Digital Square Webinar:
Global Goods Adaptation for COVID-19 Response

March 30, 2020
Agenda

- Welcome and Opening - Amanda BenDor (5 min)
- OpenHIE COVID-19 Task Force - Carl Leitner and Terry Cullen (5 min)
- CommCare - Clayton Sims (10 min)
- Community Health Toolkit - Michael Kohn, Isaac Holeman, Helen Olsen (15 min)
- DHIS2/DHIS2 Tracker - Shurajit Dutta and Rebecca Potter (15 min)
- GOFR - Emily Nicholson (5 min)
- mHero - Caitlin Loehr (10 min)
- OpenMRS - Terry Cullen, Hamish Fraser, Jennifer Antilla (10 min)
- OpenSRP/Akuna/Canopy - Matt Berg (10 min)
- SORMAS - Daniel Tom-Aba (20 min)
- ODK-X - Yaw Anokwa (10 min)
Case reporting
- to district
- to national
- to regional
- to global

Contact tracing
- cross-platform
- cross-jurisdiction
- line lists

Care management
- at-risk populations
- immunocompromised

Supply Chain
- PPEs
- reagents / test kits
Three scenarios defined in terms of Health Information Systems Interoperability Maturity Toolkit and HIS Stages of Continuous Improvement Toolkit

**Standalone** - a standalone digital health system using a bespoke data model running on a low-powered and often disconnected device required to send a data extract. Requires precise definitions for native implementation of an indicator report, care guideline or case report.

**Integrated** - a digital health system that can share data using the HL7 FHIR data model and which offloads processing of FHIR resources to a locally available service using reusable software components. Requires profiled data models and computable assets.

**Exchanged** - a connected digital health system operating within a health information exchange that wants to contribute data to a longitudinal client record on which indicator calculations are performed, case reports are generated, and decision support services are provided. Requires profiled data models, computable assets and metadata registries and shared operational data.
OpenHIE COVID-19 Task Force

Terms of Reference (draft):
- Identifying and collating information relating to data standards and exchange relevant to the COVID-19 response
- Identifying gaps in and establishing standards for data exchange priorities
- Provide documentation and guidance (to both the global good community as well as proprietary software tools) to improve adherence to these standards
- Ensure that rapidly deployed solutions can be integrated into the national digital health architectures

Co-Chairs: Terry Cullen, Carl Leitner, Garrett Mehl

Logistics:
- wiki = https://wiki.ohie.org/display/resources/COVID-19+Task+Force

Outputs:
- HL7 FHIR profile / implementation guide for case reporting & contact tracing
- What do you need?
CommCare for COVID-19 Response
In the past 30 days, CommCare was used in 130 countries by 680,000 community health workers (CHWs).

- **Build comprehensive mobile apps**, without tech expertise
- **Track data** over time with case management
- **Work offline** in remote settings
- **Empower CHWs** with counseling, performance monitoring, and multimedia for low-literacy users
1. **WHO standard protocols** built on CommCare can be rapidly tailored to country specific needs
2. **Localized** to languages and additional use cases or workflows
3. Managed by local teams - all content can be **updated over the air** and also work offline
4. Build a technology foundation for future frontline programs and **health systems strengthening**
With support from USAID’s Fighting Ebola Grand Challenge for Development, Dimagi was able to develop a suite of mobile applications to support various organizations with their outbreak response efforts in West Africa.

Dimagi also integrated CommCare with Tableau, who provided free licenses for Ebola Response programs.

<table>
<thead>
<tr>
<th>Organization</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earth Institute (Guinea)</strong></td>
<td>Contact tracing application for 3,500 individuals</td>
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<tr>
<td><strong>Innovations for Poverty Action (Sierra Leone)</strong></td>
<td>Contact tracing application adapted from Earth Institute</td>
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<tr>
<td><strong>Mercy Corps (Liberia)</strong></td>
<td>Application to support youth livelihoods post-crisis</td>
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<tr>
<td><strong>Save the Children International (Liberia)</strong></td>
<td>Case management of OVCs from Ebola, distribution of social grants</td>
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<tr>
<td><strong>Liberian Red Cross (Liberia)</strong></td>
<td>Community resilience and reduction of stigma; psycho-social support</td>
</tr>
<tr>
<td><strong>John Snow, Inc. (Liberia)</strong></td>
<td>Tracking stock of Personal Protective Equipment (PPE)</td>
</tr>
<tr>
<td><strong>Partners in Health (Liberia)</strong></td>
<td>Contact tracing, Ebola case management</td>
</tr>
<tr>
<td><strong>International Medical Corps (Liberia)</strong></td>
<td>Psychosocial support and counseling, ETU decommissioning</td>
</tr>
</tbody>
</table>
CommCare for COVID-19

1. Key Functionality
   7 technical characteristics, 4 key functionalities relevant to Ebola outbreak response, with demonstrated success in the field.

2. Rapid Flexibility
   Ability to quickly build, adapt, and deploy an application in a matter of minutes - critical in outbreaks.

3. System Ready
   Open source, supports SMS, and has open APIs for integration with Tableau, DHIS2, etc.

4. Leveraged Scale
   Build on top of Dimagi’s pre-existing user base of community health workers - 10% of all CHWs in LMICs.
CommCare & COVID-19
Pro Bono Support of CommCare Subscriptions for COVID-19

- Dimagi is offering pro bono SaaS subscriptions for people to access CommCare freely for COVID-19
- Self-service adoption is critical to scale. With InstratGHS, Ogun State in Nigeria built and deployed contact tracing in 24 hours
- State plan for all primary health centres to use the mobile application to alert the local government of any emergency.

“The mobile app will enable our health workers to easily do the risk assessment of patients at the primary health center before it escalates to the local government level”

DR. TAMI COKER
OGUN STATE COMMISSIONER FOR HEALTH
App Template:
WHO FFX Protocol

https://tinyurl.com/ffx-demo
COVID-19 Template Application: Video Demo
WHO FFX Contact Tracing Template App

- Full implementation of the WHO FFX Protocol for time critical response and case management
- Now available in 4 languages (English, Spanish, French, Portuguese), with another 5 coming soon
- Downloaded by 500 organizations in the first week of launch
- Modular template allows teams to pick and choose components for adoption
- Provides a consistent model for WHO reporting data, critical for integration with external systems and reuse of ecosystem components
Live: Risk Monitoring and Triaging

Live: SMS Monitoring of Confirmed Cases

Developed: WHO Contact Tracing

Live: PUI Management

Developed: WHO Contact Tracing

Prevention & Education

Triage / Testing

Tracking & Tracing

Quarantine Management

In-Hospital Management

Post-care management & Prevention
CommCare COVID-19 Activity Report

- Pro Bono Software Subscriptions for COVID-19
- Template Application of WHO Contact Tracing Protocols in English, French, Spanish, and Portuguese
- Documentation, videos, demos, Users Forum, multimedia
- Live projects in Nigeria & with the CDC in California
- Agreements with various governments, including Sierra Leone, Togo, Assam India (so far)

www.tinyurl.com/cc-covid19
Community Health Toolkit

Michael Kohn, Isaac Holeman, Helen Olsen
The Community Health Toolkit and the COVID-19 Response

March 30th, 2020
The Challenge

Health systems, as they are set up today, exclude people from care.

At least half the world’s population still cannot obtain basic health services. In the poorest & most remote communities, only 1% of families receive care at home when they are sick. Less than 4% of patients receive a home visit from a health worker during pregnancy.

These challenges are further exacerbated by epidemics such as Covid-19.
Medic Mobile is a non-profit organization on a mission to advance good health and human flourishing for and with the hardest-to-reach communities.

We build and apply open-source technology that helps health workers deliver equitable care.

We envision a more just world in which health workers are supported as they provide care for their neighbors, universal health coverage is a reality, and health is a secured human right.
Community Health Toolkit

The Community Health Toolkit (CHT) is a global public good and community of people advancing global health equity. Medic Mobile serves as the technical steward for the CHT. It includes:

**Tools**
Open source software frameworks and applications

**Resources**
Guides to help you design and use the framework

**Community**
An active community for collaboration and support
The Core Framework

CHT’s Core Framework makes it easier to build scalable digital health apps that equip health workers to provide better care in their communities.

A highly configurable framework, it runs on a range of devices, supports multiple hierarchies and users in a health system with integrated care workflows, and is interoperable with other systems.
Medic Mobile’s COVID Response

Medic Mobile has been focused on supporting global preparedness and response efforts in solidarity with the partners, health workers and communities that we serve. Our response is grounded in a few truths:

- COVID-19 will disproportionately affect the poor and vulnerable, and may deepen inequalities.
- A systems strengthening approach is needed to not only support COVID-19 response but also to create more robust and resilient health systems going forward.
- Building on existing platforms, infrastructure and relationships where possible will ensure greater success and sustainability in the long run.
Medic Mobile’s COVID Response Strategy

Our response has centered on:

- **Accompanying Ministries of Health** through staff secondment to Health Emergency Operation Center (HEOC), Epidemiology and Disease Control Division (EDCD) units, to understand requirements and challenges, and assess where our expertise, skills, and tools can help.

- **Evolving existing digital health systems** to support COVID-19 prevention, detection and containment efforts based on needs articulated by our partners.

- **Coordinating** with the wider community health and digital communities of practice to harmonize our responses and the data produced by digital systems supporting response efforts.
Based on priorities emerging from our partners and the broader global community, we’re exploring several critical use cases and workflows for COVID-19 response:

- **Surveillance**
  - Port of entry screening
  - Contact tracing
  - Event-based surveillance in the community and facility
  - Community-based symptom screening

- **Patient Assessment, Testing & Referrals to Care**
  - Community-based assessments
  - Rapid diagnostic testing
  - Referrals to care
  - Proactive messaging

- **Support for Community Healthcare Workers**
  - App-based CHW education & training
  - Modifications to existing PHC workflows

We have also built 3 demo apps to illustrate the power of the CHT.
COVID-19 Port of Entry Screening App

- As part of our response efforts, we designed and launched this app in partnership with Ministry of Health and Population in Nepal (HEOC & EDCD).

- The app supports enrollment of all incoming travelers at ports of entry, Covid-19 screening, and follow up for the self-quarantined. Added functionality can include contact tracing workflows.

- It is based on MoHP Nepal and WHO guidelines.

- We are currently exploring adoptions with several other MoH partners.

Watch the demo
COVID-19 Rapid Diagnostic Test App

- Medic Mobile built this app to support rapid diagnostic testing for COVID-19 screening, detection, response and containment.

- It is based on the **Antibody (IgM/IgG) test**, but can be rapidly adapted for different tests.

- It is designed to:
  - Help health workers stay safe
  - Improve quality of testing and care
  - Support evolving testing and triage protocols
  - Improve patient follow-up
  - Support patient education
  - Be adapted as needed, integrated into existing apps and platforms.

Watch the demo
COVID-19 Symptom Self-Screening

- CHT integration with RapidPro for **automated, interactive messaging support**

- Supports **identified at risk persons** (e.g. CHWs, people in quarantine following port of entry screening or contact tracing)

- App-based **automated daily messages** asking for self-symptom screening, automated thanks and educational messages

- For people self-reporting symptoms, this flow helps triage symptoms and connects those experiencing symptoms with a health worker
Thank you in advance for your contributions and support of our mission!
Shurajit Dutta and Rebecca Potter
Digital Data Packages for COVID-19 Surveillance & Response

University of Oslo | 30 March 2020
Digital Square Global Goods Demo for COVID-19 Response
COVID-19 Digital Data Package

COVID-19 Surveillance Dashboards

- Case-based surveillance + laboratory
- Contact Tracing
- Daily Reporting (aggregate)
- Port of Entry Screening & Follow-Up
- Outbreak Line Listing

Rapid data-driven response

Optimized data collection and field-based workflows
DHIS2 Digital Data Packages

**Highlights**
- Multi partner effort to promote uptake and use of standards
- Includes indicators & metadata, data quality metrics
- National and district dashboards & analysis
- Implementation guidelines

**Purpose**
- Improve information use in countries
- Simplifies support if there are standard solutions
- Reporting on key indicators
- Avoid reinventing the wheel in each country
- Promote “best practice” design in DHIS2
- Integrate disease programs in (often) HMIS-run systems

Global surveillance for COVID-19 caused by human infection with COVID-19 virus
Interim guidance
20 March 2020
COVID-19 Digital Data Package Overview

Components are designed to install in combination or standalone according to country needs:

- **COVID-19 Case-based surveillance [tracker]**: enrolls & tracks suspected cases; captures symptoms, demographics, risk factors & exposures; creates lab requests; links confirmed cases with contacts; and monitors patient outcomes. This package can be installed as a standalone COVID-19 package or can be integrated into a country's existing integrated disease surveillance & response tracker.
- **Contact registration & follow-up program [tracker]**: strengthens active case detection through contact tracing activities, such as identification and follow-up of contacts of a suspected or confirmed COVID-19 case.
- **Ports of Entry screening & follow-up program [tracker]**: enrolls travelers who have visited high-risk locations at Ports of Entry for 14-day monitoring and follow-up.
- **COVID-19 Surveillance Event Program [event]**: a simplified line-list that captures a subset of minimum critical data points to facilitate rapid analysis & response, particularly useful when caseloads or burden of reporting exceeds capacity for case-based surveillance tracker.
- **COVID-19 Aggregate Surveillance [aggregate]**: an aggregate reporting dataset that captures minimum necessary data points for daily and weekly reporting.
Natively integrated with DHIS2 Android App

Download and Install the DHIS2 Android Capture App from Google Play.

Log In and select your activity.

URL: https://covid.dhis2.org/demo
USER: android
PSW: District1#

Go!
Test it out by registering your own demo cases!
Support for local workflows

1. Patient attends facility
2. Patient is screened and identified as suspect COVID-19 case
3. Hospitalized/I isolation
4. Receives Treatment
5. Details are filled in Case Reporting Form
6. Lab request is made to confirm case
7. Lab results determine if case is confirmed
8. Discharged & Cleared
9. Hospitalized/I isolation
10. Not Recovered
11. Follow-up is conducted on case
12. Details are filled in Case Reporting Form
13. Cleared
14. Not Hospitalized
15. Recovered
16. Details are filled in Case Reporting Form
17. Death
Automated dashboards
Multi-Language Support

Current translations:
- French
- Spanish
- Portuguese
- Russian

Languages in progress:
- Arabic
- Lao
- Burmese

Community-driven translation platform
- Contribute: translate@dhis2.org
Global deployment of COVID-19 data package

42 countries expressed interest in COVID-19 packages

24 countries have DHIS2 Android deployments

51 countries use DHIS2 tracker

71 countries use DHIS2 as HMIS (13 countries in pilot)
Resources & Contact Information

Demo: [covid.dhis2.org/demo](https://covid.dhis2.org/demo)
Information page: [dhis2.org/covid-19](https://dhis2.org/covid-19)
Community page: [community.dhis2.org](https://community.dhis2.org)
Contact us: [covid@dhis2.org](mailto:covid@dhis2.org)
Managing Service Delivery Sites during the COVID-19 Response

FACILITY MATCH
Global Open Facility Registry

Emily Nicholson, Technical Advisor
Service Delivery Site Confusion

- Emergency testing centers and treatment sites spring up
- Locations of non-essential services are moved
- External organizations and partners step in to help
- Lists of service delivery sites multiply
GOFR/Facility Match Can Help

• **Compares** data sets
• **Creates** master lists
• **Improves** accuracy
• **Enhances** trust
• **Saves** time
<table>
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<tr>
<th>SN</th>
<th>iHRIS Facility</th>
<th>DHIS2 Exact Match</th>
<th>DHIS2 Manually Matched</th>
<th>DHIS2 Close Match</th>
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<td>Plantum Island MCHP</td>
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<td><img src="#" alt="Match Options" /></td>
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</table>
Current User Interface of GOFR
Select a Data Source Pair

Choose Data Source Pair

Source 1
- fake NGO
- fake DHIS2

Source 2
- fake NGO
- fake DHIS2
### Facility Reconciliation

**Source 1 Reconciliation Status: Matched: 2/2, Unmatched: 0/2**

- **100% Match**
- **0% Flap**
- **0% No Match**

**Source 1 Unmatched**

- No data available

**Source 2 Reconciliation Status: Matched: 2/2, Unmatched: 0/2**

- **100% Match**
- **0% Flap**
- **0% No Match**

**Source Location**

<table>
<thead>
<tr>
<th>Source Location</th>
<th>Source ID</th>
<th>Target Location</th>
<th>Target ID</th>
<th>Match Comment</th>
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<td>Southern</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Region**

- [Input Field]
Human Adjudication
Save time. Improve accuracy.
Compare data sets and create master lists of facilities for health, education, and agriculture applications.
Disclaimer

This is a demonstration site. Please do not upload or connect to sensitive data sources. Please also remove data sources once you are done testing. Data sources will be removed by the administrators as needed. Demo user is ‘demo’ and password is ‘demo’
Installation & User Guides

- Quick Starts
  - Example data
  - Match data sources
  - Add DHIS2 source
- User Guide
  - Data Sources
  - Match
  - Users and sharing
- Developer Guide
  - DHIS2 app installation
  - DHIS2 users and sharing
  - Quickstart with Docker
  - Install Locally
  - Vagrant
  - Production considerations
  - Ansible
  - Terraform
  - Contribute
  - Update and Build Documentation
- FAQ
  - Is there an API?
  - Can this tool be used in education or agriculture?
  - Does the tool clean the source data?
Demonstration

FACILITY MATCH
Global Open Facility Registry

facilitymatch.net
Strengthening National Health Workforce Communication for COVID-19 Response
Challenges During a Pandemic

• Frontline health workers can’t travel

• Health officials lack timely information on community-level conditions

• Frontline health workers don’t receive life-saving information

• Misinformation and rumors spread with lack of trust
How many suspected and confirmed cases did you have today?
14 suspected, 1 confirmed

True or false: there is medicine that can cure COVID-19?
False

Correct! There is not currently any medicine that is proven to cure COVID-19.

How many PPE do you need?
Request PPE
What is mHero?

- **Connects** health workers to their support at all levels of the health system

- **Communicates** information about on-the-ground needs in real time

- **Adapts** to health information system infrastructure and dynamic needs

- **Strengthens** health systems before, during, and after a crisis
mHero’s Role in the Ebola Crisis

• Developed during the West Africa Ebola outbreak

• Facilitated communication and coordination

• Continued use for disease surveillance and now COVID-19
Current (old) mHero Architecture

- DHIS2 not implemented
- iHRIS
- InterLinked Registry
- Interoperability Layer
- RapidPro
How does mHero work?

mHero Connector
emNutt
An implementation of the mACM standard

Existing health information systems
- iHRIS
- OpenMRS
- dhis2
- FHIR-compliant system

Popular communication platforms
- RapidPro
- Facebook Messenger
- WhatsApp
- Twilio

Central / Region / District MOH
Frontline Health Workers
Advantages of the new mHero

- **User-friendly** module
- **Simplified installation** and **deployment** process
- Consolidates fragmented data sources for cross sector **messaging** (not just public health workforce but also community mobilizers, vaccinators, patients, etc.)
- **Syncs contact groups** across RapidPro and iHRIS for ease of use and increased data validity
- Other **possibilities for configuration** (beyond RapidPro and iHRIS)
mHero Possibilities

• Coordinate the health emergency response
• Train frontline health workers
• Test health worker knowledge of COVID-19
• Report potential and confirmed cases
• Transmit COVID-19 test results from laboratories to health workers
• Report stock outs of essential supplies or medicine
• Report local incidents
Resources Needed

Software
• Database of contact information
• mHero Connector
• Communication platform

Hardware
• Computers
• Server or cloud hosting
• Mobile phones (for recipients)

Connectivity
• Short code for SMS
• Network coverage

Roles
• Configuration and deployment
• Content development
• Dedicated response team
OpenMRS COVID-19
Public Health Response Tools
OpenMRS, a Global Good, is a robust, scalable, user-driven, open-source electronic medical record system platform.

Our modular and open platform is flexible enough to be implemented in a variety of environments.

OpenMRS is a global community of truly dedicated, talented, generous contributors.

Compassionate individuals with expertise in healthcare, global health, and IT are committed to providing reliable electronic medical record systems that respond to real needs.
OpenMRS experience with Ebola

Developed to support intensive clinical care in the “hot zone” at the Kerrytown ebola treatment center.
As of December 2019, health care workers at least **5,485** health facilities use OpenMRS to manage health records for **12.6 million patients**.*

*self-reported by OpenMRS implementers
Our goal is to provide...

...IMPLEMENTERS with science-based tools for COVID-19 that they can customize based on country guidance and context.

...HEALTH CARE WORKERS with the tools they need to screen, test, and manage patients infected with COVID-19

...the PUBLIC HEALTH COMMUNITY with data for public health surveillance, resource mobilization, and policy-making
OpenMRS Reference Application

OpenMRS Platform
+ Metadata and Terminology
+ Starter Modules
+ Add On or Custom Modules

OpenMRS COVID-19 Response Tools

CIEL concept dictionary with COVID-19 concepts
+ COVID-19 Public Health Response Module
+ COVID-19 Public Health Reporting System Interfaces
COVID-19 Response: Terminology

Data model
CIEL concept dictionary
COVID-19 Response: Data Collection

COVID-19 Public Health Response Module
Patient Intake, Registration, and Case Management
- Patient information
- Clinical status
- Travel and exposure risk history
- Outcome
  - Case Report submission
  - PUI tracking
  - Clinical course/health outcomes

FOCUS
Collection of high quality, complete and timely data for care, surveillance and reporting

CURRENT STATUS:
IN PROGRESS

ANTICIPATED RELEASE IN EARLY APRIL
COVID-19 Response: Data Collection

COVID-19 Public Health Response Module

- Referrals
- Screening
- Labs
- Clinical assessment
- Program Enrollment and Outcomes

FOCUS
Collection of high quality, complete and timely data for care, surveillance and reporting

CURRENT STATUS:
IN DISCUSSION
COVID-19 Response: Reporting

COVID-19 Public Health Reporting Module

- Clinical case reports
- Clinical summary with alerts
- Weekly/monthly reports
- Supply forecasting based on patient enrollment and care level
- System monitoring tool (EHR reliability and usage)
- Systems Interfaces
  - DHIS2, SORMAS, CommCare, Laboratory

FOCUS
Use of high quality, complete and timely data for care, surveillance and reporting

CURRENT STATUS
IN DISCUSSION
An approach that reflects our community's values

- Use community spaces where everyone can openly and transparently share ideas, needs, and solutions
- Empower a COVID-19 Response Squad to rapidly design, develop, test, and release the suite of COVID-19 Response Tools
- Encourage informatics experts, business analysts, UI/UX designers, developers, and implementers to join the conversation, weekly meetings, design forums, and work with the COVID-19 Response Squad
Akuna/Canopy

Matt Berg
Ona

COVID-19 Response
Helping you do amazing things with data

Sign up for our trusted mobile survey software or explore our data solutions

Get Free Account  Watch how Ona works
Digital health platform for facility health workers and CHWs

Community Health Workers
Simplified app for minimal tech experience & clinical knowledge

Facility Health Workers
Enhanced app for clinical workflows & algorithms

Health Supervisors
Reports, dashboards, management tools, and communication tools
OpenSRP CHW App
CG: Marissa L Kopfle
Lee Engle 0, 3d

Male  Richmond  ID: 1868017

Record visit  Visit not done

BCG due (04 Mar 2019)
View upcoming services

Family has nothing due  Go to family's profile

Immunizations (9m)
- MCV 1, Yellow Fever, IPV provided on 04 Mar 2019

OPV 2, Penta 2, PCV 2
- OPV 2, Penta 2, PCV 2 provided on 07 Mar 2019

When was MNP 2nd pack given?
- Overdue 04 Aug 2018

Vitamin A 2nd dose
- Overdue 04 Jan 2019

Deworming 2nd dose
- Overdue 04 Jan 2019

Observations & Illness - optional

Save  Dose not given
Ensure no one is missed
Reveal Example Dashboard
Collect the blood sample (5μl) using a pipette provided or micropipette.
Place RDT at the center.
Fit RDT to the rectangle.
Move closer.

- Sharpness: passed
- Brightness: passed
- Position/Size: failed
- Shadow: passed

Light on
RDT ID 12D8D0

Carestart RDT  13 Feb 2020
Pv positive
Pf positive

Microscopy  Unavailable
P. falciparum -
P. vivax -
P. malariae -
P. ovale -
Pf. gameto -

Carestart RDT qPCR  Unavailable
P. falciparum -
P. vivax -
P. malariae -
P. ovale -
Pf. gameto -
E-Z Cassette Opener

- Laboratory Friendly
- Reduces Time and Safety Risks
- Molecular Tests Can be Done Directly From the Strip
- QR Code Serves to Improve Logistics and Link Data Back to Patient
SORMAS® - Surveillance Outbreak Response Management and Analysis System
History of SORMAS

2015
- Development of prototype (based on HANA platform), short field pilot
- Primarily for Ebola plus 3 reference diseases
- Funding from Federal Ministry for Research and Education (BMBF) via German Centre for Infection Research (DZIF), Hasso-Plattner-Institute and SAP (in-kind)

2016
- Full transition to open source
- Expansion to 7 diseases, inclusion of laboratories
- Funding from Federal Ministry for Economic Cooperation and Development (BMZ) via Gesellschaft für internationale Zusammenarbeit (GIZ)

2017
- Initiation of pilot and ad hoc activation in Monkeypox outbreak
- Expansion to 10 diseases, further functional and technical expansion
- Funding from DZIF, BMBF, GIZ

2018
- Massive roll-out in Nigeria, response to simultaneous outbreaks
- Expansion to 12 diseases, French version, further technical improvements
- Funding from GIZ, Helmholtz Association (HGF), BMBF

2019
- Further roll out in Nigeria, pilot in Ghana
- Addition of clinical management module and completion of global goods model
- Funding from BMZ&EU via GIZ, HGF, BMBF, Bill & Melinda Gates Foundation, Nigerian Basic Health Care Provision Fund (BHCPF), CDC
Mission and Objectives of SORMAS
Surveillance Outbreak Response Management and Analysis System

Mission

- Improve prevention and control of communicable diseases particularly in resource-poor settings.
- Designed by those involved in public health surveillance and disease control.
- Free of charge, highest data protection, good scientific practice and open access policy

Full integration of

- Response business process managements
- Surveillance and analysis
- Multi-directional and case based throughout
- Wireless and independent from continuous electricity or internet
- Open source and free of charge
Objectives: Digital, Mobile Outbreak Detection & Response

- Surveillance
- Outbreak
- Response
- Management
- Analysis
- System

- Response process management
- Laboratory integration
- Scalability
- Early warning & analysis
- Sustainability
- Clinical management
- Mobile offline bi-directional
Integrated Disease Surveillance and Response System

**Conventional Information Flow**

- **WHO, ECOWAS, R-CDC**
- **Field investigator**
- **Local Health Care Facilities**
- **Government Area Health Dpt.**
  - Disease Surveillance Notification Officer (DSNO)
- **Conventional Information Flow**
  - **Aggregated weekly**
    - (by Monday)
  - **Case based weekly**
    - (by Tuesday)
  - **Aggregated monthly**
    - (by Wednesday)
  - **Case based weekly**
    - (by Wednesday)

**Laboratory**

**Manual data transfer**

**IDSR 001A**

**IDSR 001B**
Response Management in SORMAS (e.g. Ebola)
Integrated Disease Surveillance and Response System Information Flow with SORMAS

- **WHO, ECOWAS, R-CDC**
  - Aggregated monthly (by Wednesday)

- **National Centre for Disease Control**
  - Aggregated weekly (by Wednesday)

- **State/Regional Health Department**
  - State /Regional Epidemiologist
  - Aggregated weekly (by Tuesday)
  - Case based weekly

- **District / Local Government Area Health Dpt.**
  - Disease Surveillance Notification Officer (DSNO)
  - Aggregated weekly (by Monday)
  - Case based Immediately

- **Local Health Care Facilities**

- **Field investigator**

- **Laboratory**
  - Manual data transfer

- **EXL**
  - Manual data transfer

- **IDSR 001A**
  - IDSR 001B

- **sormas**
Personas / Users of SORMAS

**Detect**
notification, screening

- **Community Informant**
  - Refers suspect cases in community to hospital informant

- **Hospital Informant**
  - Notifies suspect cases

- **Point of Entry Officer**
  - Notifies suspect cases at airports, ports and border crossing

- **Rumour Officer**
  - State DSNO
  - Receives calls on events from general population

**Investigate**
validation, analysis

- **Surveillance Officer**
  - LGA-DSNO
  - Investigates case, identifies contact persons

- **Surveillance Supervisor**
  - State epidemiologist
  - Coordinates surveillance officers

- **Laboratory Officer**
  - Documents and reports laboratory results

**Control**
treatment, containment

- **Case Officer**
  - Executes case based control measures (e.g., isolation)

- **Case Supervisor**
  - MD, head of isolation facility
  - Coordinates case based control measures

- **Contact Officer**
  - Assistant LGA-DSNO
  - Conducts follow-up of contact persons

- **Supranational Centre**
  - Regional CDC, WAHO, WHO
  - International coordination

- **Contact Supervisor**
  - State epidemiologist
  - Coordinates follow-up of contact persons

**Supranational Centre**
International coordination

**National CDC**
Incident Command Centre
Assesses risk, coordinates national response

**Case Supervisor**
State epidemiologist
Coordinates surveillance officers

**Surveillance Officer**
LGA-DSNO
Investigates case, identifies contact persons

**Laboratory Officer**
Documents and reports laboratory results

**Contact Officer**
Assistant LGA-DSNO
Conducts follow-up of contact persons

**Surveillance Supervisor**
State epidemiologist
Coordinates surveillance officers

**Point of Entry Officer**
Notifies suspect cases at airports, ports and border crossing

**Rumour Officer**
State DSNO
Receives calls on events from general population

**Hospital Informant**
Notifies suspect cases
Persona Profile: Laboratory Officer

Tasks
• Receives collected specimens from suspected cases from Surveillance supervisor
• Coordinates the laboratory sampling procedure and collection of results in hers/his respective laboratory
• Documents tests done, test results and gives feedback to Surveillance supervisor
• Coordinates specimen referrals for higher level laboratories when needed

Needs
• to get informed about incoming samples from surveillance supervisor
• to acknowledge the received samples
• to enter the information on the samples
• to have line list of tested specimens with results

Interaction/Dependencies with/other personas
• Surveillance supervisor

Artefacts (Input/Output)
• Laboratory investigation form
Response Management in SORMAS (e.g. Ebola)

- **Objectives**: Digital, Mobile Outbreak Detection & Response
  - management
  - sustainability
  - scalability
  - clinical
  - early warning & analysis
  - mobile, offline & bi-directional surveillance
  - outbreak response management analysis system

---

**Detect** notification, screening
- Community Informant
- Hospital Informant
- Citizen Hotline
- Rumor Officer
- Port of Entry Officer

**Investigate** validation, analysis
- Laboratory officer
- Surveillance officer
- Surveillance supervisor

**Control** treatment, containment
- Case Supervisor
- Contact Supervisor
- Case Officer
- Contact Officer

---

[Diagram showing the flow of information and response process]
Process model Ebola virus - contact follow-up
Process Models for Disease Specific Control Measures

**Coronavirus**

- search of contact persons
- symptom monitoring
- home quarantine

**VECTOR CONTROL**
- vector traps
- treatment of breeding sites
- residential spraying

**ENVIRONMENTAL SANITATION**
- environmental samples
- alternative supply
- access control or recall

**Emerging Disease X**
- Lassa
- Rabies

Corona
Guinea worm
SORMAS Coronavirus Module (mobile offline and web online)
Process Models for Disease Specific Control Measures

VECTOR CONTROL

PLAQUE

ENVIRONMENTAL SANITATION

CLINICAL MANAGEMENT
Process Models for Disease Specific Control Measures
SORMAS Deployment in 3 Simultaneous Outbreaks

November 2017 - July 2018
Monkeypox Outbreak
- 8 Federal states
- 33 Districts

January - March 2018
Bacterial Meningitis Outbreak
- 8 Federal states
- 33 Districts

February - April 2018
Lassa Fever Outbreak
- 3 Federal states
- 49 Districts

As of October 2019:
Continuous Operation in
- 15 Federal States
- 287 Districts
- \(\approx 75\) Million population covered
SORMAS Implementation in Ghana

- Start November 2019
- 40 Districts in 2 Regions
- Private Public Partnership
Technical and Organizational Interoperability of SORMAS
Technology Stack of SORMAS

- **UNIX System UBUNTU LTS 16 Server 16GB RAM, HDD efficient, 500GB**
- **Data Backup** (separate system storage from the scripts using CRON JOB scripts)
- **Vaadin** Web Client (vaadin.org)
- **JAVA** EE Server Payara
- **POSTGRES SQL** Database (pgadmin)
- **CRONJOB Service** Backup
- **Android OS 5.0 and above**
- **Open Street Map**
- **Codes and Roadmap on GitHub**
Systematic Review on mHealth Tools for Surveillance and Outbreak Response for Viral Hemorrhagic Fevers

Sources
- Google Scholar, MEDLINE, CAB Abstracts, Popline, Web of Science

Search strategy
- 01.01.2014 - 31.12.2015
- any language
- "Outbreak" OR "Epidemic") AND ("mobile phone" OR "smartphone" OR "smart phone" OR "mobile phone" OR "tablet" OR "mHealth") AND ("Ebola" OR "EVD" OR "VHF" OR "Ebola Virus Disease" OR "viral hemorrhagic fever"

Result
- 1,220 publications manually screened
- 77 (6%) publications identified as relevant and original
- 58 mHealth tools for surveillance of hemorrhagic fevers
- 3 tools (ComCare, Ebola SenseFollowup, SORMAS)
  - surveillance
  - contact tracing
  - case management
  - laboratory data
- only SORMAS covers
  - >12 epidemic prone diseases
  - ad-hoc process models
  - task management

Tom-Aba et al, JMIR Public Health and Surveillance, 2018
## Overview of functionalities of eSurveillance tools in Nigeria

<table>
<thead>
<tr>
<th>INDICATORS</th>
<th>SORMAS</th>
<th>DHIS2</th>
<th>EWARS</th>
<th>EWORS</th>
<th>AVADAR</th>
<th>eIDSR</th>
<th>ARGUS</th>
<th>eSurveillance</th>
<th>mSERS</th>
<th>GO.DATA</th>
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</thead>
<tbody>
<tr>
<td>Number of states</td>
<td>15</td>
<td>37</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>?</td>
<td>?</td>
<td>37</td>
<td>37</td>
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<tr>
<td>Primarily short term use</td>
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<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Aggregate reporting</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<td>NO</td>
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<tr>
<td>Response process management</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Mobile app (YES/NO)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<td>YES</td>
<td>YES</td>
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<td>Case management (EMR)</td>
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<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
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</tr>
<tr>
<td>Contact tracing</td>
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<td>NO</td>
<td>?</td>
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<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Point of entry</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Multi-lingual platform</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>
### Case-Based versus Aggregate Notification

<table>
<thead>
<tr>
<th>Aggregate Reporting</th>
<th>Case Based Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantage</strong></td>
<td><strong>Disadvantage</strong></td>
</tr>
<tr>
<td>+ Little training need</td>
<td>- Delay</td>
</tr>
<tr>
<td>+ Short data entry</td>
<td>- No updates &amp; corrections</td>
</tr>
<tr>
<td></td>
<td>- Lack of detail</td>
</tr>
<tr>
<td></td>
<td>- No risk assessment</td>
</tr>
<tr>
<td></td>
<td>- No quality control</td>
</tr>
<tr>
<td></td>
<td>- No individual response</td>
</tr>
<tr>
<td></td>
<td>- No migration to case based</td>
</tr>
<tr>
<td><strong>Advantage</strong></td>
<td><strong>Disadvantage</strong></td>
</tr>
<tr>
<td>+ No Delay</td>
<td>- More training need</td>
</tr>
<tr>
<td>+ Enables updates &amp; corrections</td>
<td>- Longer data entry</td>
</tr>
<tr>
<td>+ Detailed</td>
<td></td>
</tr>
<tr>
<td>+ Facilitates risk assessment</td>
<td></td>
</tr>
<tr>
<td>+ Allows quality control</td>
<td></td>
</tr>
<tr>
<td>+ Allows response management</td>
<td></td>
</tr>
<tr>
<td>+ Can migrate to aggregation</td>
<td></td>
</tr>
</tbody>
</table>

#### Hybrid Reporting

- **aggregate reporting (DHIS2)**
- **hybrid case based reporting (SORMAS)**
- **case based reporting (SORMAS)**
<table>
<thead>
<tr>
<th>Indicator</th>
<th>SORMAS</th>
<th>DHIS2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveillance Notification</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Outbreak response</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Case Management (Patient)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Contact tracing</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Follow up visits &amp; Automatic Scheduling</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Visualization &amp; Analysis</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Lab Sample Management</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic Task management</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Integrated User Work flow</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Disease process model</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Case Based Surveillance</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Automated Message Reminder</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automated Aggregation</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic Case Classification</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Interactive Epidemiological Maps (cases, contacts, events)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Event Surveillance (rumor management, persons involved)</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Complementarity between openHIE, DHIS2 and SORMAS

**Open Health Information Exchange**
- **Objective:** development and support health information architecture
- **Scope:** all health related events
- **Primary customer:** owners and developers of health information systems

**District Health Information System**
- **Objective:** collection, warehousing, visualization & analysis of health information
- **Scope:** all health related events
- **Primary customer:** policy makers

**Surveillance Outbreak Response Management and Analysis System**
- **Objective:** outbreak detection, process management of control measures, analysis
- **Scope:** infectious diseases
- **Primary customer:** public health service
DHIS2 SYSTEM

SORMAS SYSTEM

INTEROPERABILITY ENGINE LAYER

DHIS2 FHIR ADAPTER

SORMAS FHIR ADAPTER

INFRASTRUCTURE DATA

DHIS2 SERVER

SORMAS SERVER
Training Materials for SORMAS

**Instructional Cartoon Videos**
- Surveillance Supervisor
- Contact Officer
- Contact Supervisor
- Hospital Informants
- Surveillance Officer

https://www.youtube.com/watch?v=0vTKZy78-vg – Surveillance Supervisor
https://www.youtube.com/watch?v=YCA_0K46dpE&t=43s – Contact Officer
https://www.youtube.com/watch?v=i7jโต/VNtEPQ&t=11s – Contact Supervisor
https://www.youtube.com/watch?v=it2ve1ARP8U – Hospital Informants
https://www.youtube.com/watch?v=VI1k-84d-0&t=65s – Surveillance Officer

**Didactic Lectures**

**Interactive Training Scenarios**

**Trouble Shooting Guide**

**User Manual**
Repetitive User Survey among SORMAS Users, Nigeria 2018

How does SORMAS change your workload?

February 2018 
n=35

- Less workload using SORMAS: 57%
- Same workload using SORMAS: 17%
- More workload using SORMAS: 26%

March 2018 
n=39

- Less workload using SORMAS: 64%
- Same workload using SORMAS: 18%
- More workload using SORMAS: 8%

April 2018 
n=26

- Less workload using SORMAS: 88%
- Same workload using SORMAS: 4%
- More workload using SORMAS: 8%
Increasing Performance upon Deployment

Four-month-intervals after implementation of SORMAS
N= 15491 reports of 5 diseases in 10 states in Nigeria

1-4 months
5-8 months
9-12 months
13-16 months

76%
98%

16 months follow-up
Global Good Maturity Model for Digital Health Software

Global Utility

Community Support

Software Maturity

Progress of Global Good Maturity Score of SORMAS:
full score as of July 2019

Progress of Global Good Maturity Score of SORMAS: full score as of July 2019

Acknowledgements to all Partners, Sponsors, Advisors and Contractors

**Partners**
- African Field Epidemiology Network (AFENET)
- Centers for Disease Control and Prevention (CDC)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- Digital Square
- Ghana Community Network Services Limited (GCNET)
- Ghana Health Service (GHS)
- Helmholtz Center for Infection Research (HZI) [lead]
- Nigerian Centre for Disease Control (NCDC)
- University College London (UCL)
- University of Maryland Baltimore, Nigeria (UMB)

**Sponsors**
- Basic Healthcare Provision Fund Nigeria (BHCF)
- Bill and Melinda Gates Foundation (BMG)
- Centers for Disease Control and Prevention (CDC)
- Centre for Infection Research (DZIF)
- European Union (EU)
- German Federal Ministry for Economic Cooperation and Development (BMZ)
- German Federal Ministry for Education and Research (BMBF)
- Helmholtz Center for Infection Research (HZI)
- Helmholtz Association (HGF)
- WHO-Country Office Nigeria
- World Bank

**Advisors**
- Africa Centers for Disease Control (Africa CDC)
- Centers for Disease Control and Prevention
- DHIS2 Design Lab, University of Oslo
- Hasso Plattner Institute (HPI)
- Kreditanstalt für Wiederaufbau (KfW)
- Robert Koch Institute (RKI)
- University Braunschweig (TU)
- West African Health Organization (WAHO)
- World Health Organization (WHO-HQ)

**Contractors**
- Symeda
- Scigraphix
- Crowdcode
- Mirabilia
- Elektro- & Datentechnik
Strategy on Future Concepts and Methods in SORMAS

- Tuberculosis
  + 32 additional diseases
- Regional Center for Surveillance and Disease Control (RCSDC) of WAHO/CEDEAO
- Vaccination campaign & vigilance
- Antimicrobial resistance monitoring
- Molecular surveillance
- Predictive analytics & epidemic intelligence
Challenges and Measures to Overcome them

⚠️ Variable competency in disease control at local level
✔️ Interactive algorithms serve training and supervision
✔️ Training portfolio covers more than just SORMAS

⚠️ Low contribution from industry (data bundles, hardware)
✔️ Negotiations between GAVI and telecom industry
✔️ Private Public Partnership (example Ghana)

⚠️ Inappropriate private use of data plans by users (whatsapp, youtube)
✔️ Complete block of non-related apps
✔️ Considering in-built messenger service

⚠️ Weak and irregular internet connectivity via mobile phone net
✔️ Development of novel “LBDS”-technology (Low Bandwidth Database Synchronization)

⚠️ Duplicate parallel initiatives in eSurveillance
✔️ Full transparency of road map in SORMAS
✔️ Expansion of diseases in SORMAS
✔️ Back-up option for aggregate entry
✔️ Concept for integration of tools
✔️ Adherence to common standards
✔️ Intensive exchange between groups
Peer Reviewed Scientific Publications on or from SORMAS


Risks and challenges resulting from multiple parallel digital tools

- Duplication of separate data collection increases data discrepancies
- Duplication of workload for local officers
- Risk for incompleteness in all systems
- Unnecessary expenses for
  - Training
  - Hardware
  - Data plans
  - Data transfer
  - Quality control
  - Software maintenance, security measures, support
Envisioned diseases for immediate case based notification in Nigeria and digital implementation

### Aggregate weekly (11) Envisioned

<table>
<thead>
<tr>
<th>Code</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAL</td>
<td>Malaria</td>
</tr>
<tr>
<td>TYF</td>
<td>Typhoid fever</td>
</tr>
<tr>
<td>AVH</td>
<td>Acute viral hepatitis</td>
</tr>
<tr>
<td>NNT</td>
<td>Non-neonatal tetanus</td>
</tr>
<tr>
<td>HIV</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>SCH</td>
<td>Schistosomiasis</td>
</tr>
<tr>
<td>STH</td>
<td>Soil transmitted helminths</td>
</tr>
<tr>
<td>TRY</td>
<td>Trypanosomiasis</td>
</tr>
<tr>
<td>DWD</td>
<td>Diarrhea with dehydration (&lt;5)</td>
</tr>
<tr>
<td>DWB</td>
<td>Diarrhoea with Blood (Shigella)</td>
</tr>
<tr>
<td>SNB</td>
<td>Snake bite</td>
</tr>
</tbody>
</table>

### Aggregate monthly (9) Envisioned

<table>
<thead>
<tr>
<th>Code</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEF</td>
<td>Adverse event follow. immunisation (AEFI)</td>
</tr>
<tr>
<td>DIM</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>EPL</td>
<td>Epilepsy</td>
</tr>
<tr>
<td>HYP</td>
<td>Hypertension</td>
</tr>
<tr>
<td>SCD</td>
<td>Sickle cell disease</td>
</tr>
<tr>
<td>INJ</td>
<td>Injuries (road traffic accidents)</td>
</tr>
<tr>
<td>MNU</td>
<td>Malnutrition (&lt;5 Y)</td>
</tr>
<tr>
<td>SPN</td>
<td>Severe pneumonia (&lt;5 Y)</td>
</tr>
<tr>
<td>STI</td>
<td>Sexually transmitted infections</td>
</tr>
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</table>

### Aggregate digital weekly (11) To be added into SORMAS

<table>
<thead>
<tr>
<th>Code</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAL</td>
<td>Malaria</td>
</tr>
<tr>
<td>TYF</td>
<td>Typhoid fever</td>
</tr>
<tr>
<td>AVH</td>
<td>Acute viral hepatitis</td>
</tr>
<tr>
<td>NNT</td>
<td>Non-neonatal tetanus</td>
</tr>
<tr>
<td>HIV</td>
<td>HIV/AIDS</td>
</tr>
<tr>
<td>SCH</td>
<td>Schistosomiasis</td>
</tr>
<tr>
<td>STH</td>
<td>Soil transmitted helminths</td>
</tr>
<tr>
<td>TRY</td>
<td>Trypanosomiasis</td>
</tr>
<tr>
<td>DWD</td>
<td>Diarrhea with dehydration (&lt;5)</td>
</tr>
<tr>
<td>DWB</td>
<td>Diarrhoea with Blood (Shigella)</td>
</tr>
<tr>
<td>SNB</td>
<td>Snake bite</td>
</tr>
</tbody>
</table>

### Aggregate monthly (9) already covered in DHIS2

<table>
<thead>
<tr>
<th>Code</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEF</td>
<td>Adverse event follow. immunisation (AEFI)</td>
</tr>
<tr>
<td>DIM</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>EPL</td>
<td>Epilepsy</td>
</tr>
<tr>
<td>HYP</td>
<td>Hypertension</td>
</tr>
<tr>
<td>SCD</td>
<td>Sickle cell disease</td>
</tr>
<tr>
<td>INJ</td>
<td>Injuries (road traffic accidents)</td>
</tr>
<tr>
<td>MNU</td>
<td>Malnutrition (&lt;5 Y)</td>
</tr>
<tr>
<td>SPN</td>
<td>Severe pneumonia (&lt;5 Y)</td>
</tr>
<tr>
<td>STI</td>
<td>Sexually transmitted infections</td>
</tr>
</tbody>
</table>
## Envisioned diseases for immediate case based notification in Nigeria and digital implementation

### Case based IDSR (24)

**Envisioned**

- CSM - Cerebrospinal Meningitis
- CLR - Cholera
- MEA - Measles
- YWF - Yellow Fever
- LAF - Lassa fever
- DEF - Dengue
- INS - Influenza new subtype
- GUW - Guinea Worm
- AFP - Acute flaccid paralysis
- MPX - Monkeypox
- RAB - Dog bites (Rabies)
- RUV - Rubella
- TUB - Tuberculosis
- LEP - Leprosy
- LYF - Lymphatic filariasis
- BUU - Buruli ulcer
- PER - Pertussis
- NTE - Neonatal tetanus
- ONC - Onchocerciasis
- DOP - Diphteria
- TRA - Trachoma
- YAW - Yaws and endemic syphilis
- MAD - Maternal deaths
- PED - Perinatal deaths

### Aggregate digital (8)

**already in MSERS 2019**

- CSM - Cerebrospinal Meningitis
- CLR - Cholera
- MEA - Measles
- YWF - Yellow Fever
- LAF - Lassa fever (VHF)
- INS - Influenza new subtype
- GUW - Guinea Worm
- AFP - Acute flaccid paralysis

### Case based A (13)

**already digital in SORMAS 2019**

- CSM - Cerebrospinal Meningitis
- CLR - Cholera
- MEA - Measles
- YWF - Yellow Fever
- LAF - Lassa fever
- DEF - Dengue
- INS - Influenza new subtype
- GUW - Guinea Worm
- AFP - Acute flaccid paralysis
- MPX - Monkeypox
- RAB - Dog bites (Rabies)
- RUV - Rubella (congen. synd.)
- EVD - Ebola
- ANT - Anthrax
- PLA - Plague

### Case based B (13)

**to be added into SORMAS 2020**

- RUV - Rubella
- TUB - Tuberculosis
- LEP - Leprosy
- LYF - Lymphatic filariasis
- BUU - Buruli ulcer
- PER - Pertussis
- NTE - Neonatal tetanus
- ONC - Onchocerciasis
- DOP - Diphteria
- TRA - Trachoma
- YAW - Yaws and endemic syphilis
- MAD - Maternal deaths
- PED - Perinatal deaths
Transition & Integration Phases for Digitalization of Case Based Surveillance in Nigeria

Status Quo (duplication):
- Total of envisioned case based: 24 diseases
- overlap and redundancy between MSERS and SORMAS: 6-8 diseases
- Case based missing in any of the digital systems: 12 diseases

Phase 1 (alignment and integration):
- SORMAS adds case based GW & AFP: 12 +2 diseases
- SORMAS includes mSERS-app for aggregate notification: 20 diseases
- MSERS adds all aggregate diseases: 22 diseases
- Wherever SORMAS runs:
  - aggregate diseases are entered in SORMAS via mSERS app
  - only one mobile device needed per LGA

Phase 2 (transition):
- SORMAS adds all remaining case based diseases: 24+3 diseases
- SORMAS covers all remaining diseases as aggregate: 11 diseases
- MSERS covers all diseases as aggregate: 34 diseases
- Wherever SORMAS runs:
  - only one mobile device needed per LGA
  - integrated mSERS app via SORMAS for remaining aggregate diseases
  - Excel optional

Phase 3 (full integration):
- SORMAS covers all case based diseases: 24+2 diseases
- integrated mSERS app via SORMAS for all aggregate diseases: 11 diseases
- Paper based optional as back up
Transition & Integration Phases for Digitalization of Case Based Surveillance in Nigeria

Number of states implemented

Status quo

Duplication

= case based

= aggregate
Transition & Integration Phases for Digitalization of Case Based Surveillance in Nigeria

Number of states implemented

Status quo

Duplication

Integration Phase 1

Alignment & Upgrade

Excel | Paper | mSERS

CSM  | CSM  | CSM  |
CLR  | CLR  | CLR  |
MEA  | MEA  | MEA  |
YWF  | YWF  | YWF  |
LAF  | LAF  | LAF  |
DEF  | DEF  | DEF  |
INS  | INS  | INS  |
GUW  | GUW  | GUW  |
RAB  | RAB  | RAB  |
RUV  | RUV  | RUV  |
TUB  | TUB  | TUB  |
LEP  | LEP  | LEP  |
LYF  | LYF  | LYF  |
BUU  | BUU  | BUU  |
PER  | PER  | PER  |
NTE  | NTE  | NTE  |
ONC  | ONC  | ONC  |
DOP  | DOP  | DOP  |
TRA  | TRA  | TRA  |
YAW  | YAW  | YAW  |
MAD  | MAD  | MAD  |
PED  | PED  | PED  |
MAL  | MAL  | MAL  |
TYF  | TYF  | TYF  |
NNT  | NNT  | NNT  |
HIV  | HIV  | HIV  |
SCH  | SCH  | SCH  |
STH  | STH  | STH  |
TRY  | TRY  | TRY  |
DWD  | DWD  | DWD  |
DWB  | DBW  | DBW  |
SNB  | SNB  | SNB  |

Excel | Paper | mSERS

CSM  | CSM  | TUB  |
CLR  | CLR  | LEP  |
MEA  | MEA  | MAL  |
YWF  | YWF  | LYF  |
LAF  | LAF  | TYF  |
DEF  | DEF  | AVH  |
INS  | INS  | PER  |
GUW  | GUW  | NNT  |
RAB  | RAB  | NTE  |
RUV  | RUV  | HIV  |
TUB  | TUB  | YAW  |
LEP  | LEP  | DWD  |
LYF  | LYF  | DWB  |
BUU  | BUU  | SNB  |
PER  | PER  | PED  |
NTE  | NTE  | MAL  |
ONC  | ONC  | TYF  |
DOP  | DOP  | NNT  |
TRA  | TRA  | HIV  |
YAW  | YAW  | SCH  |
MAD  | MAD  | STH  |
PED  | PED  | SCH  |
MAL  | MAL  | TRY  |
TYF  | TYF  | DWD  |
NNT  | NNT  | TRY  |
HIV  | HIV  | DWD  |
SCH  | SCH  | DWB  |
STH  | STH  | DBW  |
TRY  | TRY  | SNB  |
DWD  | DWD  | CSM  |
DWB  | DBW  | CLR  |
SNB  | SNB  | MEA  |

= case based
= aggregate
Transition & Integration Phases for Digitalization of Case Based Surveillance in Nigeria

Status quo
Duplication

Alignment & Upgrade
Integration Phase 1

Integration Phase 2
Transition

Number of states implemented

= case based
= aggregate
Transition & Integration Phases for Digitalization of Case Based Surveillance in Nigeria

**Status quo**
- Duplication

**Integration Phase 1**
- Alignment & Upgrade

**Integration Phase 2**
- Transition

**Integration Phase 3**
- Full Integration

---

**Number of states implemented**

- Excel
- Paper
- mSERS
- sormas

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**Transition & Integration Phases for Digitalization of Case Based Surveillance in Nigeria**

**Duplication**
- Excel
- Paper
- mSERS
- sormas

**Alignment & Upgrade**
- Excel
- Paper
- mSERS
- sormas

**Transition**
- Excel
- Paper
- mSERS
- sormas

**Full Integration**
- Excel
- Paper
- mSERS
- sormas

---

**Legend**

- Green: = case based
- Red: = aggregate
Advantages of phased integration approach

- Digital aggregate reporting already improves timeliness, while case based digitalization is being developed
- Benefiting from added value of mSERS in
  - Competency in aggregate digital reporting
  - Country wide coverage
- Benefiting from added value of SORMAS in
  - Case based reporting
  - Bi-directional information exchange
  - Response management process
  - Established data feed into DHIS2
- Redundancy reduced in phases allows back-up option
- Resources reduced for
  - Hardware (Phase 1-3)
  - Data plans (Phase 1-3)
  - Manual data transfer into Excel (Phase 2-3)
  - Software maintenance, security measures, support (Phase 3)
- Use case for alignment and integration of other digital tools
Comprehensive data protection scheme & IT-security
iOS, Android, Web-application
Complex roles and specific access
Integration of bio-samples e.g. in case of infection
Real-time & personalized surveillance
New topics easily implemented
Gamification features
Feedback for participants
Mobile eResearch System
PIA – App: Prospective Assessment of Incident Health Events

- Real-time reporting
- Monitoring of symptoms and medications
- Symptoms?
- Vaccinations? Travel?
- Weekly questionnaire

- Diabetes
- Lung
- Allergy
- Heart
- Mental Health
- Cancer
ODK is open-source mobile data collection software

- **ODK Collect**: Offline-first mobile client
  - Powerful logic for validation and branching
  - Variety of widgets (multimedia, file upload, external apps)
  - Rich forms with multiple languages and embedded videos
  - Audit support (background GPS, change tracking)
  - On-device mapping of data (plus offline tiles)

- **ODK Central**: Hosted locally or in the cloud
  - High performance on low-cost hardware
  - Projects to organize users, forms, permissions
  - First-class support for XLSForm
  - Single-click managed encryption
  - OData feed and REST API for integration

- **Core tech powers a lot of data collection ecosystem**
  - Kobo, Ona, SurveyCTO, Survey123, LINKS, and more
ODK is actively used in most countries

Mobile client sessions from last 30 days (Nov 2019)
ODK is trusted at scale in the health sector

- WHO: Collects the world’s polio immunization and surveillance data
- PMA2020: Monitors key health indicators in nine sentinel countries
- LSHTM: Measures the efficacy of the Ebola vaccine in DRC
- WHO: Records verbal autopsies that inform the global burden of disease
COVID-19 Response from Nafundi

- ODK is widely used in health and regularly deployed for surveillance and outbreak response. No code adaptations needed.
- We are digitizing forms from WHO, CDC, MOHs, protocols and making them available for others to use and build on.
- We are offering pro-bono help to orgs working on the response. Use ODK for contact tracing, decision support, etc. Your data, your infrastructure.
- Incoming requests range from large-scale clinical trials, real-time monitoring of clinics, case-based reporting, animal disease surveillance.
- Email yanokwa@nafundi.com to get started.
Demo

- **WHO’s COVID-19 Minimum reporting form** - [https://forum.opendatakit.org/t/25647](https://forum.opendatakit.org/t/25647)
  - Converted into XLSForm to be used in any ODK compatible system
  - Added logic to ensure higher data quality and reduce data entry
  - Added multiple languages for broader adoption
- **Data can be sent from ODK Collect (Android) or Enketo (web)**
  - Use whatever client works best for your use-case
  - Both work offline and support most important features
- **ODK Central (server) stores data and makes it available for dashboards**
  - $10 VPC can comfortably handle millions of submissions
  - Live-updating dashboards in Excel, PowerBI, R, CKAN
  - REST API for even more integration
Digital Square on LinkedIn

Follow our new LinkedIn page!
https://www.linkedin.com/company/digital-square-at-path
Thank you!