COVID-19 Surveillance Webinar Series - June 8, 2020

Electronic Data Tools for COVID-19 Surveillance

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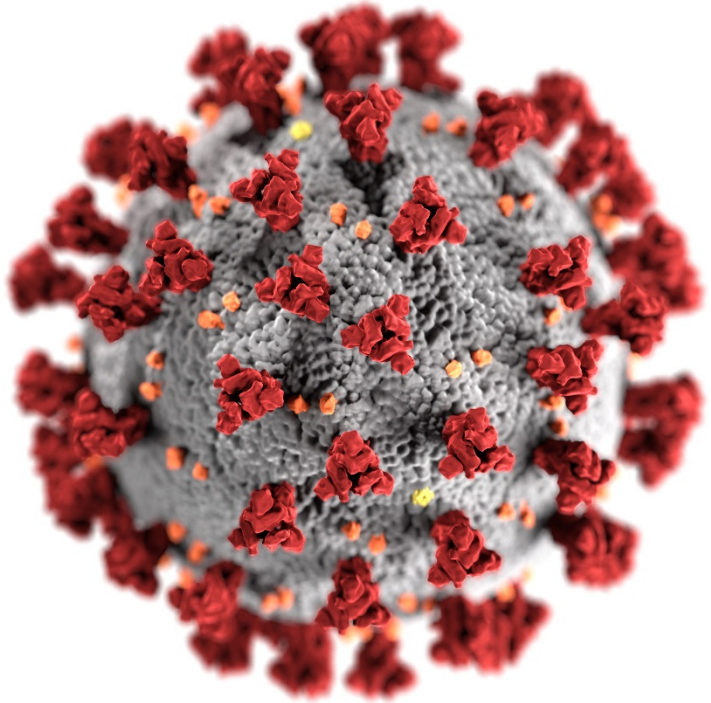


cdc.gov/coronavirus

Using Electronic Tools for Health Systems Strengthening

- Understand the surveillance goals and objectives
- Encourage use of electronic tools currently available in country
- Consider resources and skills in country
- Leverage available partnerships for implementation and resource sharing
- Pick the right tool for the job
- Focus on sustainability

Benefits of Electronic Data Tools

- Timely reporting and communication
- Reliable and concise record keeping
- Availability of data at multiple health system levels
- Completeness of data
- Standardized data collection
- Faster and improved analysis
- Hypothesis generation

Choose a Tool that Meets the Surveillance Objectives

Note: These are examples of tools that can be used for surveillance. There are many others not included in this presentation, and CDC does not endorse one tool over another.

Use of trade names is for identification only and does not imply endorsement by the Centers for Disease Control and Prevention or the U.S. Department of Health and Human Services.

District Health Information Software (DHIS2)

COVID-19 Package

Carl Kinkade
Epidemiology, Informatics, Surveillance, and Lab Branch
Division of Global Health Protection

DHIS2 Overview

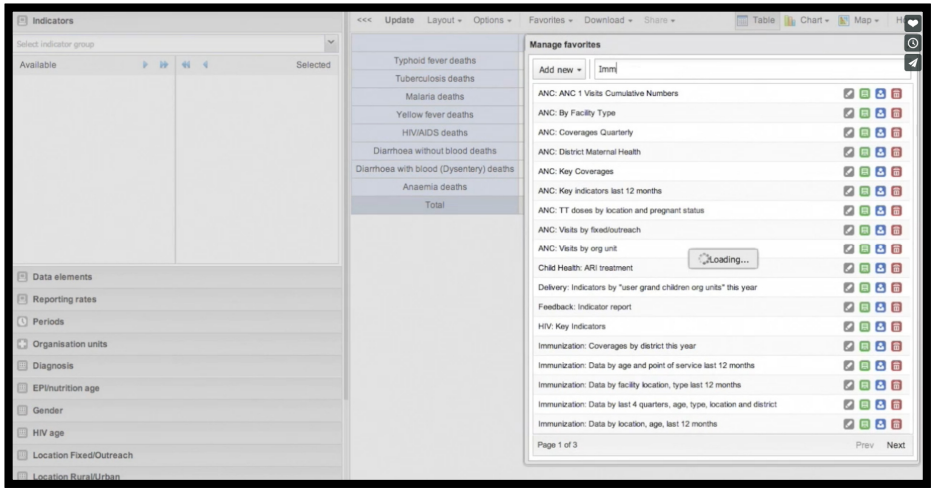
- World's largest health management information system (HMIS) platform, used by 72 low and middle-income countries covering 2.3 billion people
- Built and maintained by the University of Oslo's Department of Informatics
- Used across CDC Division work for President's Malaria Initiative (PMI), President's Emergency Plan for AIDS Relief (PEPFAR), Global Health Security Agenda (GHSA) for Integrated Disease Surveillance and Response (IDSR) and electronic IDSR, Global Immunization Division/GAVI/WHO for Vaccine Preventable Diseases (VPD), and routine surveillance via the HMIS across the globe

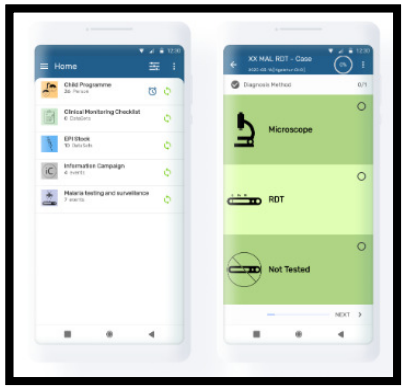
DHIS2 Overview

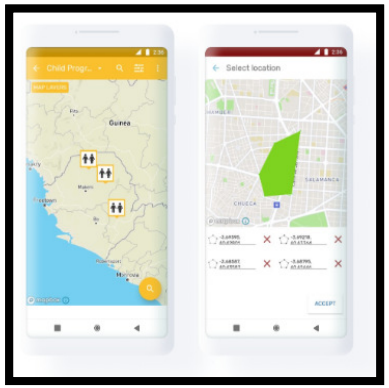
- Free and open source
- Real-time analysis and visualization
- Integrated SMS and Android data collection
- Established partner network in both the Health Information System Partners (HISP), implementing partners, and expert community of practice to provide support to countries
- Provides an online and in-person DHIS2 Academy to build capacity

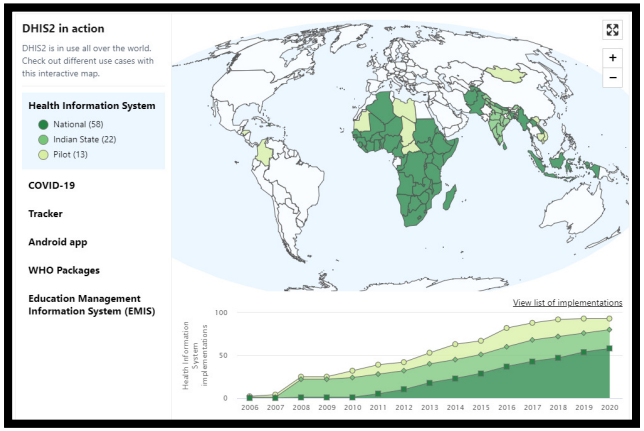
DHIS2 Overview

- Aggregate reporting from the facility
- Case-based reporting using tracker
- Multilingual
- Android collection tool
- Integrated SMS



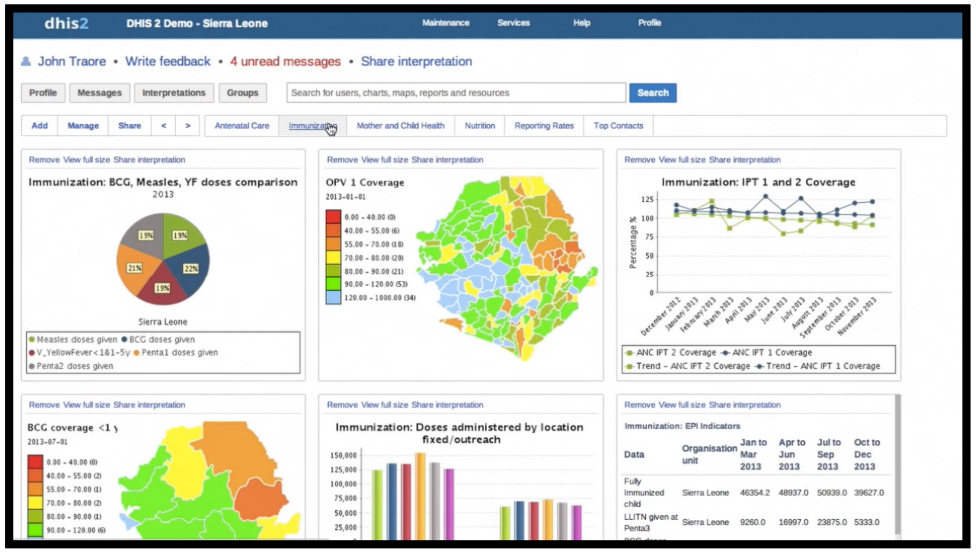


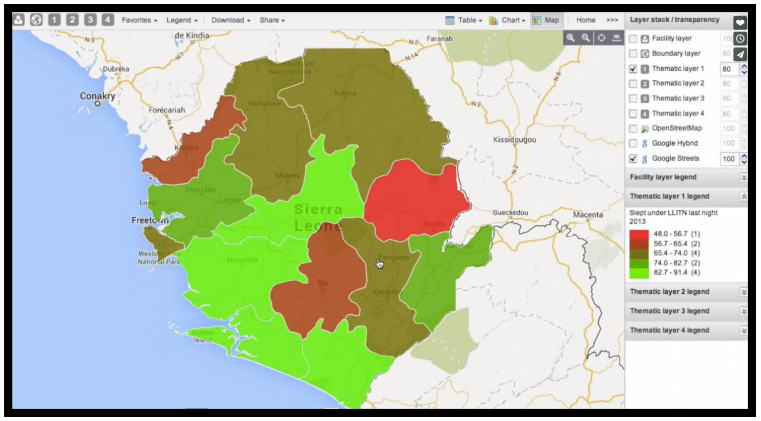


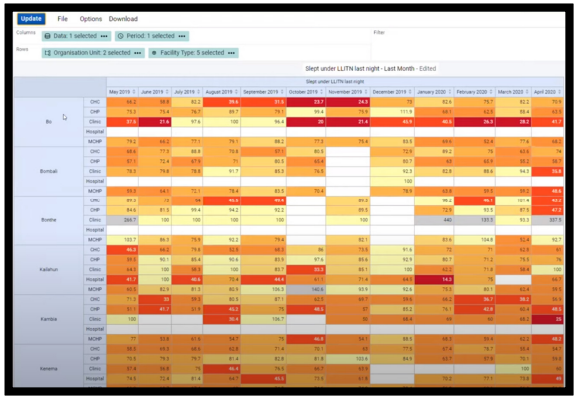


DHIS2 Overview

- GIS
- Analysis and data management
- OpenHIE compliant and interoperable with many other health Information systems (HIS)
- On premise or in the cloud
- Scorecards

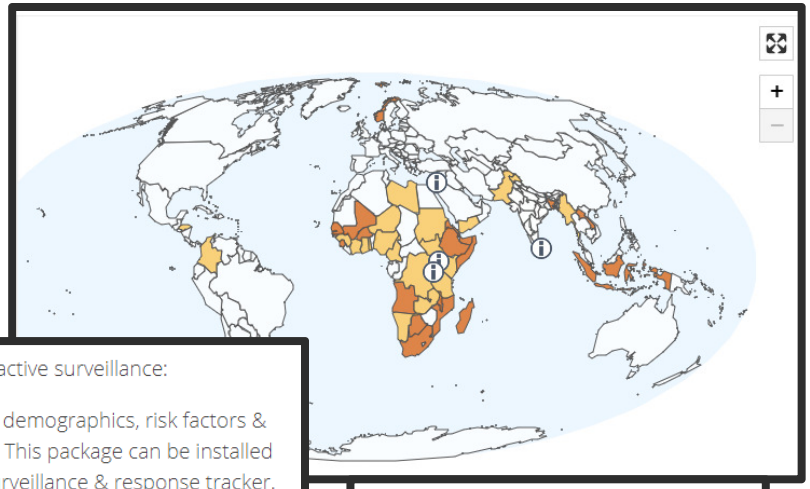






DHIS2 COVID-19 Package

- Operational in 27 countries
- In development in 23 countries



The packages support surveillance workflows and automated analysis for key components of routine and active surveillance:

- **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 or weekly reporting

All digital data packages are optimized for Android data collection with the DHIS2 Capture App, which is free to download on the Google Play store.

DHIS2 in action

DHIS2 is in use all over the world. Check out different use cases with this interactive map.

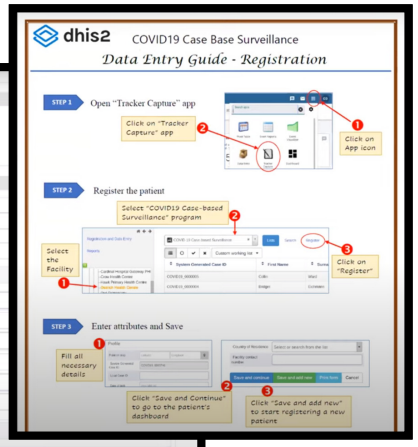
Health Information System

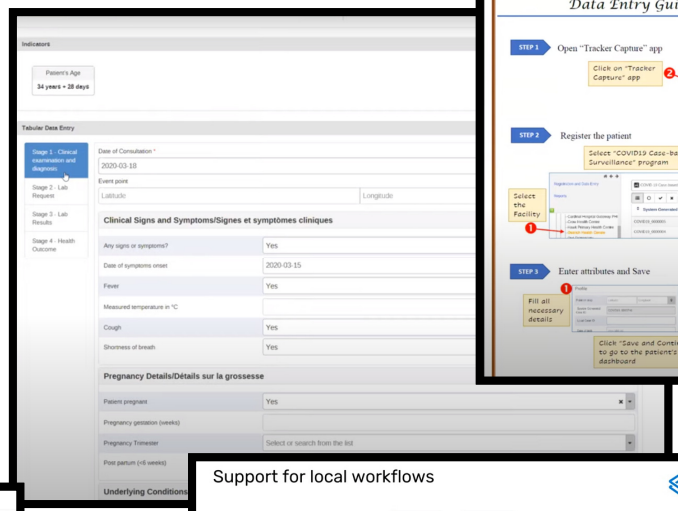
COVID-19

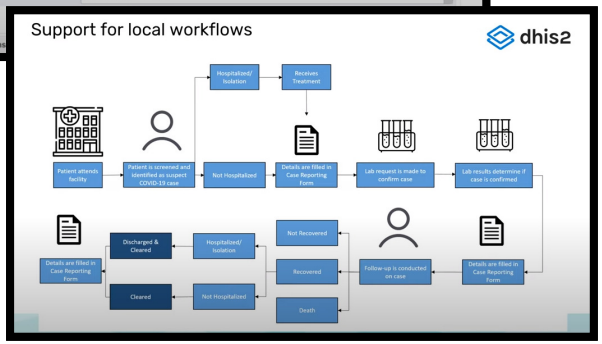
- Operational (27)
- In development (23)

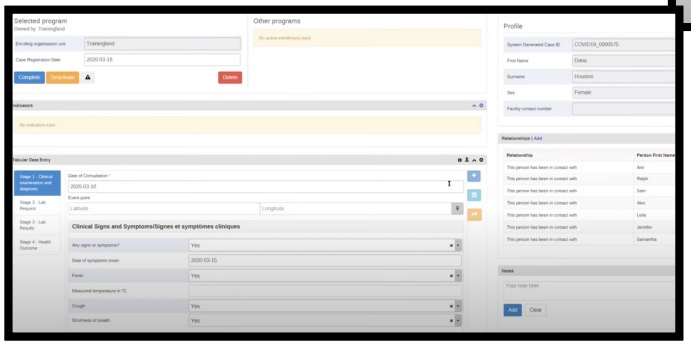
COVID-19 Package: Case-based and Aggregate Surveillance

- Supports local data flows and international OpenHIE standards for integration in other health information systems
- Multilingual
- Aggregate and case-based case surveillance tools
- Real-time field data collection into surveillance system
- Data entry guides for end users



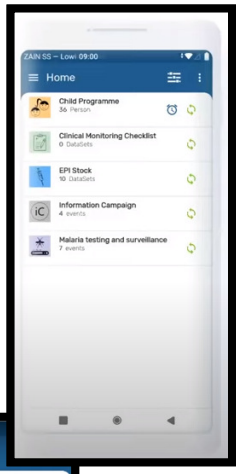


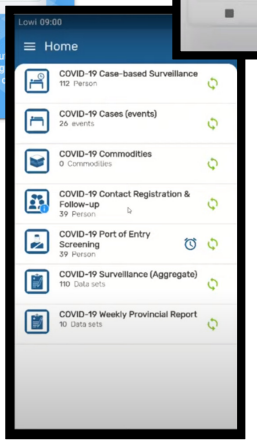


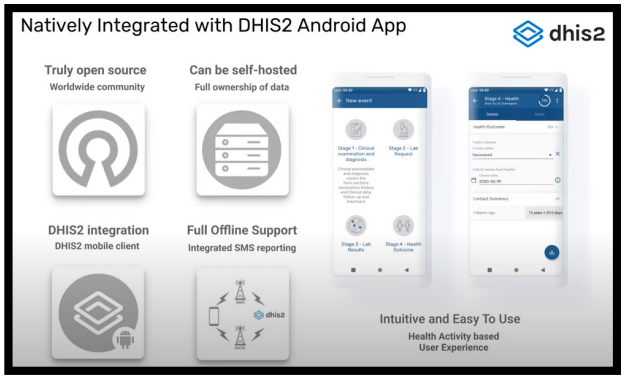


COVID-19 Package: Mobile Data Collection

- Android case management and contact tracing tool
- Android tools link to cases, contacts, commodities, ports of entry, aggregate reports, and weekly reports
- Real-time synchronization with Android data collection
- DHIS2 Android app in Google Play Store

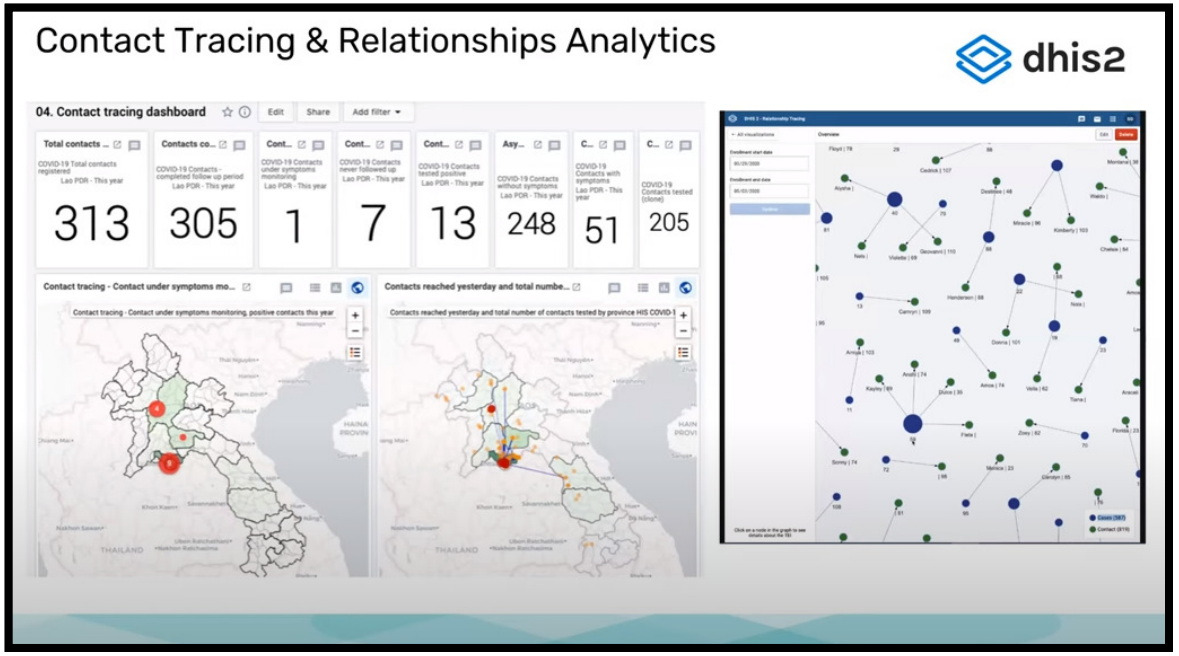






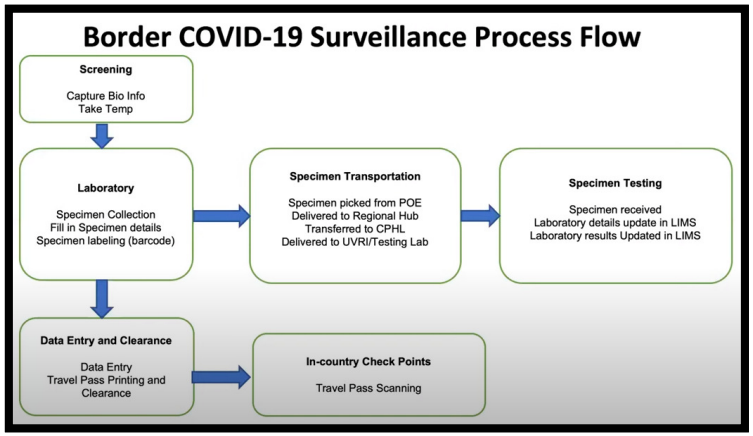
COVID-19 Package

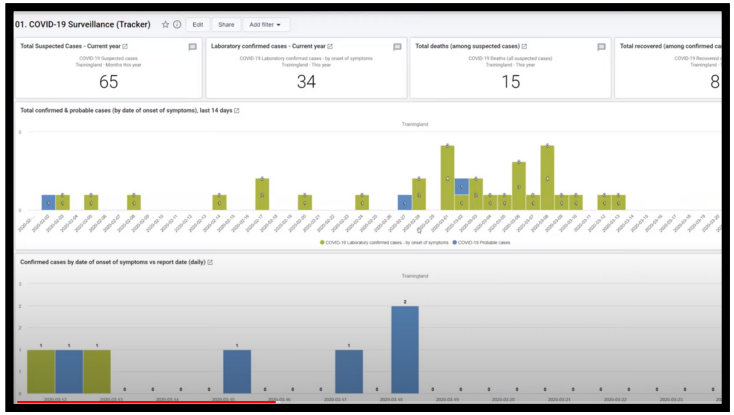
- Contact tracing visualization
- Integrated SMS
- GIS
- Analysis and data management

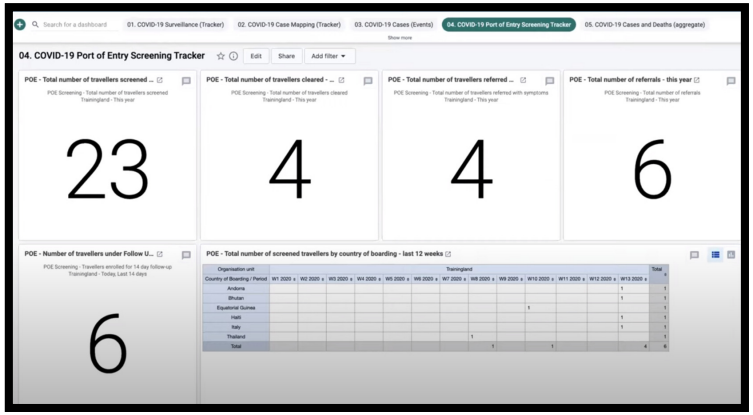


COVID-19 Package

- Ports of entry case-based instance, dashboard, and collection tools
- Specimen tracking
- Case management
- Interoperable with HMIS and other HIS platforms

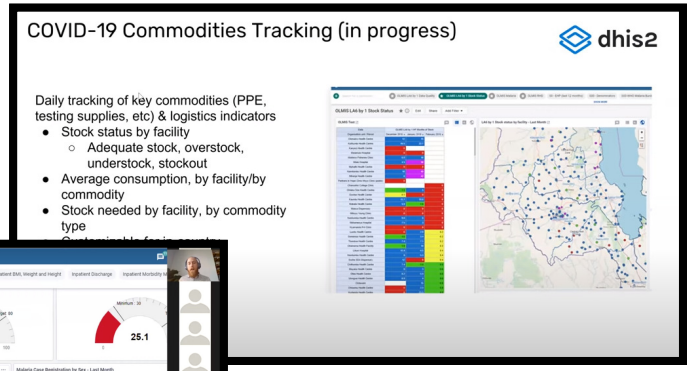


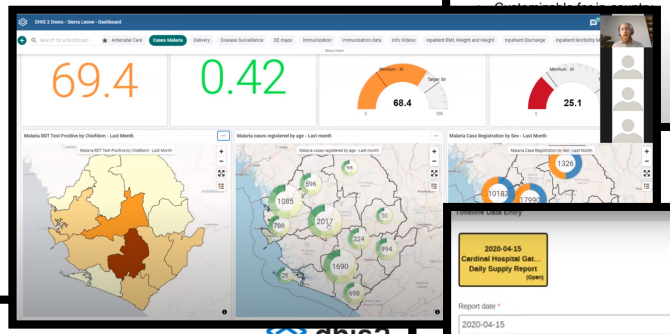


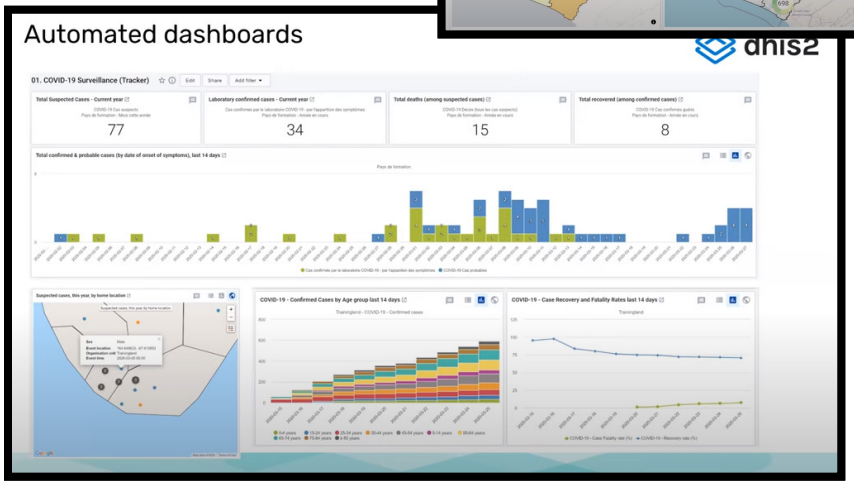


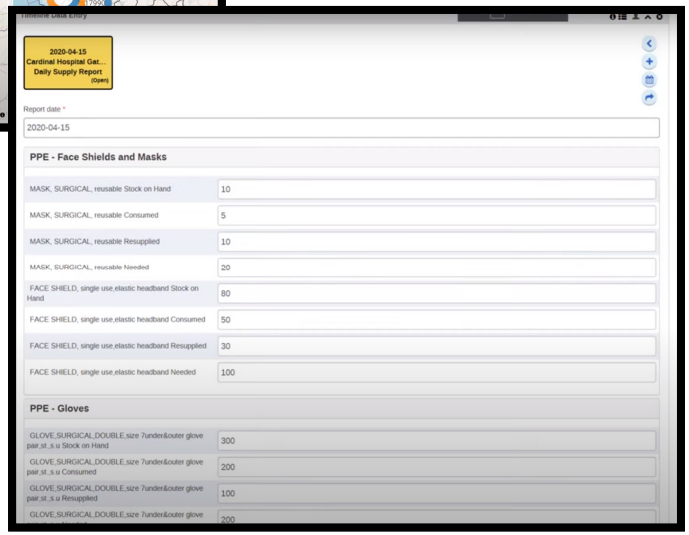
COVID-19 Package

- Supply chain tracking
- Commodities
- On premise or in the cloud
- Customizable dashboards









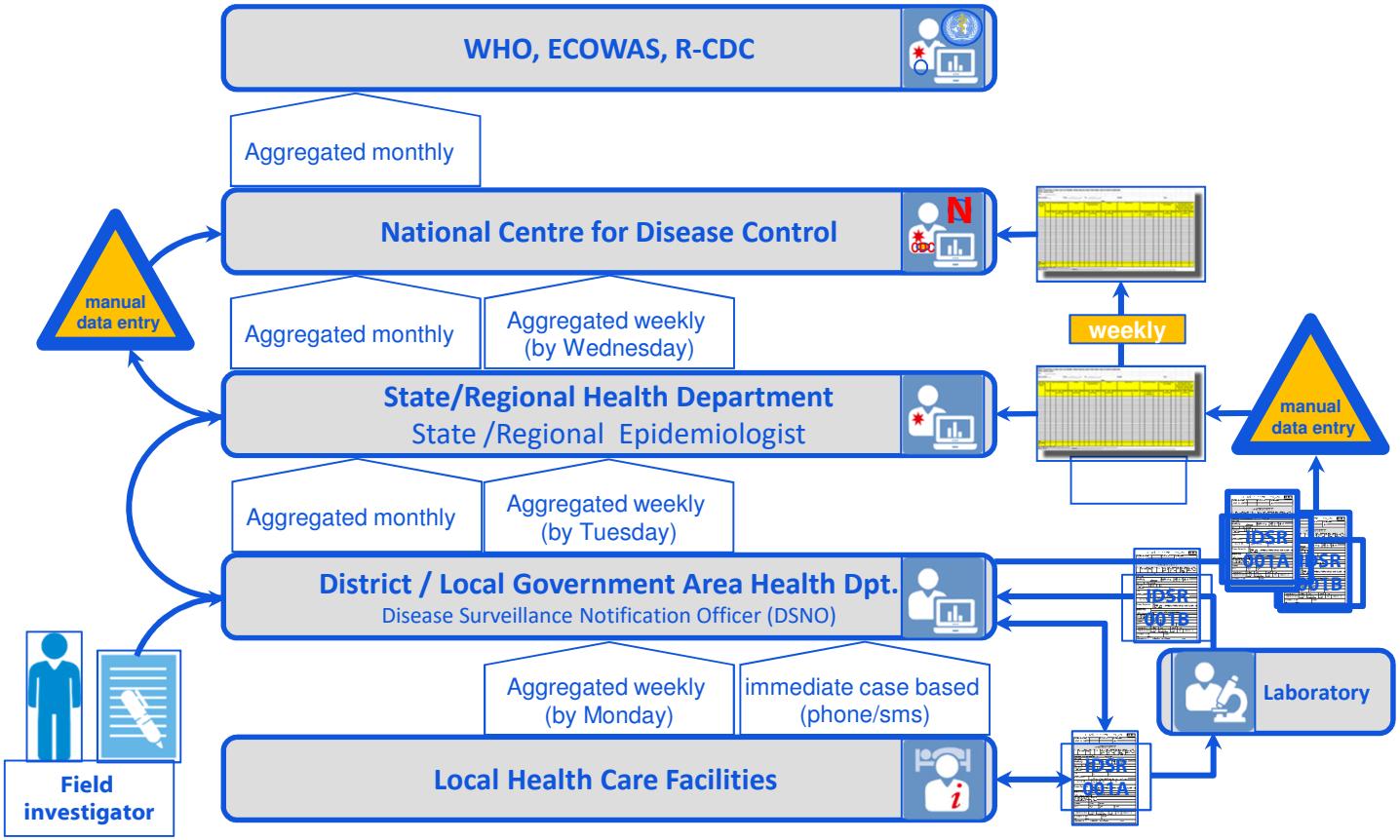
SORMAS® - Surveillance Outbreak Response Management and Analysis System

Oluwasegun Adegoke (Joel)
Strategic Information and Workforce Branch
Global Immunization Division

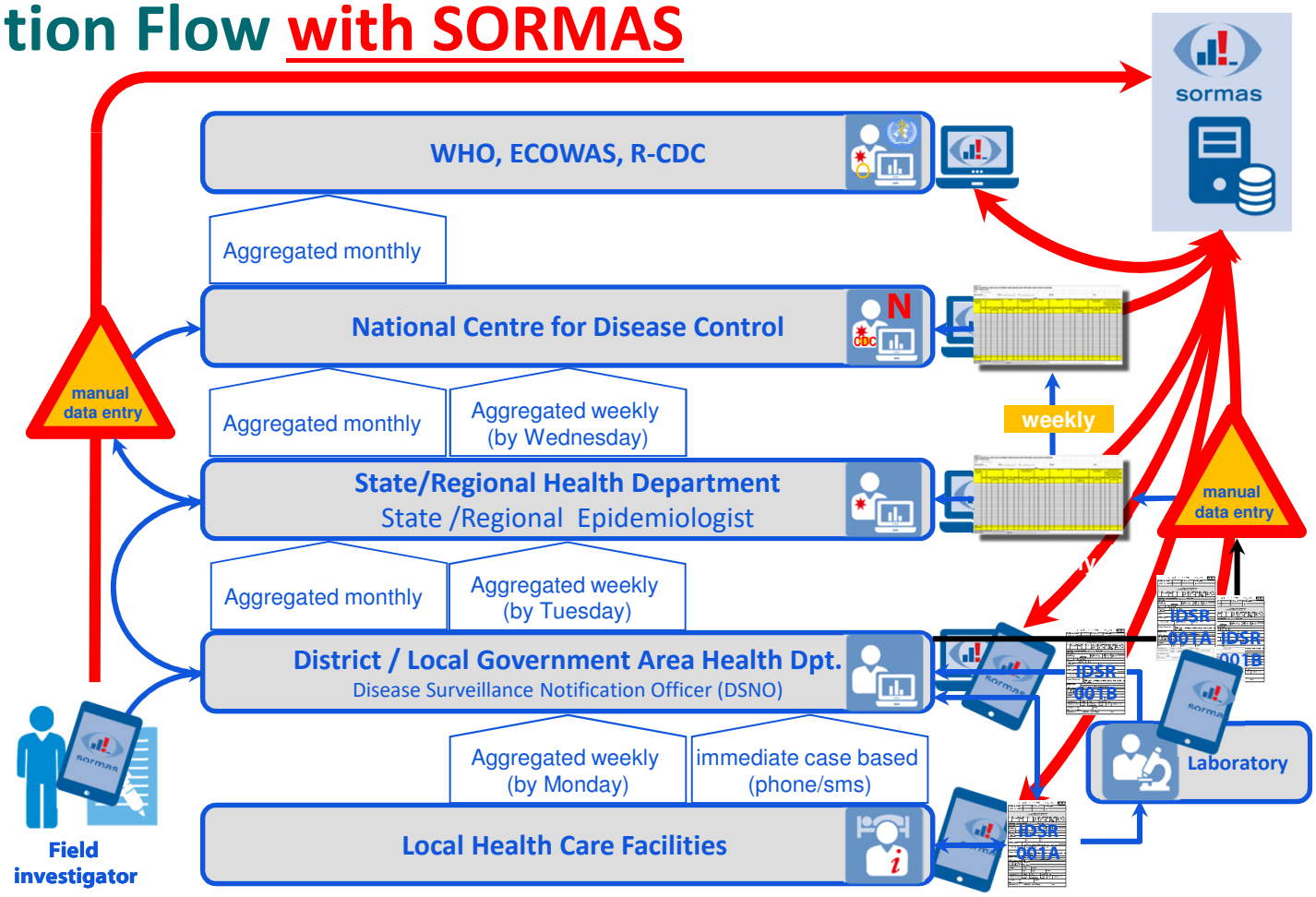
What is SORMAS?

- Digital implementation of Integrated Disease Surveillance and Response (IDSR)
- Outbreak response management and case based surveillance
- Event-base surveillance
- Real-time data processing
- Interactive task management (including contact tracing, laboratory)
- Fully digital
- Fully mobile in offline conditions
- Free and open source
- Mobile device management integrated into SORMAS

Integrated Disease Surveillance and Response System
Conventional Information Flow



Integrated Disease Surveillance and Response System Information Flow with SORMAS



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 (e.g., isolation)

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

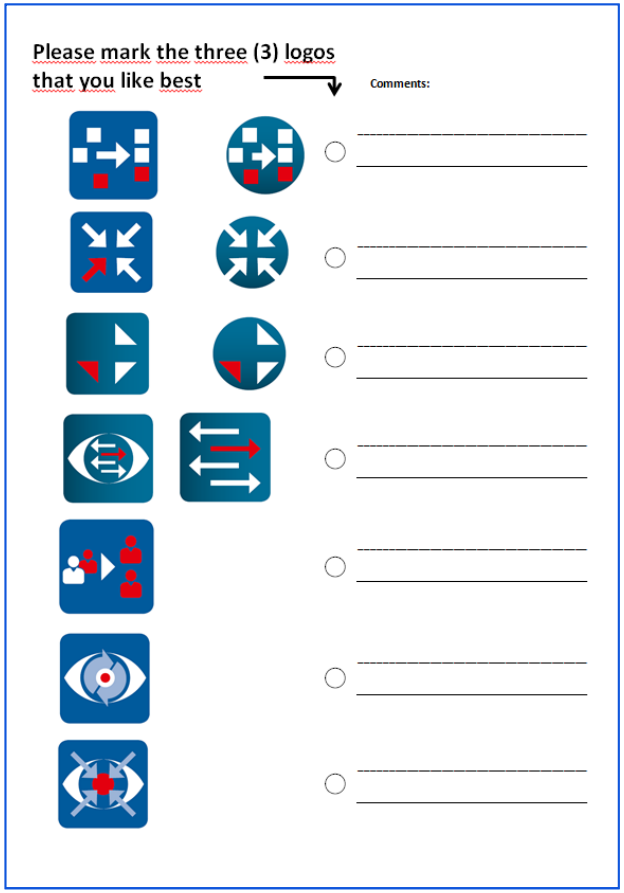
Contact Officer
Assistant LGA-DSNO
Conducts follow-up of contact persons

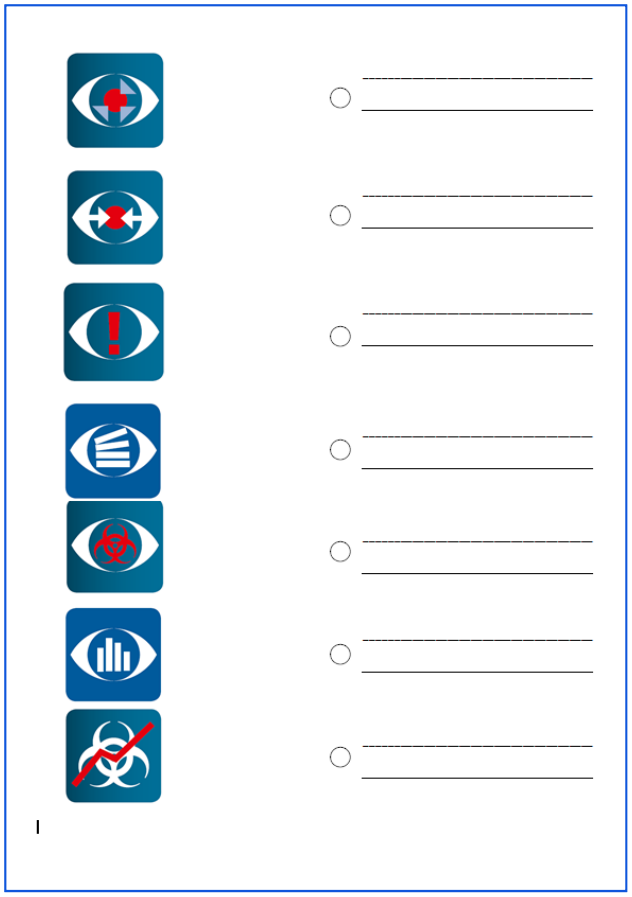
Contact Supervisor
State epidemiologist
Coordinates follow- up of contact persons

User-Centered Design

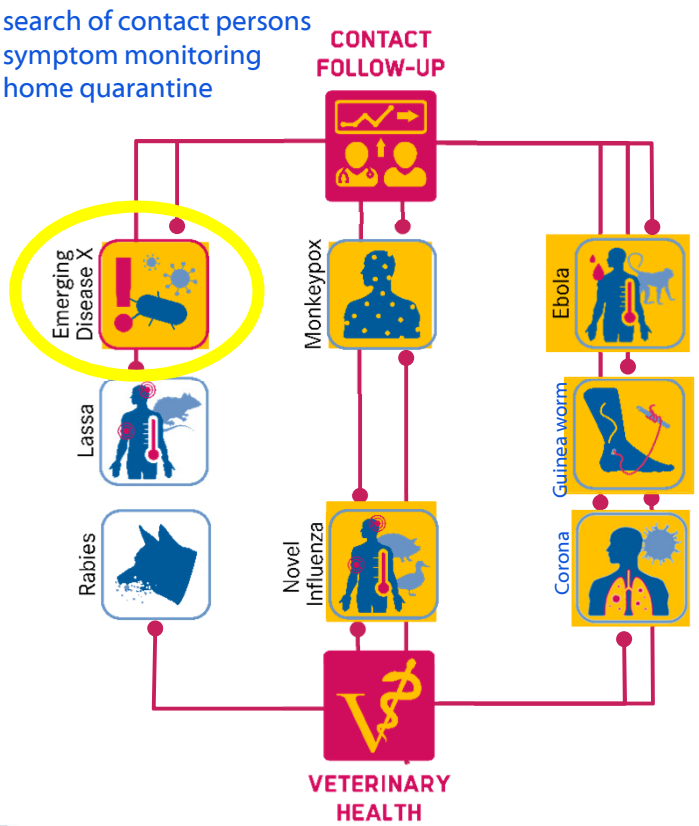
Prototype Development and Acceptability

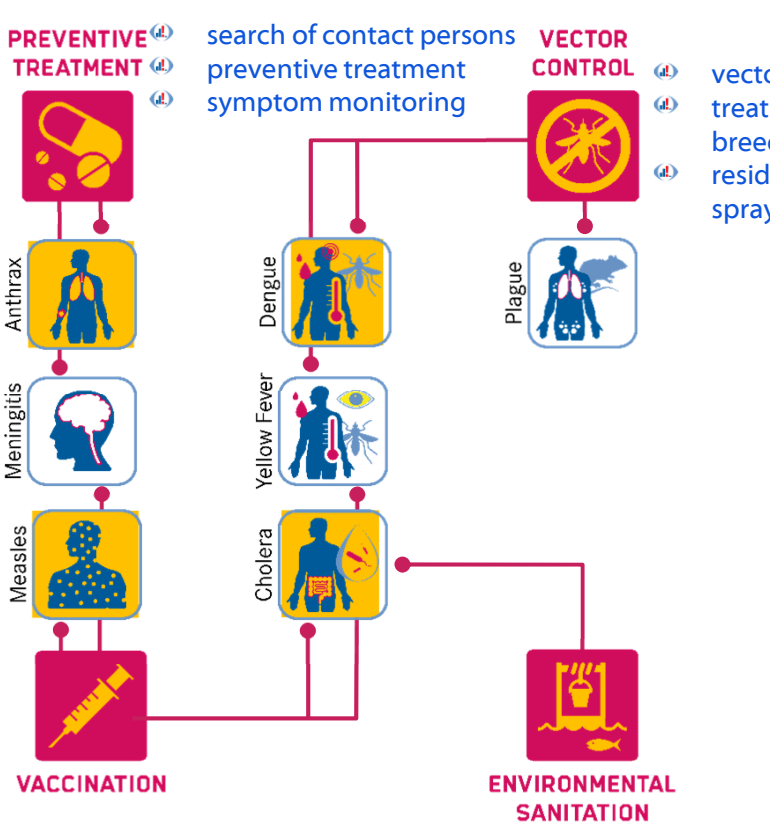
Culture-Sensitive Design



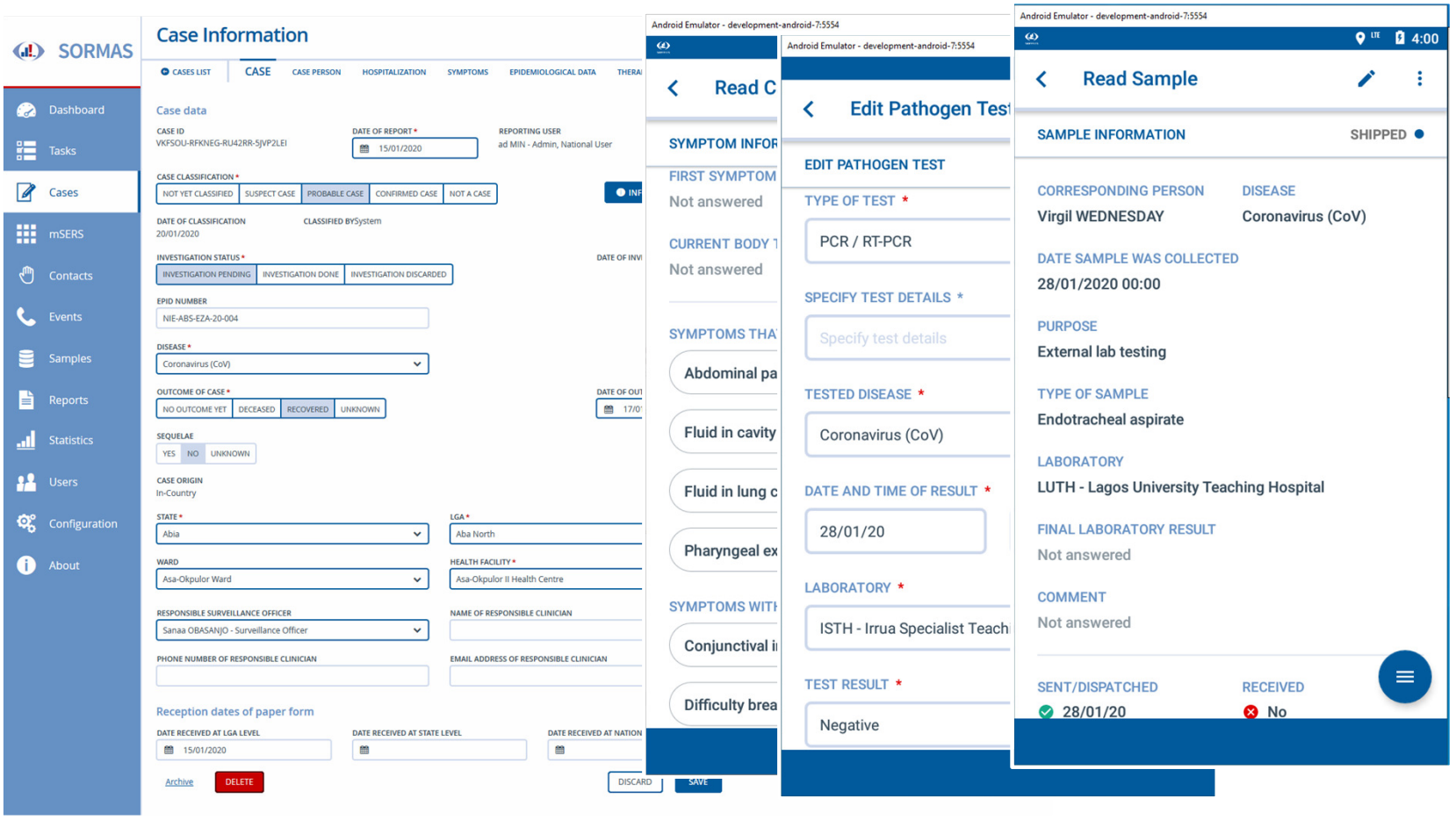


Process Models for Disease-Specific Control Measures

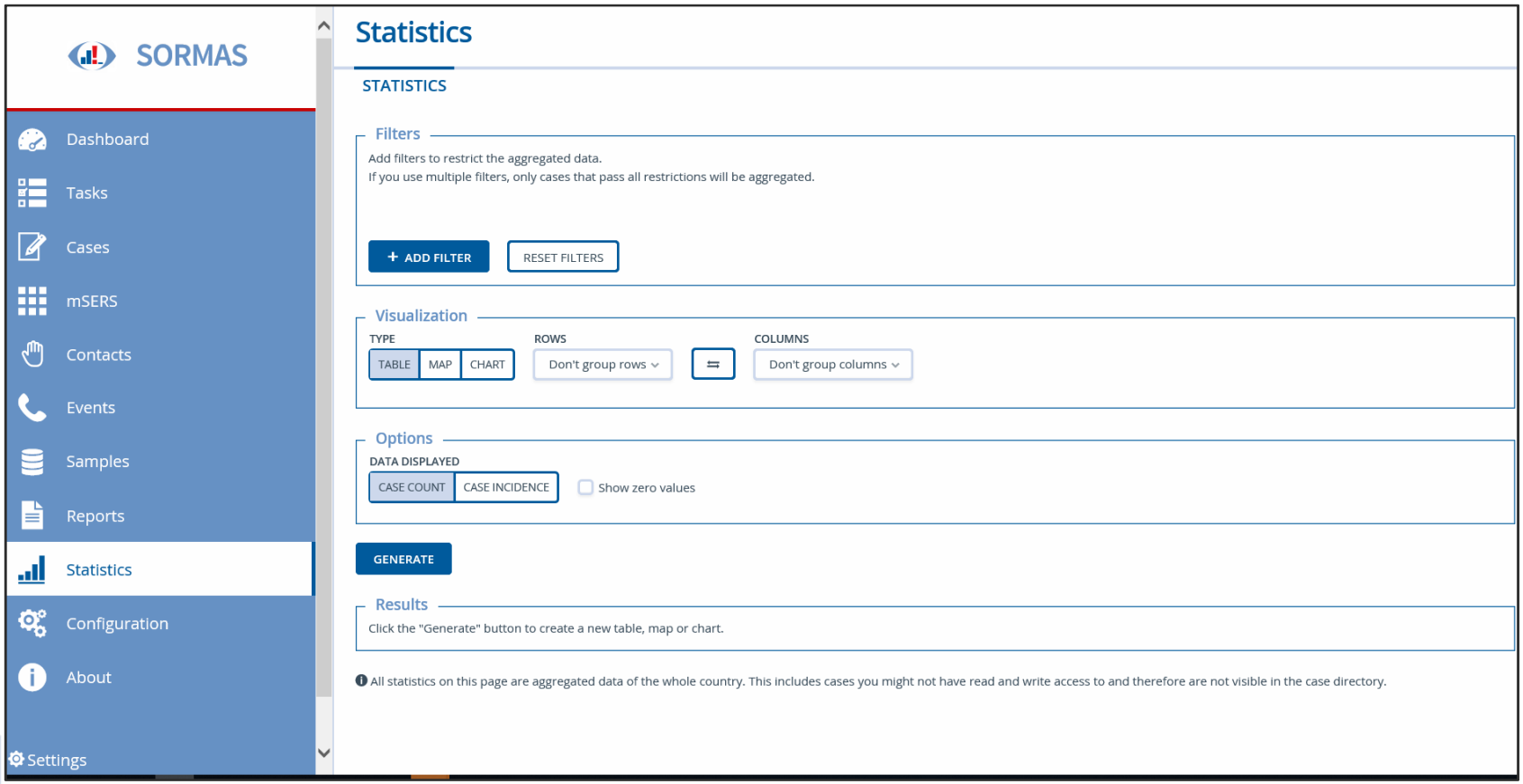




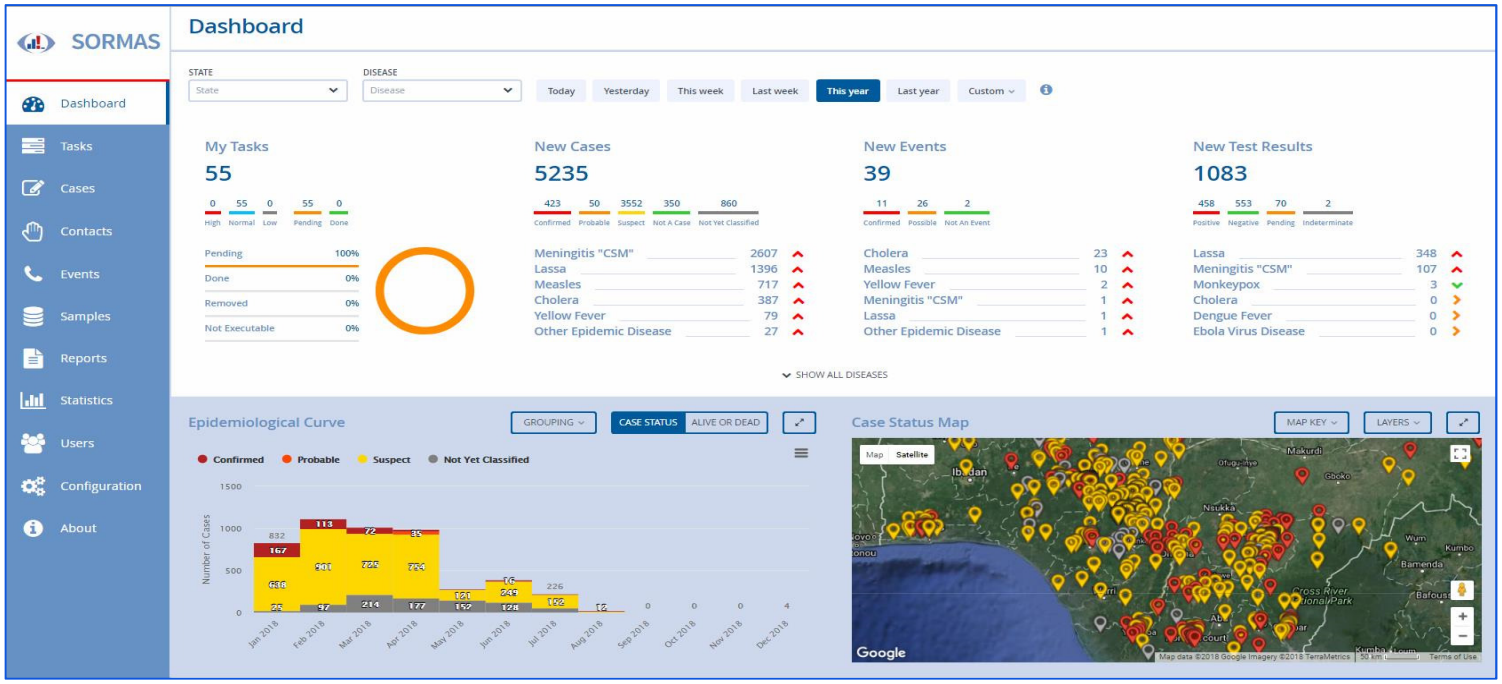
Coronavirus Module (mobile offline/ web online)



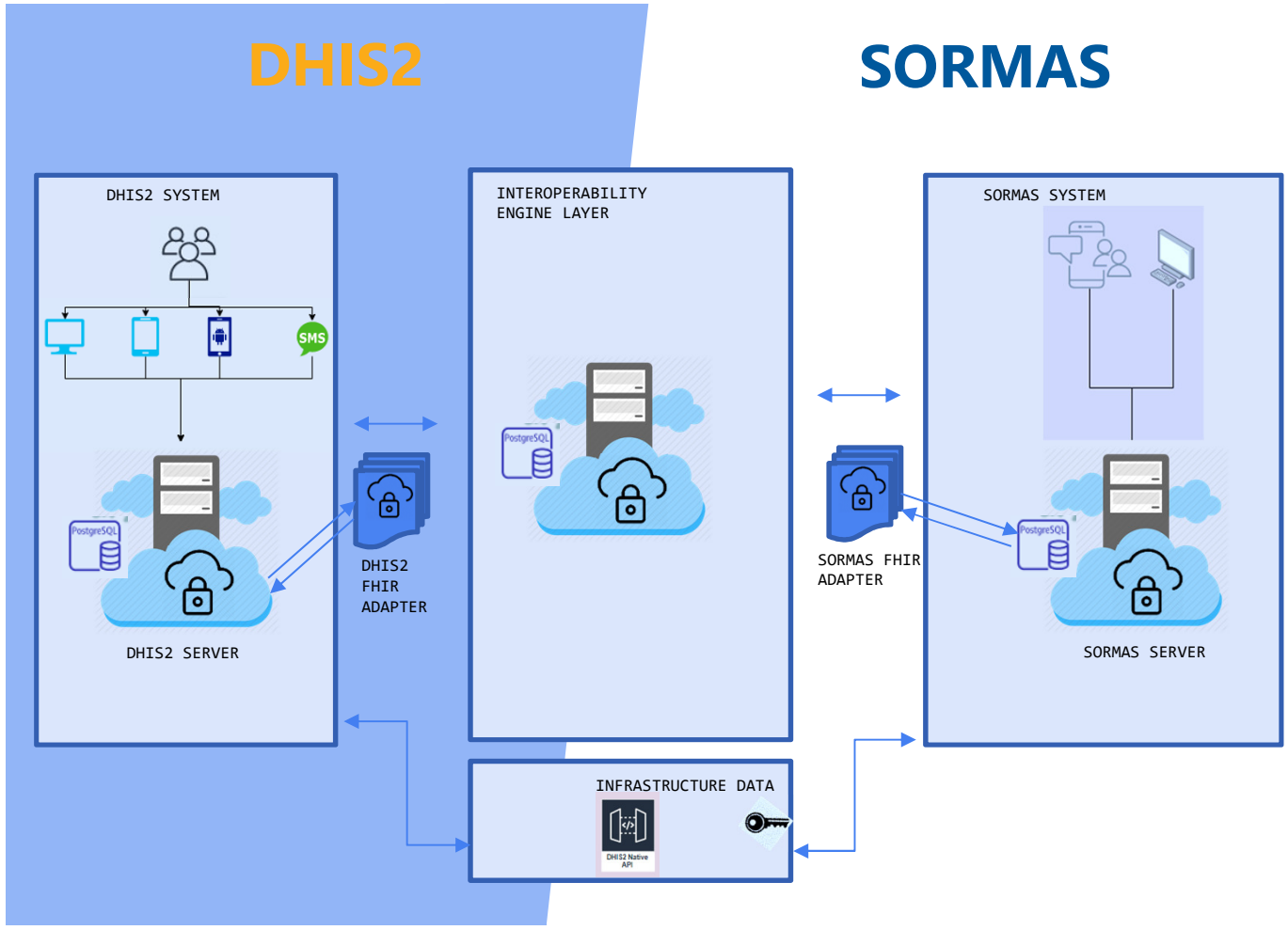
SORMAS Analytics



SORMAS National Dashboard on Lassa Fever



SORMAS dashboard on Lassa fever 2018 at incident command center of the Nigerian Center for Disease Control


DHIS2
SORMAS
DHIS2 SYSTEM
SMS
DHIS2 SERVER
DHIS2
FHIR
ADAPTER
INTEROPERABILITY
ENGINE LAYER
SORMAS FHIR
ADAPTER
SORMAS SYSTEM
SORMAS SERVER
INFRASTRUCTURE DATA
DHIS2 Native API

Countries expected to Use SORMAS by End of 2020 (or doing so already)

Fiji

Nepal, start May 2020 (CORESMA, EU Horizon 2020)

Afghanistan, start 2020, (only Polio vaccine) (US-CDC)

Germany, start March 2020, (only COVID contact tracing)

Burkina Faso, start 2020 (BMBF & CFR)

Ghana, since 2019 (BMBF & EU via GIZ)

Ivory Coast, start May 2020 (CORESMA, EU Horizon 2020

Togo (BMBF & EU)

Nigeria, since 2017 (World Bank, BMBF, BMZ, GIZ, EU, B&MGF, US-CDC etc)

Kenya, planned 2020 (B&MGF via digital square)

Tanzania (PANDORA-ID-NET)

Use and funding ongoing

Funding promised or in negotiations

Funding announced

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

Epi Info™ - Statistical Software for Public Health

José Aponte
Informatics Services Branch
Division of Health Informatics and Surveillance
CSELS

WHAT IS EPI INFO™?

- A suite of free data management, analysis, and visualization tools designed specifically for the public health community

- Features include:
  - Rapid electronic form creation and data entry
  - Statistical analysis
  - Mapping and visualization

- Used extensively throughout CDC, domestically and internationally

EPI INFO™ (circa 1990s)

EPI INFO™ TODAY

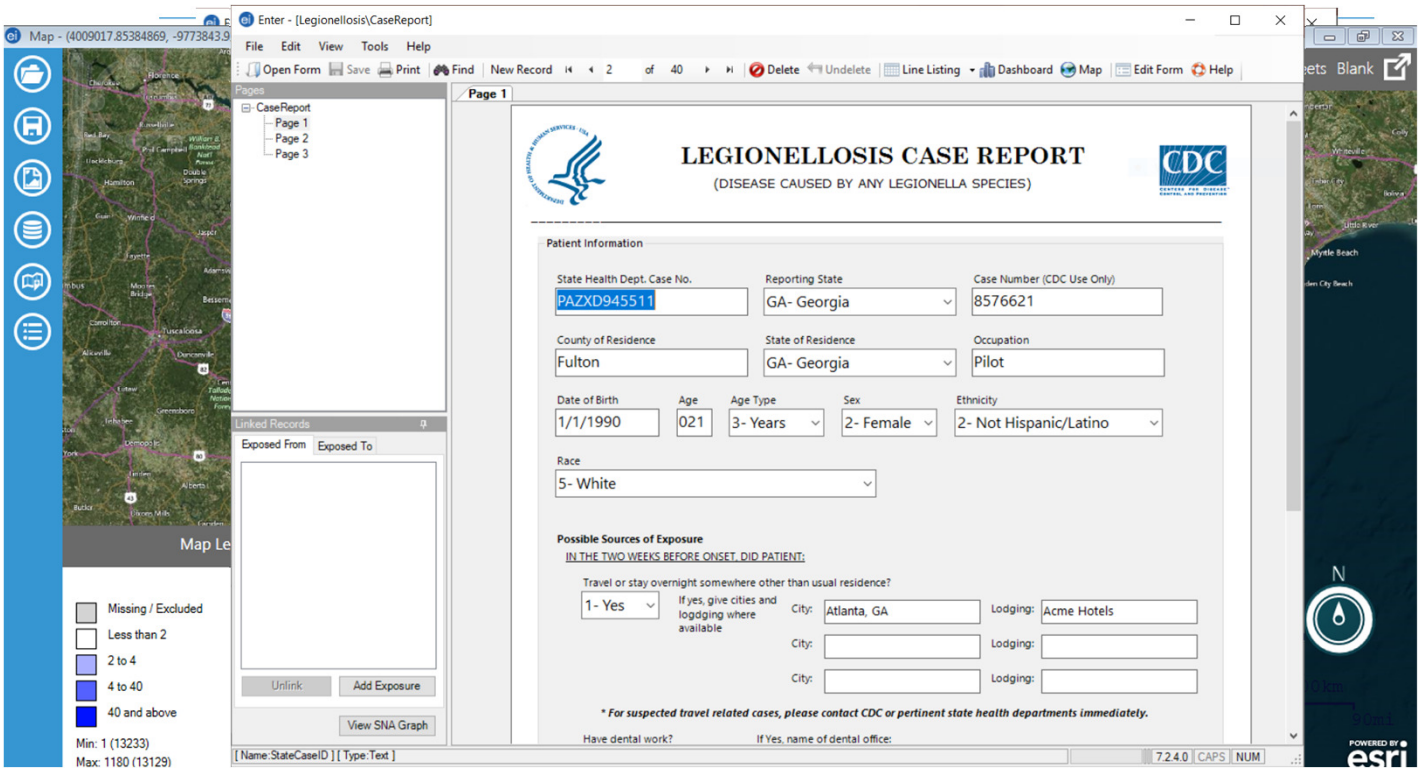
- Public Health Impact - 2019
  - Directly supported 25+ public health conditions (from AIDS to Zika)
  - Responded to 18 training requests
  - Supported 42 domestic projects
  - Supported 14 CDC Centers and 18 State, Tribal, Local, or Territorial Jurisdictions (STLTs)

EPI INFO™ ECOSYSTEM

EPI INFO™ FOR WINDOWS

- Lightweight application that enables rapid data collection and analysis from your PC
- Ideal for small to medium size surveillance and response activities and special epidemiologic studies
- Download from https://www.cdc.gov/epiinfo/pc.html
- No admin rights required to download or install

EPI INFO™ FOR WINDOWS



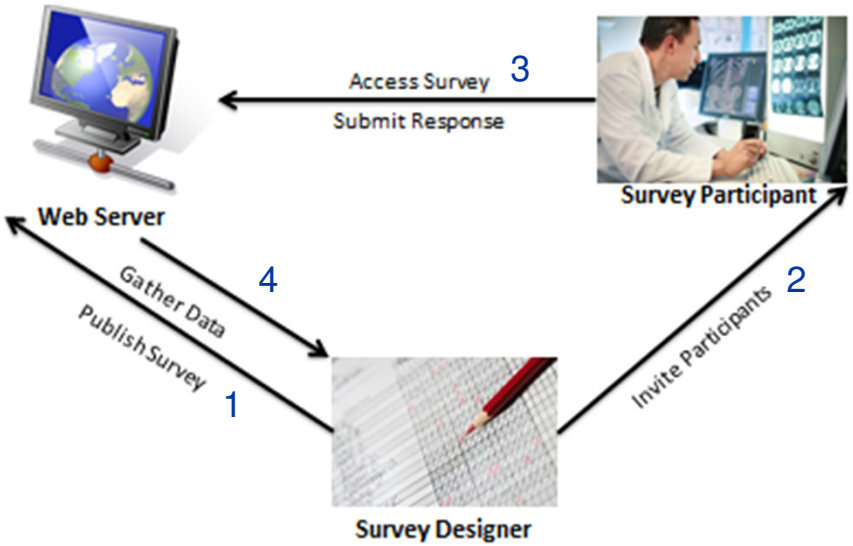
EPI INFO™ FOR WEB & CLOUD

- Web-based and cloud-optimized components for data collection, analysis and visualization
  - Web Survey
  - Cloud Data Capture
- Ideal for large-scale surveillance and response activities in locations with reliable network connectivity
- CDC-hosted environment is already live and being used extensively by the foodborne program

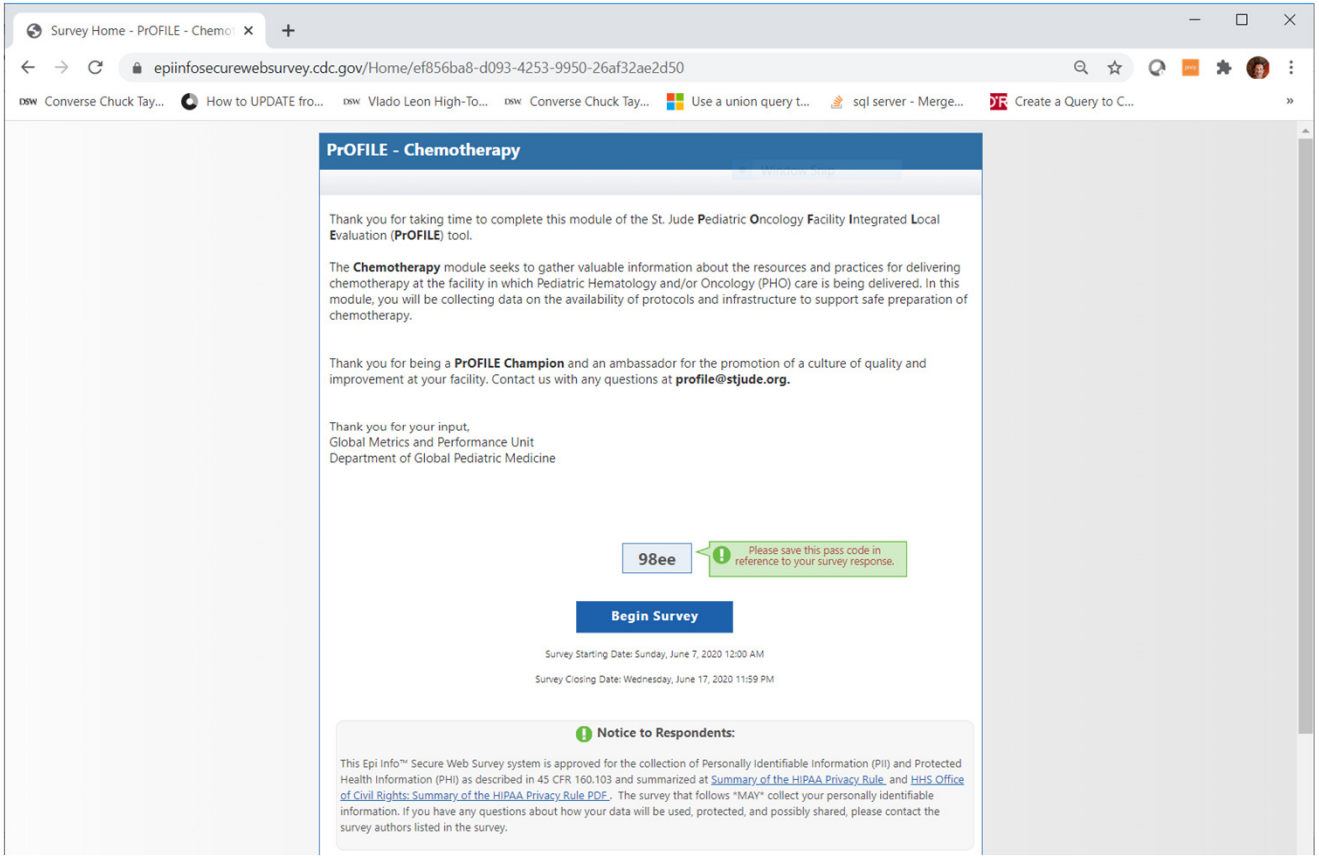
EPI INFO™ WEB SURVEY

- Enable Epi Info™ forms on web
- Faster deployment of Epi Info™ forms and faster data collection
- Collect data from participants geographically dispersed
- Allow access to forms on web using variety of electronic modes
- Participants to provide data without administrators involvement
- Centralized data management of all the surveys for an organization

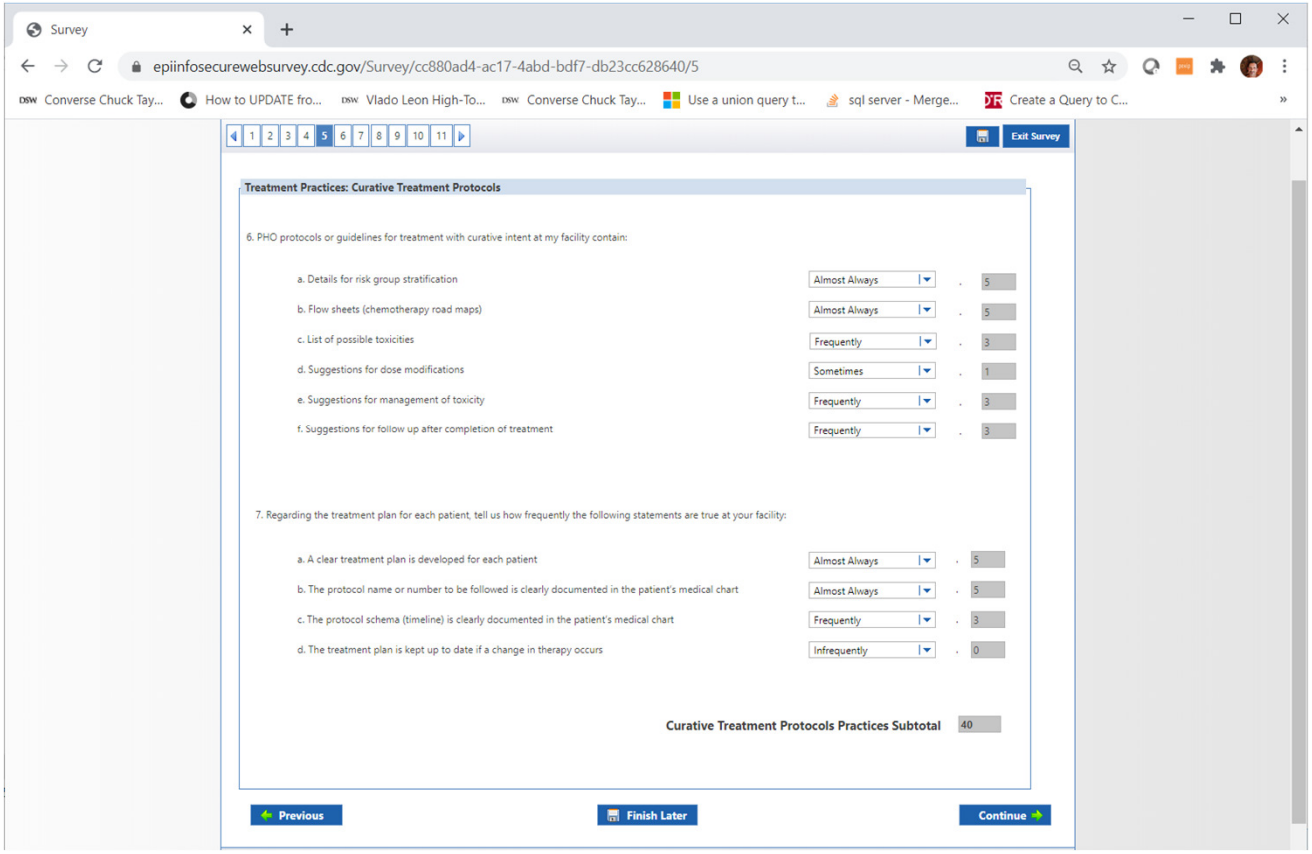
EPI INFO™ WEB SURVEY – How does it work?



EPI INFO™ WEB SURVEY



EPI INFO™ WEB SURVEY



EPI INFO™ FOR WEB – CLOUD DATA CAPTURE

- Companion to the Epi Info™ 7 suite of tools
- Allows the survey designer to collect information from authorized users over the internet
- Meets a different business need than Epi Info™ Web Survey tool

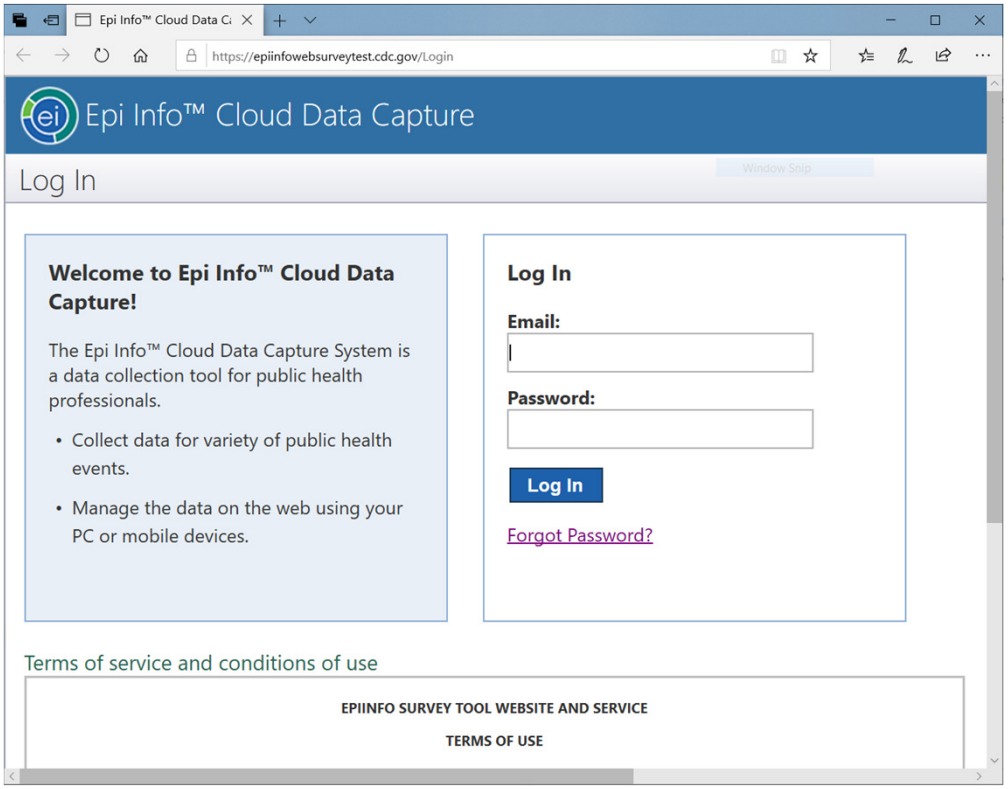
EPI INFO™ FOR WEB – CLOUD DATA CAPTURE

- Epi Info version upgrades – IT dependency
- Only authorized person should be able to edit form design
- Only authorized users should be entering data
- Only members of organization should be able to access data
- Data should be secure behind firewall
- Data should be available instantaneously
- Data consolidation should not involve import/export files

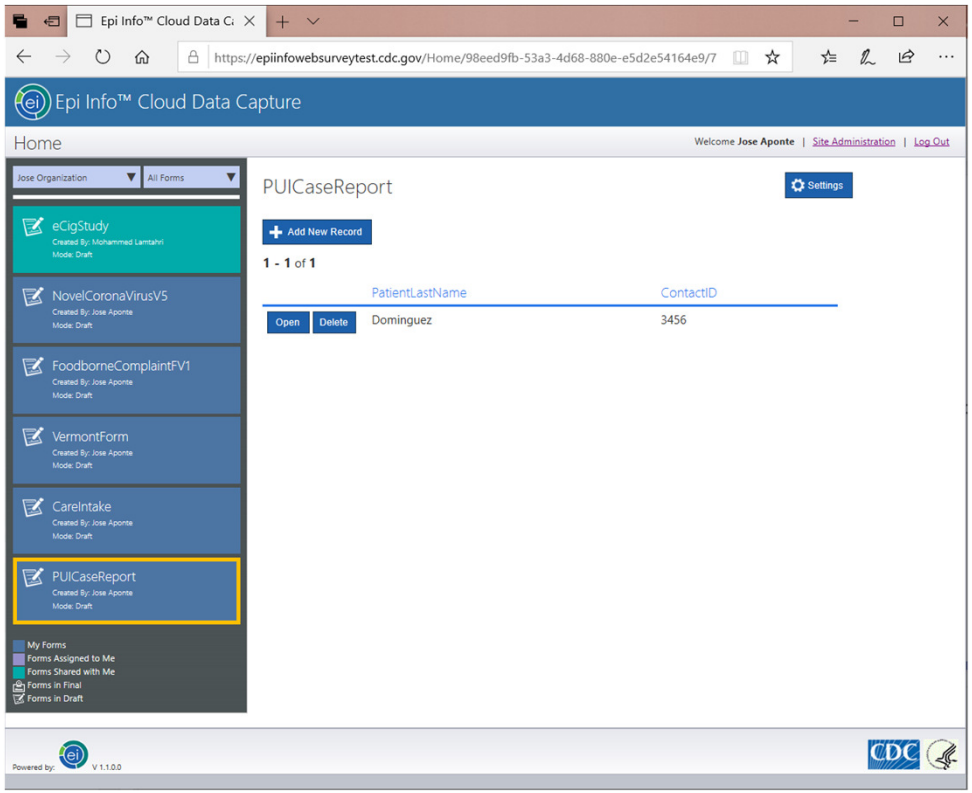
EPI INFO™ FOR WEB – CLOUD DATA CAPTURE

- Authentication and authorization
- Organization and user management
- Multi-user data entry environment
- Only authorized users enter data in the system
- Concurrency management at time of data entry
- Option to sort and search data
- Data maintained in secure database server behind firewall
- Data collection form can be designed using Epi Info 7
- Enterprise implementation using SQL Server

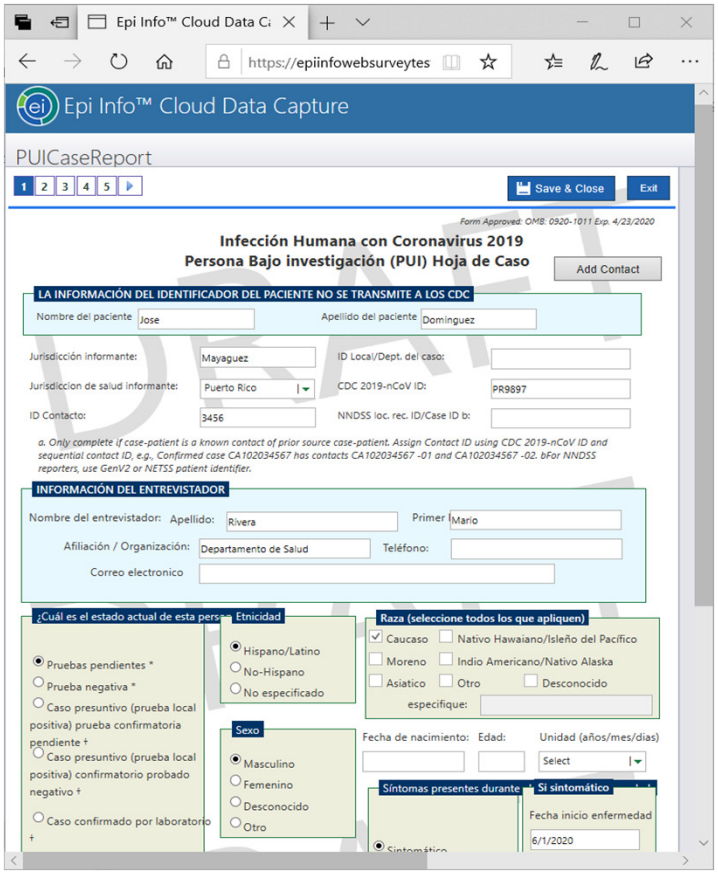
EPI INFO™ FOR WEB – CLOUD DATA CAPTURE



EPI INFO™ FOR WEB – CLOUD DATA CAPTURE



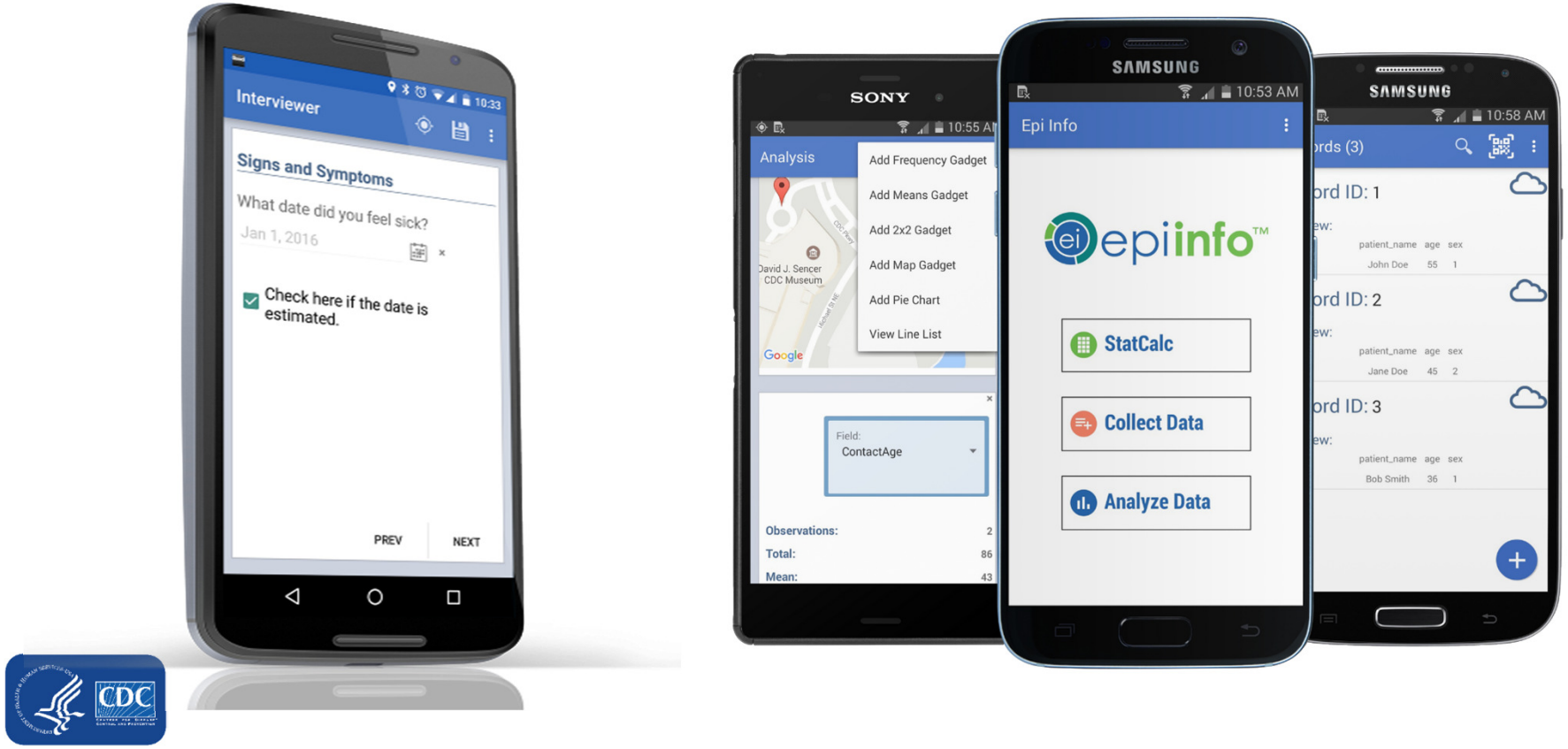
EPI INFO™ FOR WEB – CLOUD DATA CAPTURE



EPI INFO™ FOR MOBILE

- Appropriate for distributed data collection in locations lacking IT infrastructure
- Load forms on to multiple devices as email attachments
- Collect and store data within the mobile device and copy them back to Epi Info™ for Windows using sync files
- Automatically sync data to cloud services such as Box or to CDC's secure SFTP site
- Supports relational forms and most Epi Info Windows form logic

EPI INFO™ FOR MOBILE



Epi Info™ Team Functions

- The Epi Info Team supports three editions of Epi Info™ software:
  - Epi Info™ for Windows
  - Epi Info™ for Mobile
  - Epi Info™ for Web & Cloud

- And provides other services such as:
  - Training and support in multiple languages
  - Build custom solutions for CDC programs

COLLABORATIONS OVERVIEW

- COVID-19 - Domestically
  - West Virginia
    - Reporting of COVID-19 testing for Long Term Care and Assisted Living facilities
  - Nebraska
    - Traveler's history surveys
  - Puerto Rico & Guam
    - Contact Tracing
    - COPA

COLLABORATIONS OVERVIEW

- E-cigarette outbreak (DDNID/NCCDPHP)
- COPA (NCEZID) – Puerto Rico
- Child anthropometry (ONDIEH/NCCDPHP) - Guatemala
- Economic evaluation project (NCIRD/DBD) - Zimbabwe
- Seroprevalence and Risk Factors for Leptospirosis (NCEZID) - USVI
- Micronutrient Household and Biomarker Study (MRMHHS) - Tanzania
- Community Assessment for Public Health Emergency Response (CASPER)
- Opioids – Grady Health / New England High Intensity Drug Trafficking Area
- St. Jude's Research Children's Hospital - Pediatric Oncology Facility Evaluation

go.data

James A. Fuller, PhD, MSPH

Epidemiologist (Contractor)

GDD Operations Center, CGH

kux9@cdc.gov

godata@who.int

World Health Organization

GOARN

Global Outbreak Alert and Response Network

Go.Data – project goal

- Design, develop and deploy comprehensive Go.Data software to be used globally by WHO, Member states and Partners to:

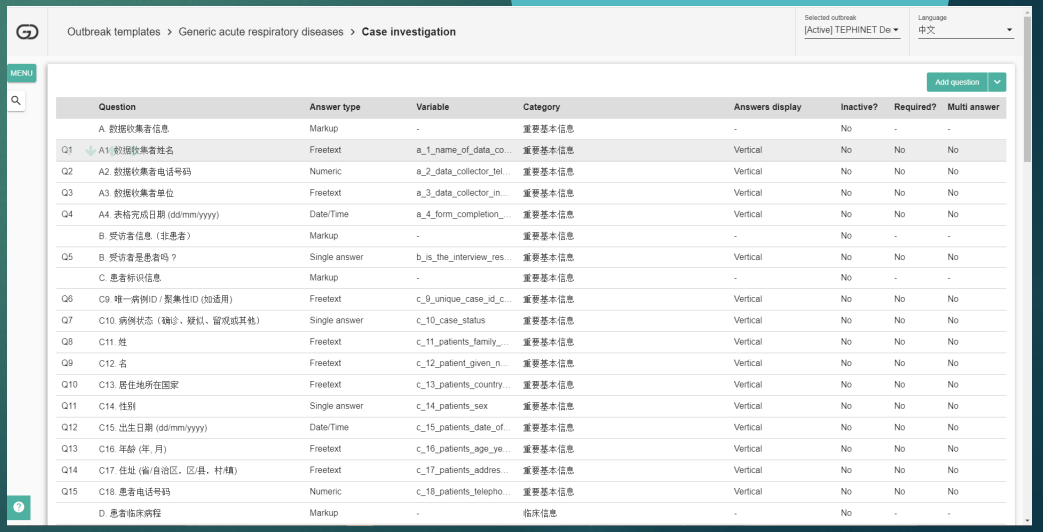
Support and facilitate outbreak investigation including field data collection, contact tracing and visualization of chains of transmission.

Go.Data - In 30 seconds

- **Collaborative** project coordinated by WHO and conducted in cooperation with GOARN partners.
- Building on previous **WHO and partners experience** in design, development and rollout of the **field data collection** tools.
- Focus on **individual-level data**: **case** (*including lab, hospitalization and other variables though case investigation form*) and **contact** data (*including contact follow-up*).

Key features 1

- Different types of operation (online, offline / server, standalone) on multiple platforms (Windows, Linux, Mac).
- Multi-lingual support, with possibility to add additional languages.
- Granular user roles and permissions.
- Library of APIs for integration with other systems.
- Free for use.



	Question	Answer type	Variable	Category	Answers display	Inactive?	Required?	Multi answer
	A. 数据收集者信息	Markup	-	重要基本信息	-	No	-	-
Q1	A1.数据收集者姓名	Freetext	a_1_name_of_data_co...	重要基本信息	Vertical	No	No	No
Q2	A2. 数据收集者电话号码	Numeric	a_2_data_collector_tel...	重要基本信息	Vertical	No	No	No
Q3	A3. 数据收集者单位	Freetext	a_3_data_collector_in...	重要基本信息	Vertical	No	No	No
Q4	A4. 表格完成日期 (dd/mm/yyyy)	Date/Time	a_4_form_completion_...	重要基本信息	Vertical	No	No	No
	B. 受访者信息（非患者）	Markup	-	重要基本信息	-	No	-	-
Q5	B. 受访者是患者吗？	Single answer	b_is_the_interview_res...	重要基本信息	Vertical	No	No	No
	C. 患者标识信息	Markup	-	重要基本信息	-	No	-	-
Q6	C9. 唯一病例ID / 聚集性ID (如适用)	Freetext	c_9_unique_case_id_c...	重要基本信息	Vertical	No	No	No
Q7	C10. 病例状态（确诊、疑似、留观或其他）	Single answer	c_10_case_status	重要基本信息	Vertical	No	No	No
Q8	C11. 姓	Freetext	c_11_patients_family_...	重要基本信息	Vertical	No	No	No
Q9	C12. 名	Freetext	c_12_patient_given_n...	重要基本信息	Vertical	No	No	No
Q10	C13. 居住地所在国家	Freetext	c_13_patients_country...	重要基本信息	Vertical	No	No	No
Q11	C14. 性别	Single answer	c_14_patients_sex	重要基本信息	Vertical	No	No	No
Q12	C15. 出生日期 (dd/mm/yyyy)	Date/Time	c_15_patients_date_of...	重要基本信息	Vertical	No	No	No
Q13	C16. 年龄 (年, 月)	Freetext	c_16_patients_age_ye...	重要基本信息	Vertical	No	No	No
Q14	C17. 住址 (省/自治区，区/县，村/镇)	Freetext	c_17_patients_addres...	重要基本信息	Vertical	No	No	No
Q15	C18. 患者电话号码	Numeric	c_18_patients_telepho...	重要基本信息	Vertical	No	No	No
	D. 患者临床病程	Markup	-	临床信息	-	No	-	-

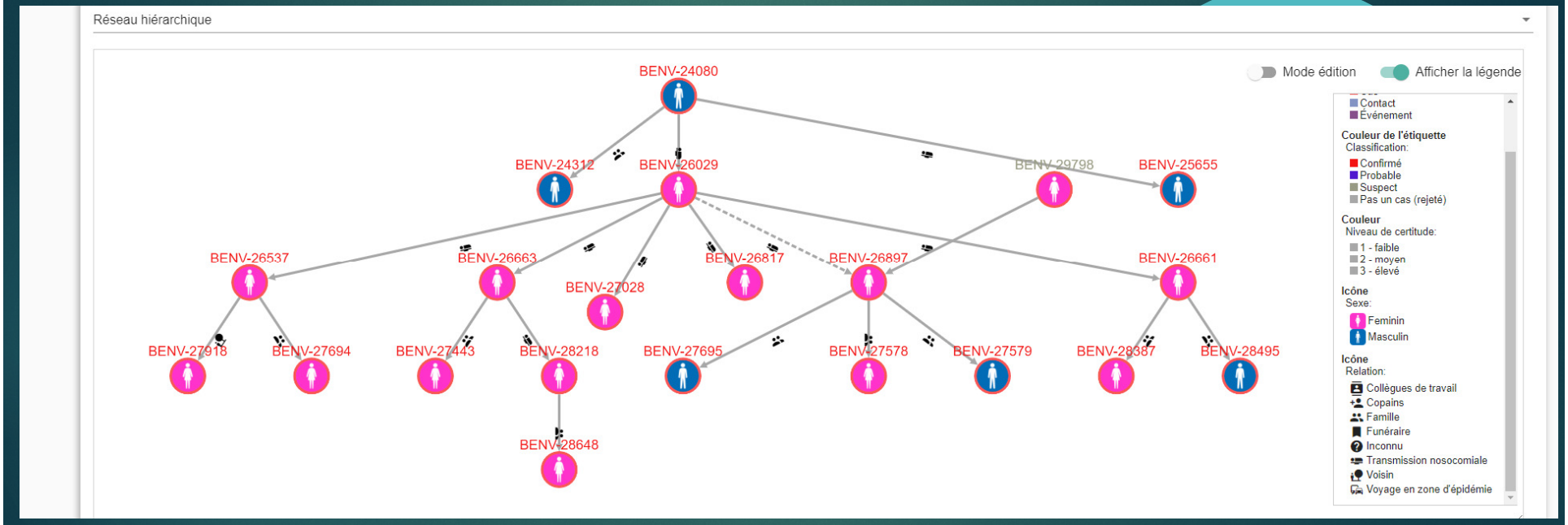
Key features 2

- One Go.Data installation can be used to collect data for many outbreaks.
- Highly configurable, with configurable reference data, location data and data variables.
- Outbreak templates for easier creation of data collection forms.
- Extensive data import and export features.
- Generates contact follow-up list.
- Data encryption on server/PC and mobile app

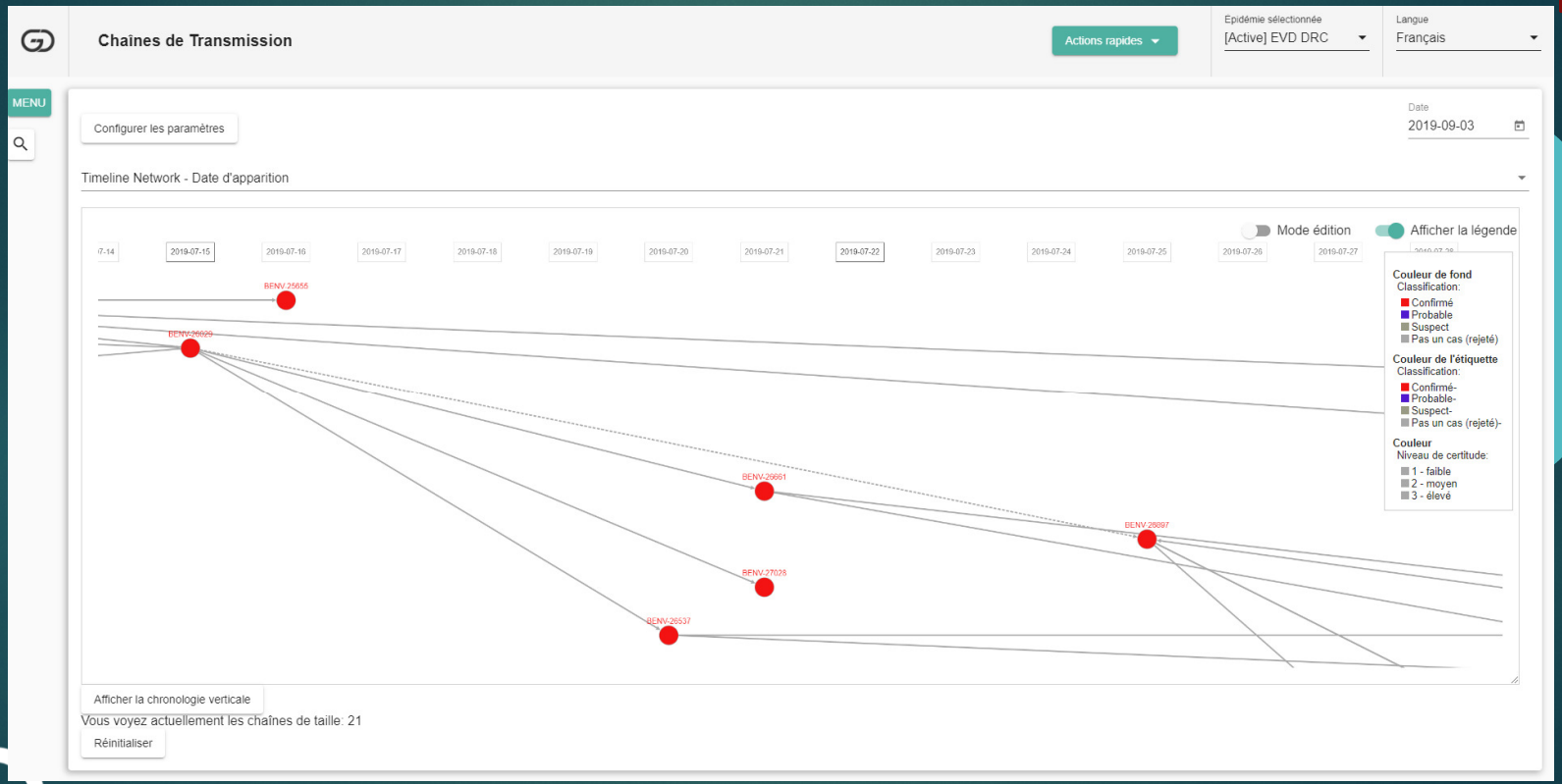
Key features 3

- Has optional mobile app (Android and iOS) focused on contact tracing.
- Provides features to visualize chains of transmission using timelines, integrated data bars, network graphs.

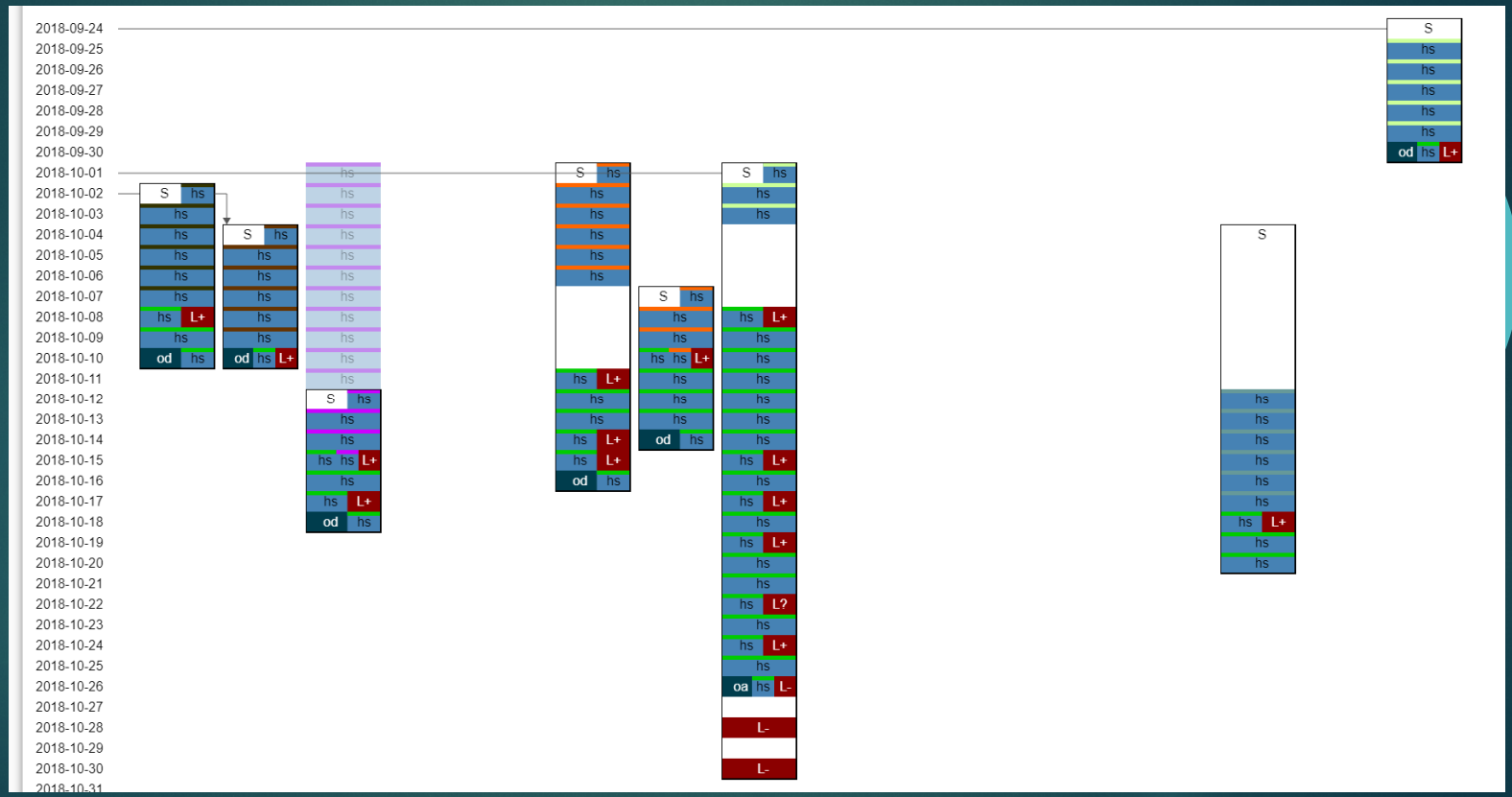
Chains of Transmission



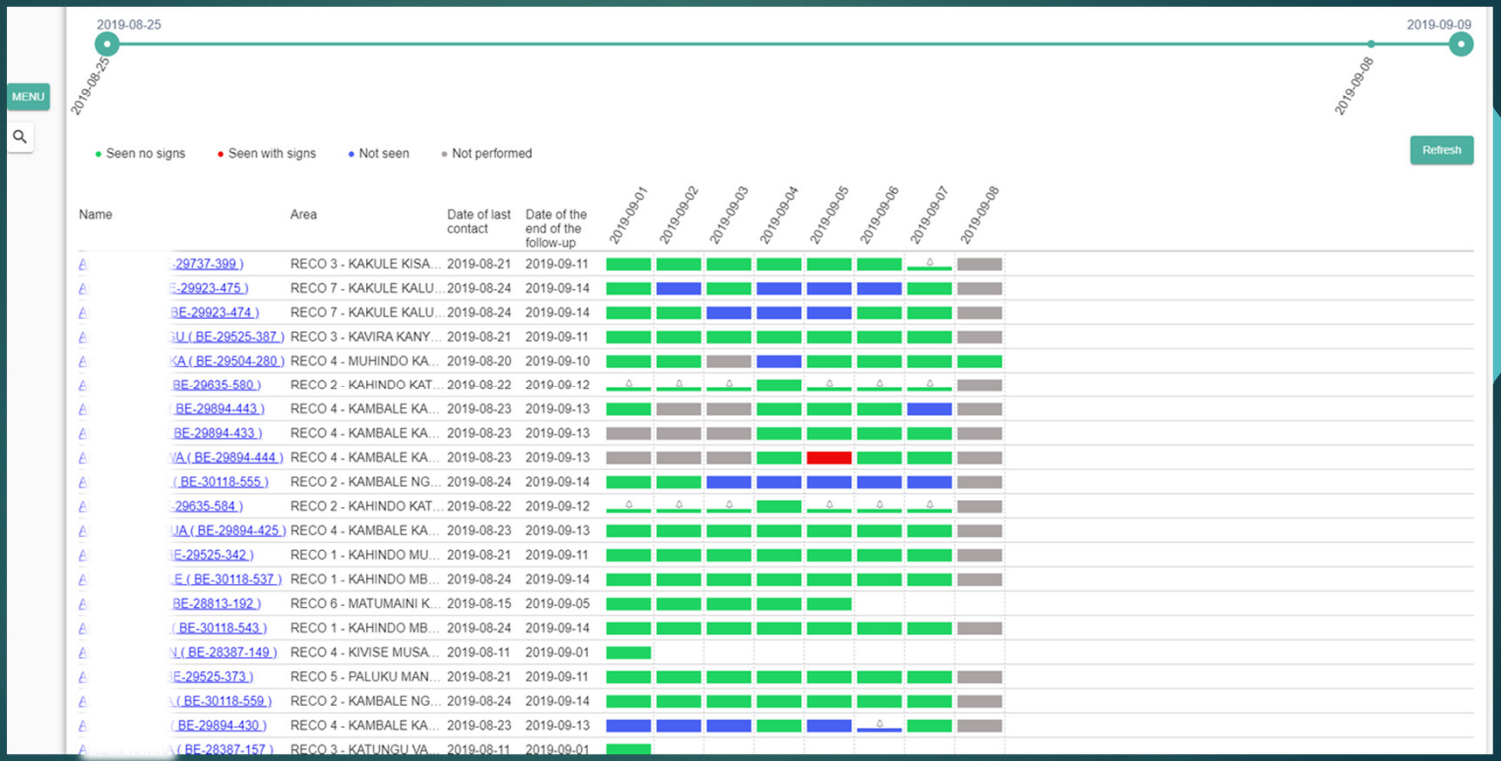
Chains of Transmission



Case Timelines



Contact Follow-Up



Thank you

Go.Data Contacts and Resources

- GoData@who.int
- James Fuller, kux9@cdc.gov
- Larry Hinkle, ndf5@cdc.gov
- Amy Lang, uyf7@cdc.gov
- Online Training: https://openwho.org/courses/godata-en

Considerations for Choosing the Right Tool

- Conduct appropriate needs assessments
- Understand current functionality and flow of systems
- Existing data tools and systems that could be upgraded or reused
- Skillsets available in country
- Understand the partner landscape
- Consider the technical infrastructure (power, internet, hardware, communications systems)
- Consider training needs
- Sustainability is paramount

Developing a Good Electronic Surveillance System

- Aligns with the national digital health / eHealth strategy
  - Understand and address user and program needs
  - Strengthen existing data tools and systems
- Interoperability with other systems is ideal, or integration at minimum
  - Epidemiology and lab
  - Supply chain, human resource, finance
- Use open standards, open source, and open innovation
- Assign appropriate user access roles

Best Practices for Data Management

- Unique IDs
- Secure and protect patient confidentiality
- Build in data quality through validation, skip patterns, choice menus
- Ease of analysis and accessible data output
- Integrity of data through traceability and audit trails
- Ensure comprehensive documentation

Leverage COVID-19 Investments to Improve Data Science

- Focus on the ***why / objective*** of the system trying to build
- Improve, strengthen, and reuse systems available in country
- Innovate with caution, consider national capacity and sustainability
- Improve overall data science – e.g., data management, data analysis
- Build country capacity
- Align with current investments
- Help countries meet their Joint External Evaluation (JEE) goals
- Sustainability

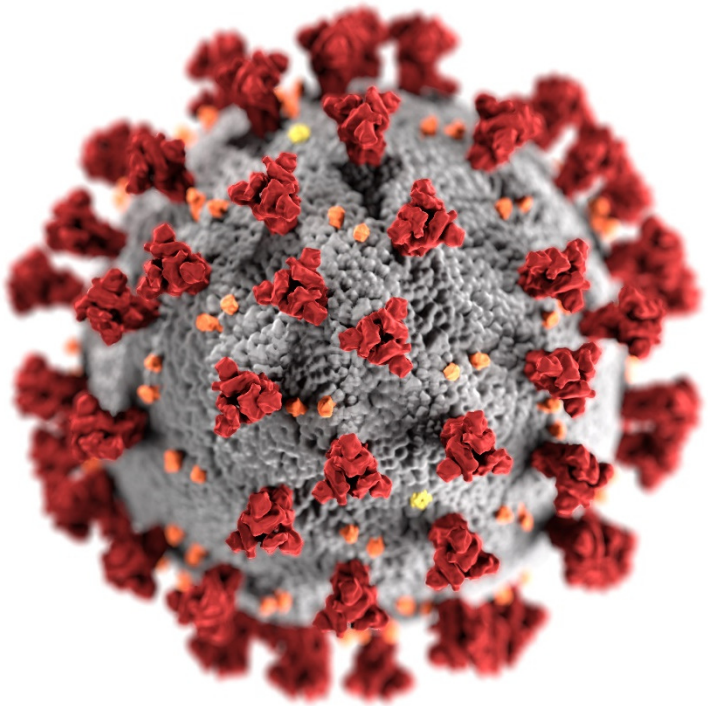
Resources

- https://www.dhis2.org/
- https://sormasorg.helmholtz-hzi.de/
- https://www.cdc.gov/epiinfo/index.html
- https://www.who.int/godata
- https://digitalprinciples.org/
- https://ohie.org/

Questions?

CDC COVID-19 International Task Force:

eocevent223@cdc.gov



For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.