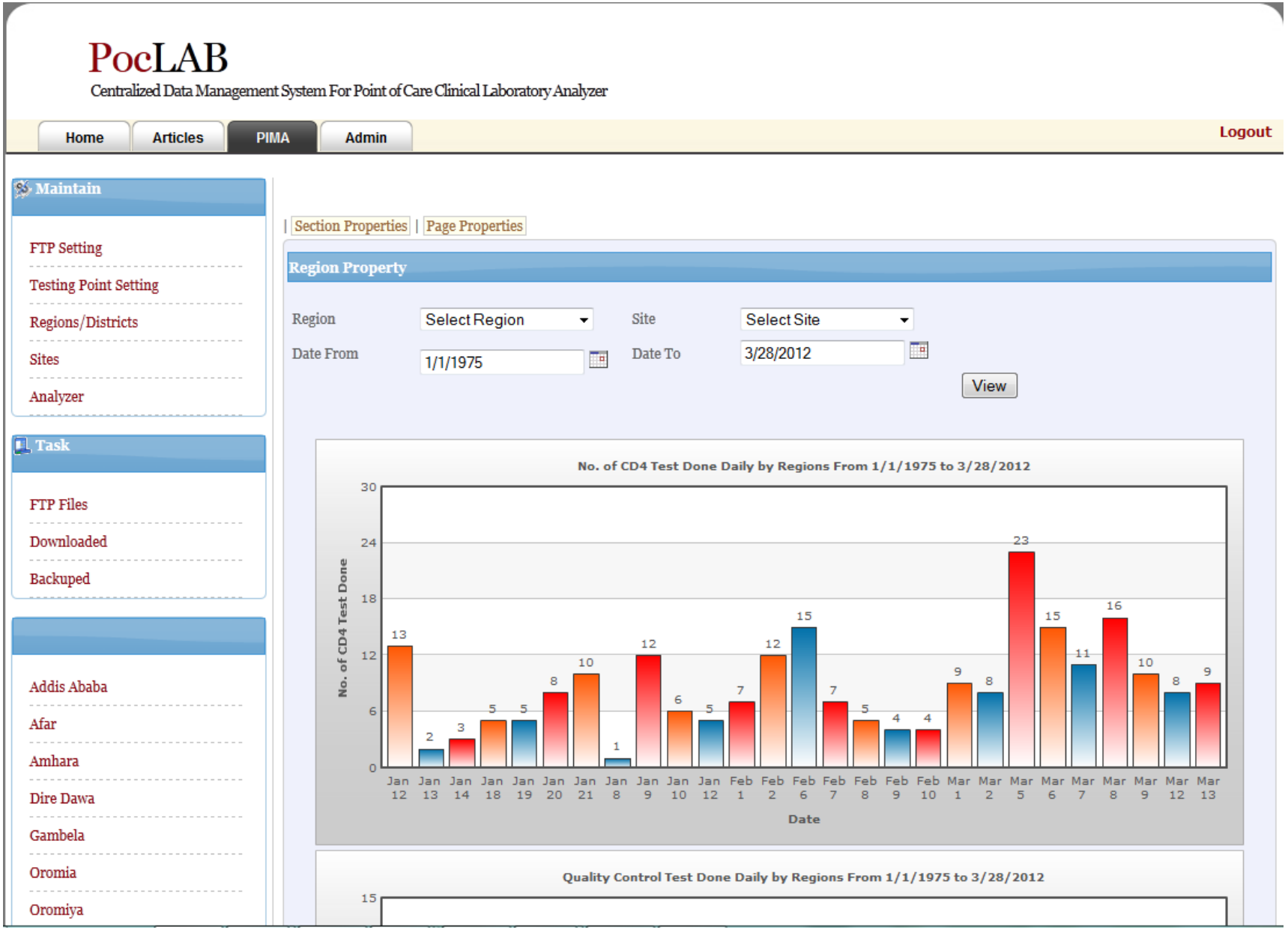
Point of Care Tech using data on GSM networks & Cloud

Example: PIMA CD4—with mobile network connectivity—3G module internet/external

Use Case	Activities	Technology
Program management	• Determine device placement based on patient catchment and monitor volumes in real time compared to expected volumes • Allow for real time monitoring of CD4 access (against patient volumes) at scale allowing for rationalization of placements for different platforms i.e. POC, semi-automated, high volume automated	• **Internal 3G module sending data over FTP/email**
Supply Chain & Procurement	• Tracking volumes linked to health facility re-supply decisions—no need for requisitions • Procurement based on real-time national statistics potentially with real time quantification with data from the field	
Training	• Tracking users by errors recorded by machine and offer targeted training for such users • Tracking common user errors can help fine tune on going training on use of POC devices	
Service and Maintenance	• Remote monitoring of equipment—aggregating all error messages to useful information • Aggregate error can point to impeding machine failure • Broken machines can be quickly identified & replaced • Error messages can help provide a crowd source for improvements on next generation POC	

Point of Care Technologies- mobile/web technologies

Example: Data management systems—web platform monitoring volumes



Point of Care Technologies- mobile/web technologies

Example: Data management systems—web platform reporting

Gambela
Oromia
Oromiya
SNNPR
Somalia
Tigray

Reports

CD4 Report
BEADS Report
Error Frequency
Report by Region and Site
Report by Month
Report by Days
Summary Of Assay