

# The GSID System: Real-Time Data Collection From the Point of Care (HIV and Malaria)

International Workshop on Point of Care (POC) Tests  
for Diagnosis of HIV and TB  
Harare, Zimbabwe, 16 – 19 March 2015

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Global Solutions for Infectious Diseases

# RDTs at Global Scale Today

(HIV and Malaria ~300 M/year)

## WHO ASSURED Criteria

**A**ffordable by those at risk of infection

**S**ensitive (few false-negatives)

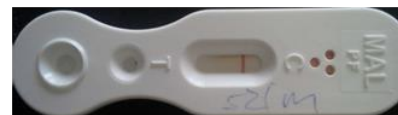
**S**pecific (few false-positive)

**U**ser-friendly - simple to perform with minimal training

**R**apid and Robust

**E**quipment-free

**D**elivered to those who need it



**Vast majority read visually and recorded on paper.**  
**Some dedicated readers.**

# Revolution in Data Reporting

MINISTRY OF HEALTH AND CHILDREN  
TALLY FORM  
(Tally sheet to be used from July 2011)

NAME OF CLINIC/ HOSPITAL: *70000503 7340*

Type of Vaccination	Adverse Effects After Immunization	Under 1 Year		Total	
		Male	Female	Male	Female
BCG Initial		00000 00000 00000	00000 00000 00000	00000 00000 00000	00000 00000 00000
OPV 1		00000 00000 00000	00000 00000 00000	00000 00000 00000	00000 00000 00000
OPV 2		00000 00000 00000	00000 00000 00000	00000 00000 00000	00000 00000 00000
OPV 3		00000 00000 00000	00000 00000 00000	00000 00000 00000	00000 00000 00000
Pentavalent 1		00000 00000 00000	00000 00000 00000	00000 00000 00000	00000 00000 00000
Pentavalent 2		00000 00000 00000	00000 00000 00000	00000 00000 00000	00000 00000 00000

Paper-based



Feature phone:  
SMS - text

is and Reporting | Questionnaires | T5

Tick all those that apply

**Diarrhoea**

Yes

No

**Dysentery**

Yes

No

**Nutritional**

Yes

No

**Malaria**

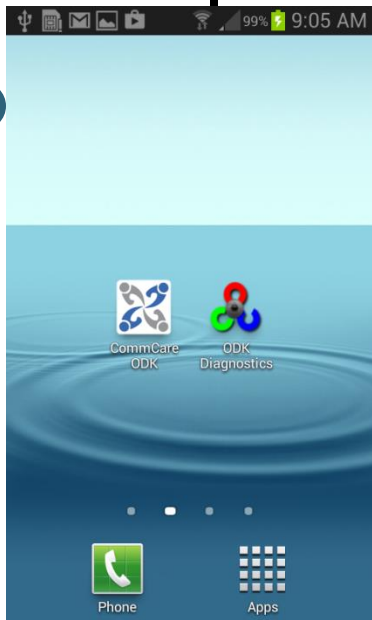
Yes

Touch-screen forms,  
Images and  
On-phone computation

# GSID Universal RDT Reader and Reporting Solution



Rapid Tests + Smartphones + Cell Phone Networks  
Open-source software, designed to be user-friendly,  
and user-configurable



is and Reporting Questionnaires T5

Tick all those that apply

**Diarrhoea**

Yes

No

**Dysentery**

Yes

No

**Nutritional**

Yes

No

**Malaria**

Yes

Select Test Type

FirstResponse\_Malaria\_Pf

Omega\_HepBsAg

p24\_test

Paracheck\_Malaria\_Pf

SD\_HIV

SD\_Malaria\_Pan\_Pf

Diagnosis and Reporting Malaria Test

Visual Readings

**Control Line**

Valid

Invalid

**PF Result Line**

Positive

Negative

ODK Diagnostics

Patient ID:  
1425407769535

Test Type:  
Paracheck Malaria Pf

Scan Test

Paracheck\_Malaria\_Pf



ODK Diagnostics

Patient ID:  
1425407769535

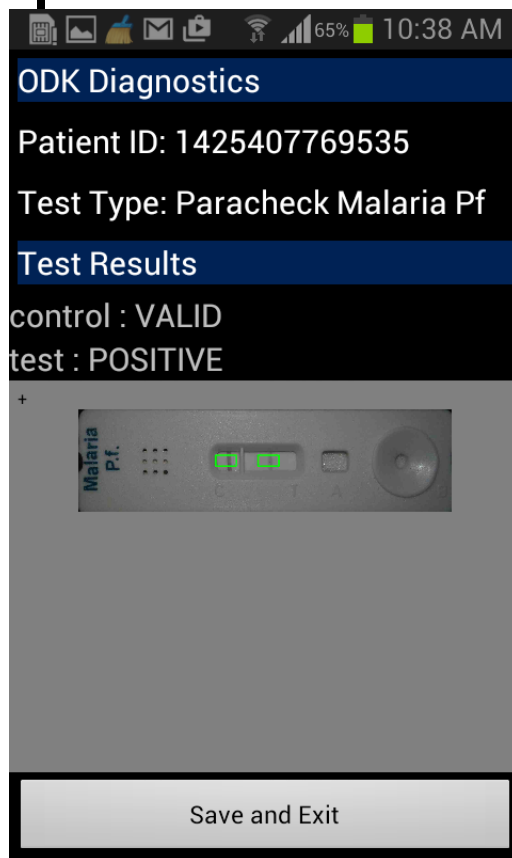
Test Type:  
Paracheck Malaria Pf

Process Batch

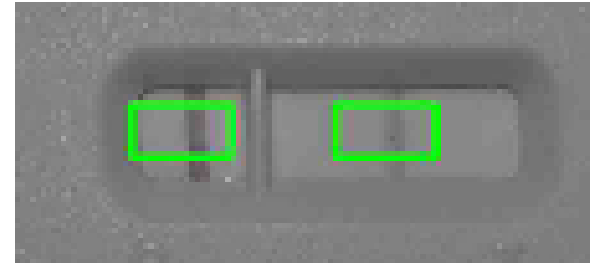
Retake Photo

Process Test

# Process Test



Valid, Positive



Return to data collection

**All data stored and then transmitted to a web server via the cellular network when bandwidth available**



# Any visual-format POC test

- Open Source Software
- Without any software code
  - Add/change data collection forms 1-2 hours
  - Add new RDTs to the test menu (~30 min)
  - Optimize sens/spec of new tests (~1-2 days)
  - 6 HIV, 4 malaria, 1 flu, 1 HepBsAg, 1 HIV/Syph

# Proof Of Concept Study: Zimbabwe



- 5 Locations in Manicaland Province:
  - Mutare Provincial Hospital      5 phones
  - Hauna District Hospital      4 phones
  - Nyanga District Hospital      4 phones
  - Tombo Clinic      1 phone
  - Zindi Clinic      2 phones
- Over 60 nurses trained
- Tests
  - HIV: Determine, First Response, SD Bioline
  - Malaria: First Response, Paracheck, SD Bioline
- Over 2500 results collected in 6 weeks





# Field Evaluation of a camera-Based Mobile Health System in Low-Resource Settings

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<sup>2</sup>Global Solutions for Infections Diseases, San Francisco

<sup>3</sup>Ministry of Health and Child Care, Zimbabwe



# Results Summary

	HIV		Malaria	
	Number	Positive	Number	Positive
Male	214	17%	749	24%
Female	648	13%	965	20%
<b>Total</b>	<b>862</b>	<b>14%</b>	<b>1714</b>	<b>22%</b>



# App Performance Results (1)

- Econet Transmission: 3 of 5 sites with issues - RESOLVED

Problems	% of All Results
No image / Not RDT	0.7%
Test not in our menu	2.6%
Test placed upside down	3.6%
Test selected different in image	2.7%
Partial Bands	1.7%
Heavy Background	2.3%



## App Performance Results (2)

	HIV	Malaria
Total Reported	977	1828
Results Included	862 (88%)	1714 (94%)
<b><u>Performance</u></b>		
ODK vs. Visual	68.8%**	94.4%
Visual vs. Review	99.2%	97.6%
ODK vs. Review	69.3%**	97.3%

\*\* HIV Determine – major imaging problem identified now mostly resolved.

# User Feedback & Challenges



- User response positive:
  - Easy to learn (~1 hour)
  - Fits into workflow (~90 sec)
  - Users loved it
- Challenges
  - Data transmission
  - User errors
  - Defective RDTs



# Data Captured/Transmitted

- Diagnostic Result (visual and phone)
- Test Image(s)
- Demographics (age, gender)
- Consumption (lot, expiration)
- User (individual, department)
- Geographic (GPS)
- Temporal (time, date)



## Summary (proof of concept)

- Image analysis performed well in field conditions
- Data capture and reporting was successful
- No significant disruption of work flow
- Concordance with visual reading:
  - Malaria ++
  - HIV - lessons learned for Determine
- Challenges identified:
  - Auto-detect user/manufacturing errors
  - Auto-detect RDT type



# Benefits of digital data at the POC

- Paperwork reduction
- Reduce transcription errors
- QA – supervisory review / training
- Aggregation of Dx and clinical data
- Merge with data from other Dx platforms
- Patient database (“local LIMS/EMR”)
- Referral to treatment and follow-up

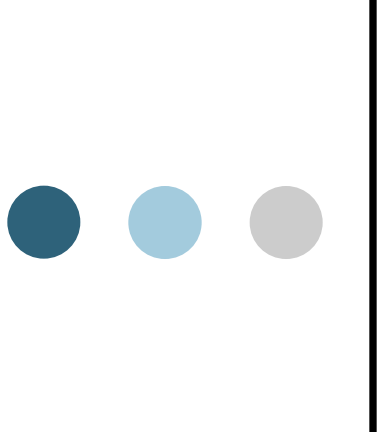




# Benefits of data beyond the POC

Ian Francis

Thursday morning



Thanks !