SORMAS® - Surveillance Outbreak Response Management and Analysis System
How it may contribute to EIOS

Gérard Krause
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
Personas / Users of SORMAS

Detect
notification, screening

Investigate
validation, analysis

Control
treatment, containment

**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

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

**Surveillance Supervisor**
State epidemiologist
Coordinates surveillance officers

**Laboratory Officer**
Documents and reports laboratory results

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

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

**Case Officer**
Executes case based control measures (eg. isolation)

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

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

**Contact Supervisor**
State epidemiologist
Coordinates follow-up of contact persons
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 Surveillance & Response Management Analysis System**

- Early warning & analysis
- Mobile, offline & bi-directional
- Laboratory integration
- Sustainabilty
- Scalability
- Clinical management
- Case Supervisor
- Contact Supervisor
- Case Officer
- Contact Officer

**Detect**
- notification, screening

**Investigate**
- validation, analysis

**Control**
- treatment, containment
Process Models for Disease Specific Control Measures

- search of contact persons
- symptom monitoring
- home quarantine
- search of contact persons
- preventive treatment
- symptom monitoring
- vector traps
- treatment of breeding sites
- residential spraying
- animal surveillance
- veterinary diagnostics
- culling
- coverage survey
- catch-up vaccination
- ring vaccination
- environmental samples
- alternative supply
- access control or recall

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

Yinka-Ogunleye, Lancet Infectious Diseases 2018

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
- ≈75 Million population covered
Deployment of SORMAS in Ghana

**Ghana**
- Pilot in 35 districts in 2 Regions

- Ghana-specific SORMAS version programmed in Ghana
  - Minor adaptations to country specific situation
  - Anthrax added
  - Rabies /animal bite added

**Private Public Partnership**
- Ghana Health Service (GHS)
- Ghana Community Network Services Limited (GCNet)
- Helmholtz Centre for Infection Research (HZI)
Increasing Performance upon Deployment

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

- 16 months follow-up

- 76% in 1-4 months
- 98% in 13-16 months
Training Materials for SORMAS

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

[Links to videos]
- https://www.youtube.com/watch?v=d0vTKZDr8-vg – Surveillance Supervisor
- https://www.youtube.com/watch?v=ycA_0J46dpE&t=43s – Contact Officer
- https://www.youtube.com/watch?v=7iJdTeEPQ&t=11s – Contact Supervisor
- https://www.youtube.com/watch?v=t2ve1ARR9U – Hospital Informants
- https://www.youtube.com/watch?v=nV1ik-84d-0&t=65s – Surveillance Officer

Didactic Lectures

Interactive Training Scenarios

Trouble Shooting Guide

User Manual
Global Good Maturity Model for Digital Health Software

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

SORMAS Deployment in 3 Simultaneous Outbreaks

November 2017 - July 2018
Monkeypox Outbreak
- 8 Federal states
- 33 Districts
Yinka-Ogunleye, Lancet Infectious Diseases 2018

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
- ~75 Million population covered
Contribution of SORMAS to EIOS

Detect
notification, screening

Investigate
validation, analysis

Control
treatment, containment

Community Informant
Hospital Informant
Citizen Hotline
Epidemic Intelligence Officer
Port of Entry Officer

Epidemic Intelligence From Open Sources
Strategy on Future Concepts and Methods in SORMAS

- Tuberculosis, Polio + 32 additional diseases
- Weather based algorithms
- Molecular surveillance
- Vaccination campaign & vigilance
- Antimicrobial resistance monitoring
- Verification within Epidemic Intelligence from Open Sources
Thank You

SORMAS Team

Nigeria
Chikwe Ihekweazu
Olawunmi Adeoye
Chinedu Arinze
Ferdinand Oyiri

Ghana
Franklin Asiedu-Bekoe
Alwin Högerle
Adriana Ignea

Germany
Gérard Krause
Juliane Dörrbecker
Bernard Silenou
Daniel Tom-Aba
Amanda Mühlmann
Christin Walter

Internet: www.sormas.org
E-mail: sormas@helmholtz-hzi.de
Facebook: facebook/sormas_open
Twitter: @sormas_open
GitHub: github.com/hzi-braunschweig/sormas-open
Demoversion: https://sormas.helmholtz-hzi.de
Integrated Disease Surveillance and Response System (IDSR)

Conventional Information Flow

WHO, ECOWAS, R-CDC

State/Regional Health Department

State/Regional Epidemiologist

National Centre for Disease Control

District/Local Government Area Health Dpt.

Disease Surveillance Notification Officer (DSNO)

Local Health Care Facilities

WHO, ECOWAS, R-CDC

Field investigator

Laboratory

IDSR 001A

IDSR 001B

Integrated Disease Surveillance and Response System (IDSR) System

Conventional Information Flow

- Field investigator: aggregated monthly (by Wednesday)
- Field investigator: aggregated weekly (by Tuesday)
- Case based weekly immediately

IDSR 001A

IDSR 001B
Integrated Disease Surveillance and Response System (IDSR) 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)
  - District / Local Government Area Health Dpt.
    - Disease Surveillance Notification Officer (DSNO)
      - aggregated weekly (by Monday)
      - case based weekly (by Monday)
      - case based Immediately

- Local Health Care Facilities

- Field investigator

- Laboratory

- manual data transfer

- sormas

- EXL

- manual data transfer
Open Source 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** Backup
- **Android OS 4.0** and above
- **Open Street Map**
- Codes and Roadmap on GitHub
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
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
Ebola Outbreak 2014/15: 28,646 Cases, 11,323 Deaths