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.
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.
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

- WHO, ECOWAS, R-CDC
  - Aggregated monthly

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

State/Regional Health Department
- State /Regional Epidemiologist
  - Aggregated monthly
  - Aggregated weekly (by Tuesday)

District / Local Government Area Health Dpt.
- Disease Surveillance Notification Officer (DSNO)
  - Aggregated weekly (by Monday)
  - Immediate case based (phone/sms)

Local Health Care Facilities

Field investigator

Laboratory

Data entry

Weekly

Manual
Integrated Disease Surveillance and Response System Information Flow with SORMAS

WHO, ECOWAS, R-CDC
Aggregated monthly

National Centre for Disease Control
Aggregated monthly
Aggregated weekly (by Tuesday)

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)
Immediate case based (phone/sms)

Local Health Care Facilities

Field investigator

Laboratory

Manual data entry

Weekly

WHO, ECOWAS, R-CDC

National Centre for Disease Control

State/Regional Health Department

District / Local Government Area Health Dpt.

Local Health Care Facilities

Laboratory

Manual data entry

Weekly

WHO, ECOWAS, R-CDC

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WHO, ECOWAS, R-CDC

National Centre for Disease Control

State/Regional Health Department

District / Local Government Area Health Dpt.

Local Health Care Facilities

Laboratory

Manual data entry

Weekly
### Personas / Users of SORMAS

#### Detect
notification, screening

- **Community Informant**
  - LGA-DSNO
  - 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

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

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

#### 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

- **Contact Supervisor**
  - State epidemiologist
  - Coordinates follow-up of contact persons
User-Centered Design
Prototype Development and Acceptability
Culture-Sensitive Design

Please mark the three (3) logos that you like best

Comments:

[Logos and options for selection]
Process Models for Disease-Specific Control Measures

- Search of contact persons
- Symptom monitoring
- Home quarantine
- 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
- Preventive treatment
- Search of contact persons
- Symptom monitoring
- Plague
- Guinea worm
- Corona
- Novel Influenza
- Ebola
- Lassa
- Rabies
- Monkeypox
Coronavirus Module (mobile offline/ web online)
### Statistics

#### Filters
Add filters to restrict the aggregated data. If you use multiple filters, only cases that pass all restrictions will be aggregated.

[ADD FILTER]  [RESET FILTERS]

#### Visualization

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ROWS</th>
<th>COLUMNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE</td>
<td>Don't group rows</td>
<td>Don't group columns</td>
</tr>
<tr>
<td>MAP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHART</td>
<td></td>
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</tr>
</tbody>
</table>

#### Options

**DATA DISPLAYED**
- CASE COUNT
- CASE INCIDENCE
- Show zero values

#### Results
Click the "Generate" button to create a new table, map or chart.

> All statistics on this page are aggregated data of the whole country. This includes cases you might not have read and write access to and therefore are not visible in the case directory.
SORMAS National Dashboard on Lassa Fever

SORMAS dashboard on Lassa fever 2018 at incident command center of the Nigerian Center for Disease Control
Countries expected to Use SORMAS by End of 2020 (or doing so already)

- **Nigeria**, since 2017 (World Bank, BMBF, BMZ, GIZ, EU, B&MGF, US-CDC etc)
- **Ghana**, since 2019 (BMBF & EU via GIZ)
- **Ivory Coast**, start May 2020 (CORESMA, EU Horizon 2020)
- **Nepal**, start May 2020 (CORESMA, EU Horizon 2020)
- **Burkina Faso**, start 2020 (BMBF & CFR)
- **Germany**, start March 2020, (only COVID contact tracing)
- **Afghanistan**, start 2020, (only Polio vaccine) (US-CDC)
- **Togo** (BMBF & EU)
- **Tanzania** (PANDORA-ID-NET)
- **Fiji**
- **Kenya**, planned 2020 (B&MGF via digital square)

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**
  - Epi Info Desktop
  - Cloud Analytics
  - HTML 5

- **Epi Info for Web & Cloud**
  - Cloud Analytics Lite
  - Epi Info Web Survey

- **Epi Info for Mobile**
  - Android Companion
  - iOS Companion
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

LEGIONELLOSIS CASE REPORT
(DISEASE CAUSED BY ANY LEGIONELLA SPECIES)

Patient Information

State Health Dept. Case No.: AA210645-511
Reporting State: GA- Georgia
Case Number (CDC Use Only): 8576621

County of Residence:
Fulton
County of Residence: GA- Georgia
Occupation: Pilot

Date of Birth: 1/1/1990
Age: 31
Age Group: 3-5 Years
Sex: Female

Race:
5 - White

Possible Sources of Exposure

Travel or city overnight somewhere other than usual residence:
1. Yes
2. No

For suspected travel related cases, please contact CDC or pertinent state health departments immediately.

Have dental work?

Yes

Name of Dental Office:

Address:

City:

State:

Zip Code:

Phone:

Fax:

Email:

Additional comments:
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

PROFILE - Chemotherapy

Thank you for taking time to complete this module of the St. Jude Pediatric Oncology Facility Integrated Local Evaluation (PROFILE) tool.

The Chemotherapy module seeks to gather valuable information about the resources and practices for delivering chemotherapy at the facility in which Pediatric Hematology and/or Oncology (PHO) care is being delivered. In this module, you will be collecting data on the availability of protocols and infrastructure to support safe preparation of chemotherapy.

Thank you for being a PROFILE Champion and an ambassador for the promotion of a culture of quality and improvement at your facility. Contact us with any questions at profile@stjude.org.

Thank you for your input.
Global Quality and Performance Unit
Department of Global Pediatric Medicine

Begin Survey
Survey Starting Date: Sunday, June 7, 2020 12:00 AM
Survey Closing Date: Wednesday, June 17, 2020 11:59 PM

Notice to Respondents:
This Epi Info Secure Web Survey system is approved for the collection of Personally Identifiable Information (PI) and Protected Health Information (PHI) as described in 45 CFR 160.103 and summarized at Summary of the HITECH Privacy Rule, and 45 CFR Office of Civil Rights, Summary of the HITECH Privacy Rule, and Office of Civil Rights Electronic Health Information Privacy Rule. If you have any questions about how your data will be used, protected and possibly shared, please contact the survey authors listed in the survey.
EPI INFO™ WEB SURVEY

![Image of EPI INFO™ WEB SURVEY interface]

The image shows a screenshot of the EPI INFO™ WEB SURVEY interface, focusing on the Treatment Practices: Curative Treatment Protocols section. The survey contains questions related to treatment practices, such as:

6. IHD protocols or guidelines for treatment with curative intent at my facility contain:
   - a. Details for risk group stratification
   - b. Flow charts (chemotherapy, follow-up)
   - c. List of possible toxicities
   - d. Suggestions for dose modifications
   - e. Suggestions for management of toxicity
   - f. Suggestions for follow-up after completion of treatment

7. Regarding the treatment plan for each patient, tell us how frequently the following statements are true at your facility:
   - a. A clear treatment plan is developed for each patient
   - b. The protocol name or number to be followed is clearly documented in the patient's medical chart
   - c. The protocol scheme is clearly documented in the patient's medical chart
   - d. The treatment plan is kept up to date as change in therapy occurs

The interface also includes options to complete the survey, such as “Finish Later” and “Continue.”
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

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dominguez</td>
</tr>
<tr>
<td></td>
<td>3456</td>
</tr>
</tbody>
</table>
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
James A. Fuller, PhD, MSPH
Epidemiologist (Contractor)
GDD Operations Center, CGH
kux9@cdc.gov
godata@who.int
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.
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)

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.