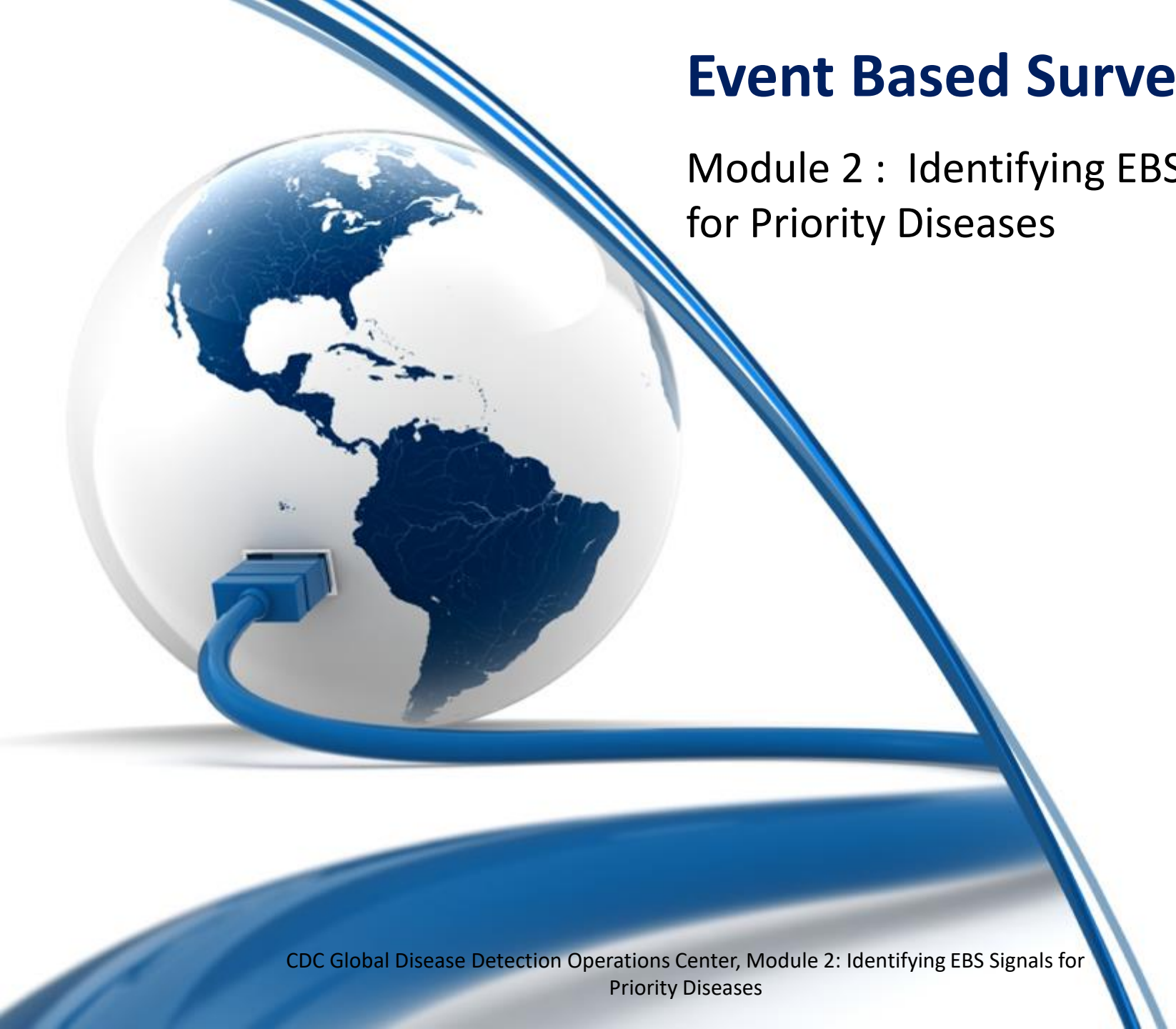


Event Based Surveillance

Module 2 : Identifying EBS Signals for Priority Diseases

Module 2 Learning Objectives

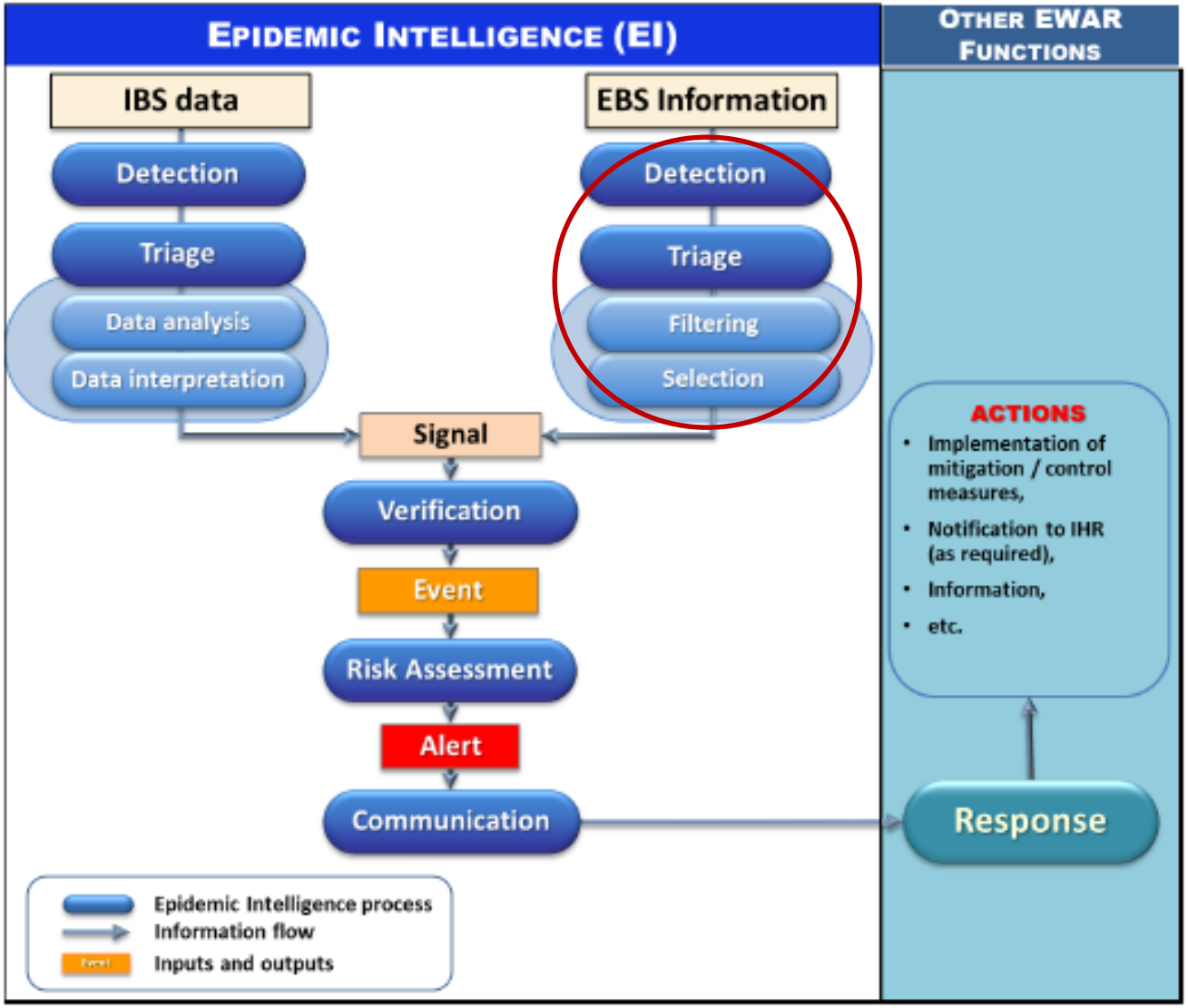
2.1 Describe EBS work protocols for detection of signals

2.2 Describe types of electronic or digital information that can be used as non-traditional/unstructured sources of data on public health event

2.3 Use publicly accessible international sources to identify events of potential public health significance

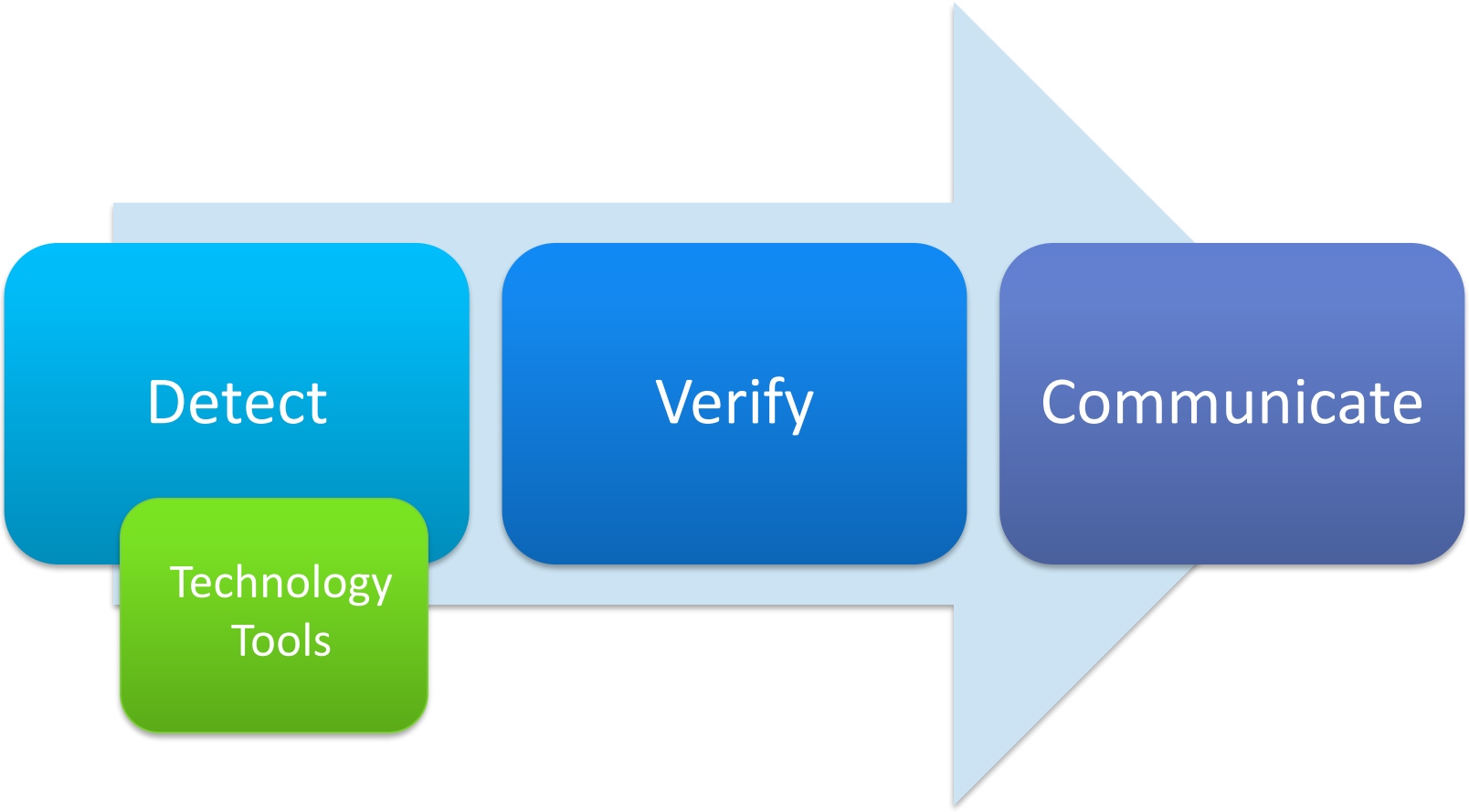
PROCESS:

Epidemic intelligence (EI) within EWAR

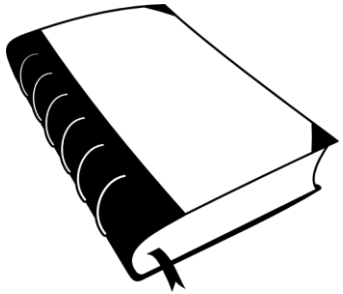


Reprinted with permission from WHO (2014)

Phases of Event-Based Surveillance



DEFINITION:
Signal

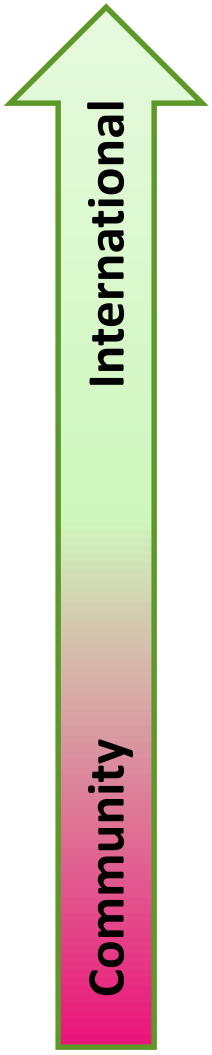


- Data and/or information considered by the Early Warning and Response (EWAR) system as representing a potential acute risk to human health.
  - When it has been verified, a signal becomes an “event.”

INFORMATION SOURCES

Introduction to tools for EBS –
Identifying types of information

EBS information may come from numerous sources across sectors and levels



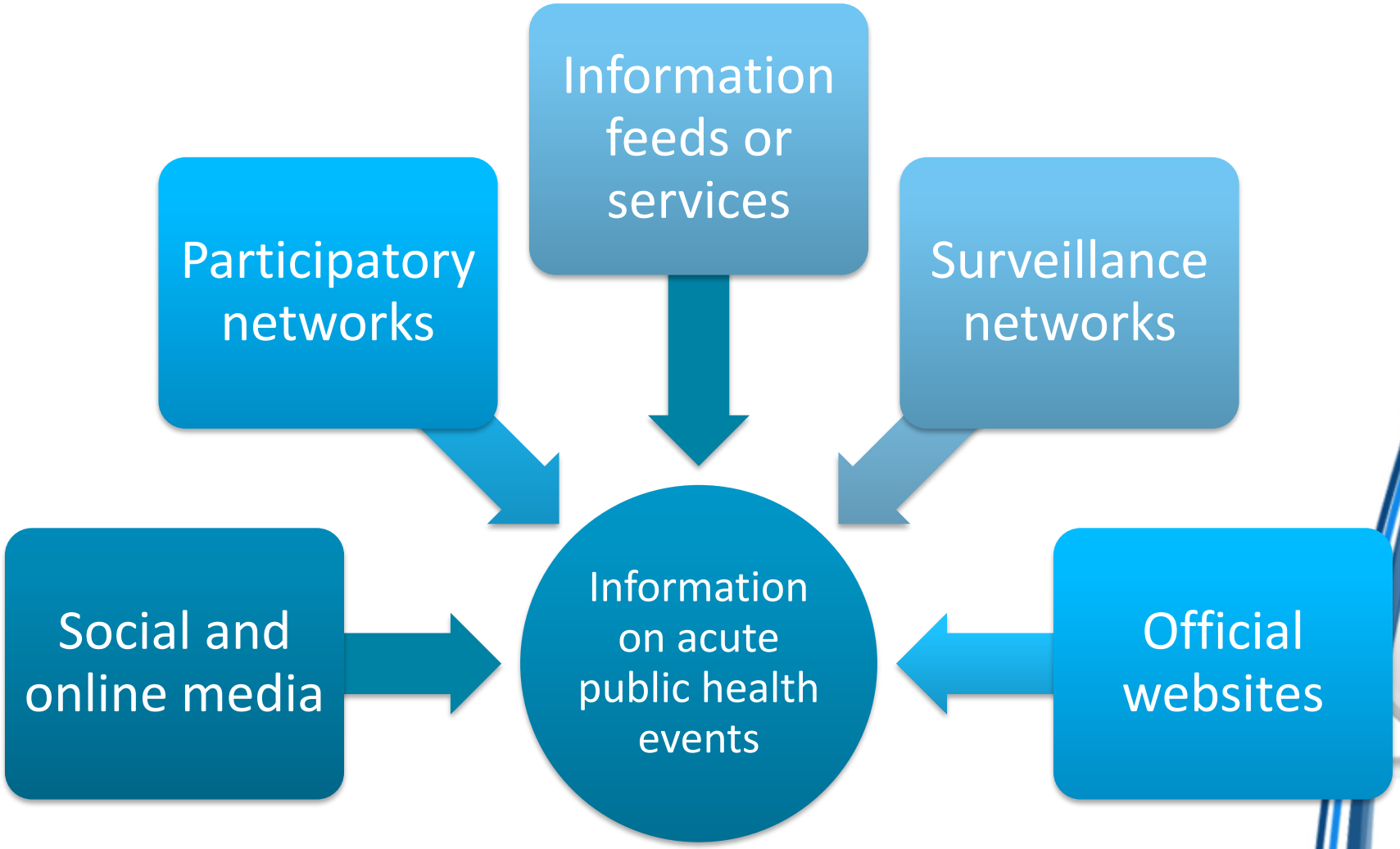
Electronic biosurveillance data systems
Supranational networks
International agency early warning systems
Law enforcement

Veterinary services
Chemical or radiation safety authorities
Food safety agencies
Pharmacy/drug supply agencies
Laboratories

Water and sanitation authorities
Health facilities
Poison control centers
Schools and businesses

Community leaders
Community health workers
Non-traditional practitioners
Social media and participatory reporting

Various types of electronic or online sources can provide information for EBS



EBS information sources include official, formal and informal

Official sources

- Any subnational, national, or international organization that is accredited by governments or by agreement to provide information

Formal sources

- Actors directly involved in an event (for example, providing patient consultations, healthcare, or diagnostic services) as part of formal roles and responsibilities

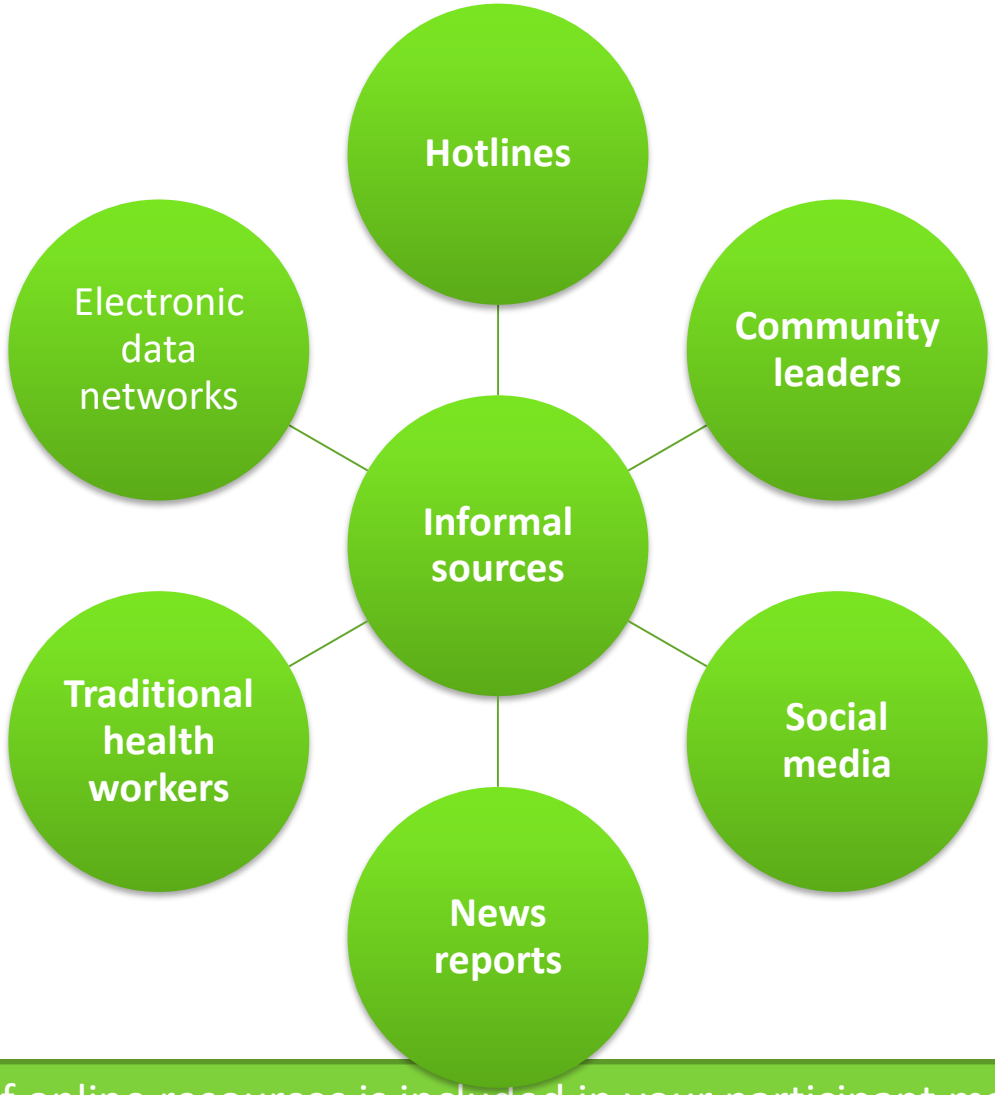
Informal sources

- Not associated with any organized activity related to the event

EBS information may come from official or formal sources - examples

A list of online resources is included in your participant materials.

EBS information may come from unofficial or informal sources - examples



A list of online resources is included in your participant materials.

Official websites are sources of regularly updated information – Ex: WHO

System	Type	Content
IHR Event Information System (EIS)	Closed	Full information on reported events – open to National IHR Focal Points
Disease Outbreak News (DON)	Open	Information stripped of specific details (names, facilities)
Epidemic and Pandemic Alert and Response – regional offices	Open	Not updated daily, but includes useful details

Novel Coronavirus – Republic of Korea (ex-China)

Disease outbreak news
21 January 2020

On 20 January 2020, National IHR Focal Point (NFP) for Republic of Korea reported the first case of novel coronavirus in the Republic of Korea. The case is a 35-year-old female, Chinese national, residing in Wuhan, Hubei province in China.

The case-patient had developed fever, chill, and muscle pain on 18 January while in Wuhan. She visited a local hospital in Wuhan and was initially diagnosed with a cold. On 19 January , the case-patient was detected with fever (38.3 °C) upon arrival at the Incheon International Airport. The case-patient was transferred to a national designated isolation hospital for testing and treatment. She was tested positive for pancoronavirus reverse transcriptase-polymerase chain reaction (RT-PCR) assay, and subsequently was confirmed positive for novel coronavirus (2019-nCoV) on 20 January by sequencing at the Korea Centers for Disease Control and Prevention (KCDC). Upon detection, the patient had chills, runny nose, and muscle pain.

The case-patient did not report visiting any markets, including Huanan Seafood

Other official websites can be sources of information on outbreaks or events

Official websites

Inter-governmental organizations

- UN Food and Animal Organization (FAO)
- World Animal Health Organization (OIE)
- International food safety authorities network (INFOSAN)
- International Atomic Energy Agency (IAEA)

Government agencies and services

- MOH websites
- Travel health sites
- Other ministries

Non-governmental organizations

- ReliefWeb
- IRIN
- International SOS

Other official websites: intergovernmental organizations

Official websites

Intergovernmental organizations

- UN Food and Animal Organization (FAO)
  - EMPRES Global Animal Disease Information System
- World Animal Health Organization (OIE)
  - World Animal Health Information Database (WAHID)
- International food safety authorities network (INFOSAN)
- International Atomic Energy Agency (IAEA)

Other official websites: governmental and non-governmental organizations

Official websites

Government agencies and services

- MOH websites
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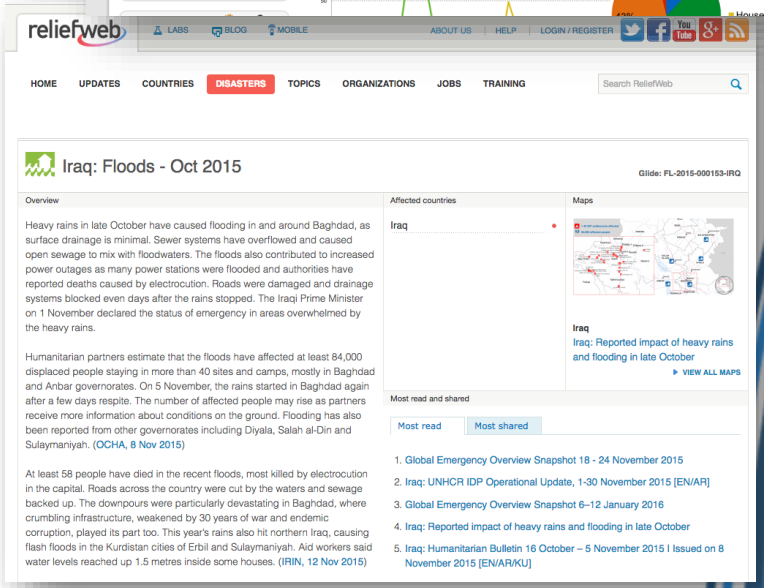


Cross-border surveillance networks organized by region or by disease

Surveillance networks

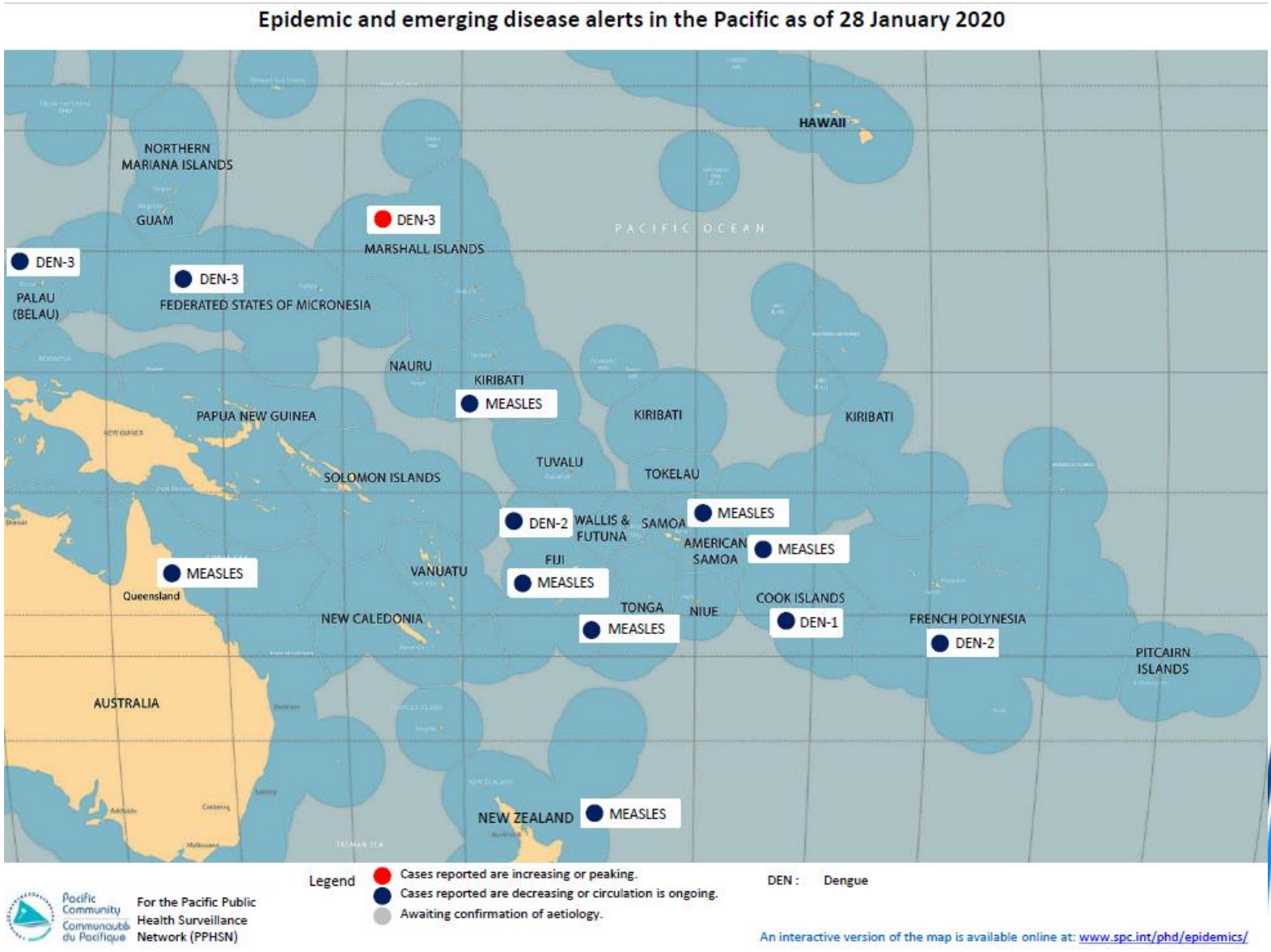
Cross-border initiatives

- European Centre for Disease Prevention and Control (ECDC)
- Caribbean Public Health Agency (CARPHA)
- Pacific Public Health Surveillance Network (PPHSN)
- Mekong Basin Disease Surveillance Network (MBDS)
- Global Influenza Surveillance & Response System
- Global Polio Eradication initiative

Supranational and regional networks

Disease-specific networks

Cross-border surveillance networks can offer context or a snapshot of ongoing events



Platforms for community-based surveillance information

Participatory networks

Surveillance networks

- Community leaders and community health workers can be engaged in reporting acute public health events and risks directly

Lay case definitions → Outreach and training to stakeholders → Mechanisms for reporting → Unstructured information

Participatory surveillance: individual reporting of priority syndromes

Participatory networks

- Participatory surveillance
  - Self-reporting by individuals through mobile phone app or website
  - User-generated data
  - Advantages: low-cost complement to other sources
  - Challenges: user engagement, sample size

Social content and media may offer a direct window onto events

Social and online media

News media	Social networks	Social content
• Online content from traditional media	• Facebook • Blogs • Twitter • WhatsApp groups	• User-generated queries of wikis, search engines • Google Alert

Social content and media may offer a direct window onto events

Social and online media

Identify social media or media sources

Search for keywords associated with priority syndromes or events

Analyze keyword use trends and review content

Information feeds or services: RSS feeds

Information feeds or services

Rich site summary (RSS) feeds

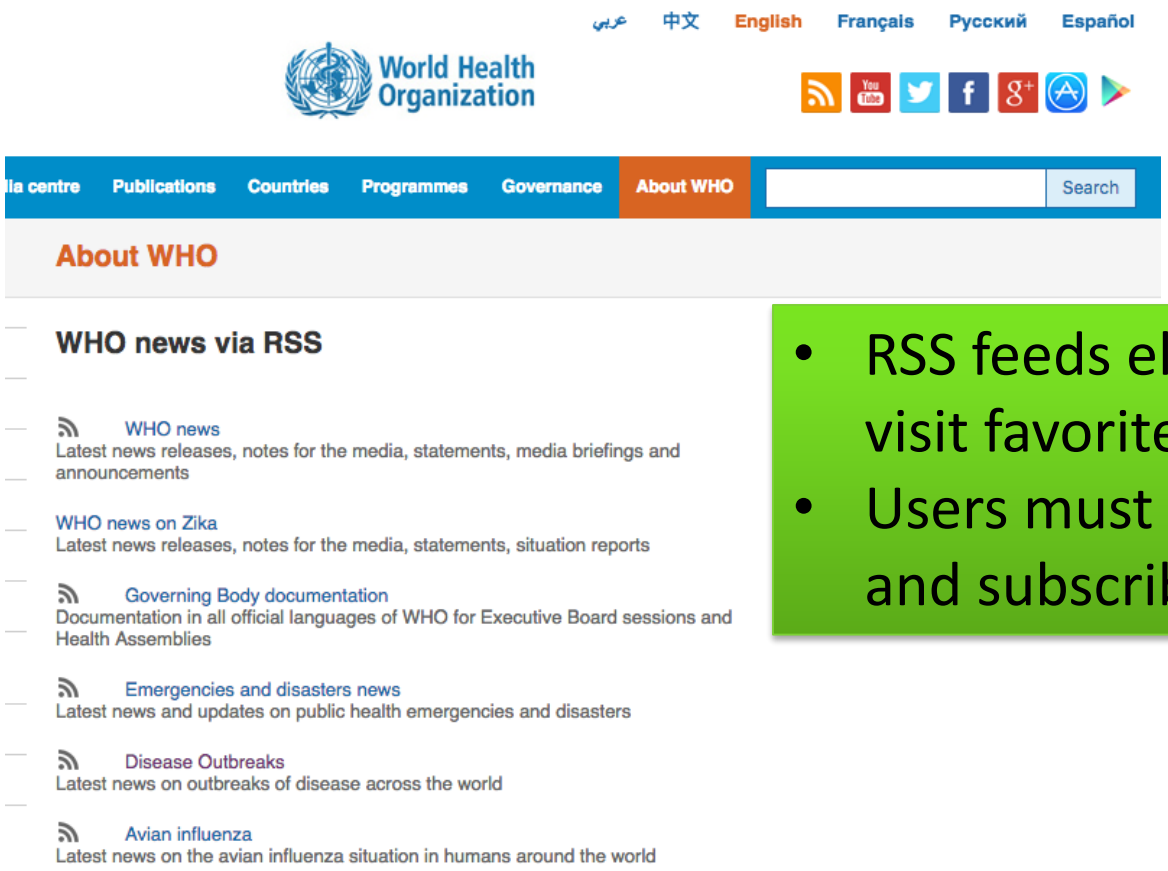
- Publish frequently updated information from favorite online sources

Standardized software tools to publish frequently updated information from websites

- The user identifies a favorite website that publishes an RSS feed
- The user pastes the feed's URI into an RSS reader (a free/low-cost app) which:
  - Constantly monitors the selected website
  - Informs the user of any updates
  - Can automatically download new data

Information feeds or services: RSS feeds

Information feeds or services

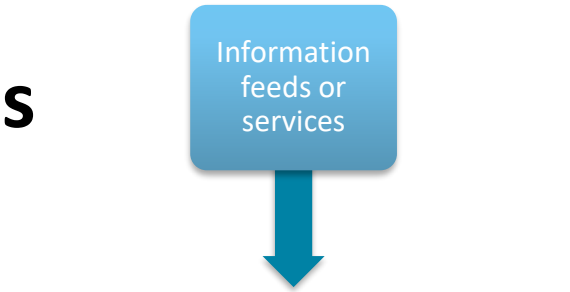


- RSS feeds eliminate the need to visit favorite websites individually
- Users must identify the websites and subscribe to feeds

Information feeds or services: information platforms or services

Data “scrapers” or aggregators take advantage of information available on the internet

- Algorithms designed to extract data- downloaded pages which can be stored and/or manipulated in a database
- Data can be extracted from wide range of official and unofficial sources



Information platforms or services

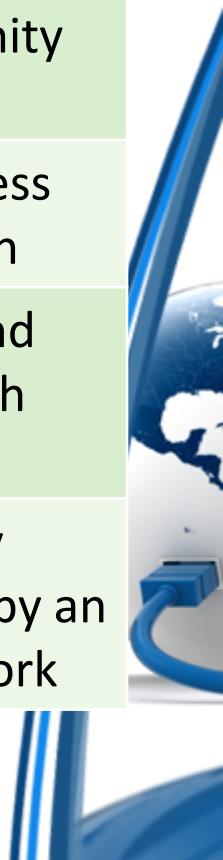
- Tailored software tools that collect information relevant to biosurveillance or health security from online resources

AGGREGATING ANALYSIS

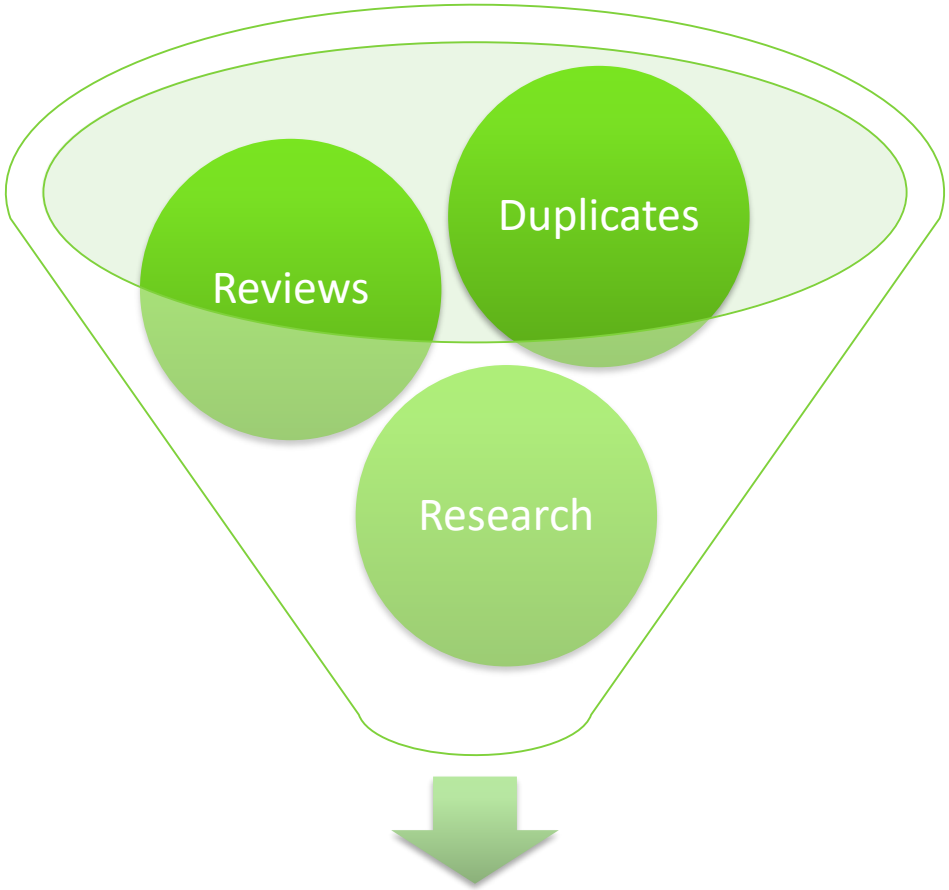
Using information platforms and services as sources

The same event may be described in multiple sources

Health Incident	Structured	Unstructured
Unexpected deaths	Death registry data	Reports of unexpected deaths from community leader
Illness in children	School absenteeism monitoring	Media reports of illness among schoolchildren
Priority syndrome	Sentinel surveillance for influenza-like illnesses	Social media posts and internet searches with the keyword “flu”
Outbreak in neighboring country	Notification to WHO and neighboring country NFPs	Reports on a ministry website or collected by an electronic data network



Filtering - screening out duplicates and irrelevant information



Relevant Signals

Scrapers and aggregators: general process of automated analysis

Collects

Raw text from pre-defined sources

Extracts

Information from online sources using algorithms for language analysis

Transforms

Raw text into structured information that can be stored in a database of events

Aggregates

Similar information across multiple sources to reduce redundancies

Scores

Reports according to relevance

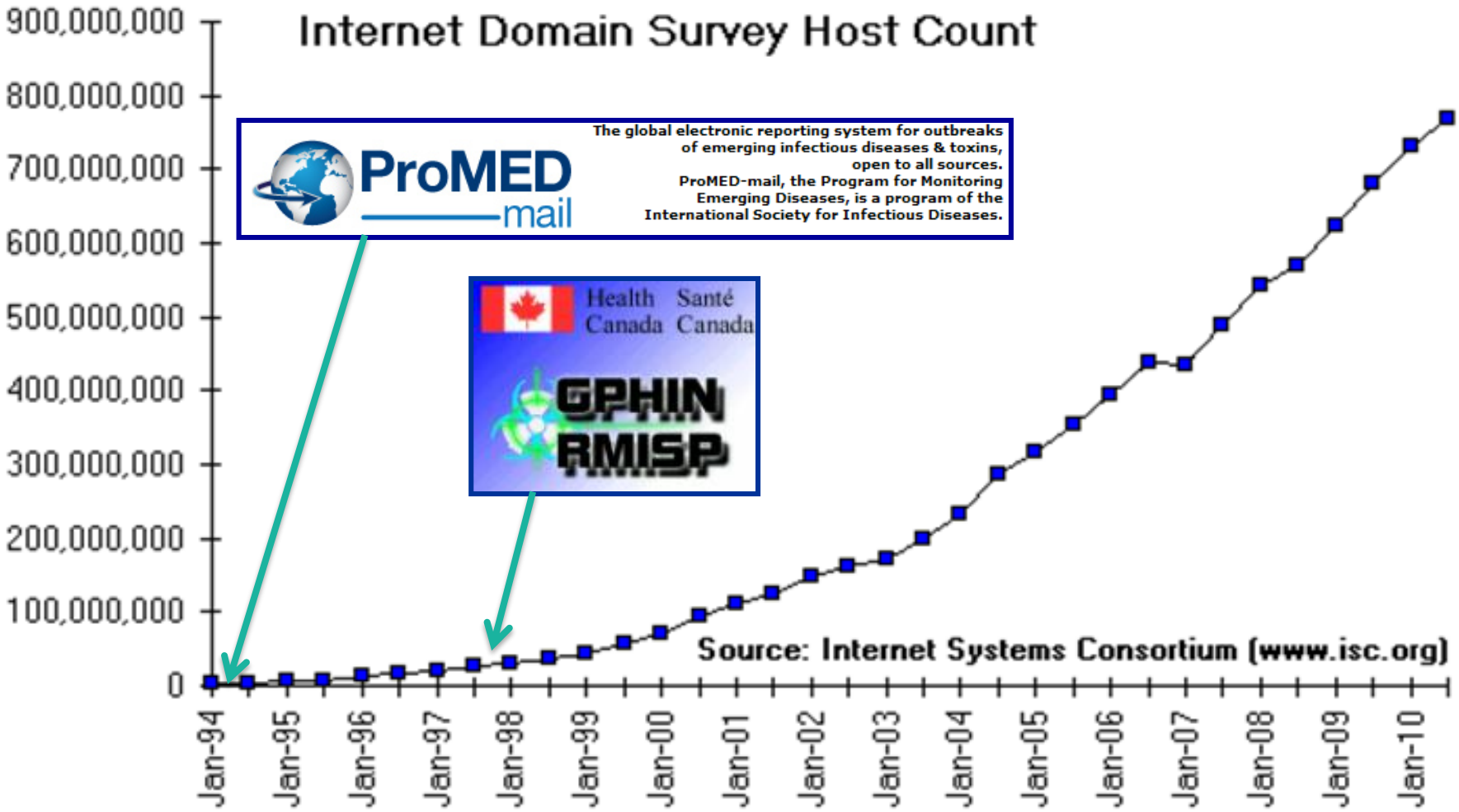
Scrapers and aggregators include closed and open platforms

System	Manager	Access
HealthMap	Team based at Boston Children's Hospital	Open
Global Public Health Network (GPHIN)	Public Health Agency of Canada	Freely accessible to national public institutions by request
Medical Information System (MEDISYS)	European Commission Joint Research Centre	Open
Pattern-based Understanding and Learning System (PULS)	University of Helsinki	Open – partnership with MEDISYS
Emergency and Disaster Information Service (EDIS)	National Association of Radio Distress-Signaling and Infocommunications (RSOE) - Hungary	Summary content open; detailed content accessible to national institutions by request

Internet Event-based Surveillance Systems

System Name		Country	No. Languages	Moderated
EIOS		Global	>50	No
GPHIN		Canada	9	Yes
HealthMap		US	7	No
MedISys		EU	26	No
ProMED		US	4	Yes

Growth of the Internet 1994-2010



Information feeds or services: contributor-based sources

ISID.org Donate Subscribe

ProMED
INTERNATIONAL SOCIETY
FOR INFECTIOUS DISEASES

https://promedmail.org/

HOME ABOUT OUR TEAM PARTNERS FROM THE FIELD SEARCH POSTS

ProMED-mail Português Español Русский Mekong Basin Afrique Francophone Anglophone Africa South Asia Middle East/North Africa

Latest Plants Hot Topics Errata

Latest Posts On ProMED-Mail

28 Jan 2020 Crimean-Congo hem. fever- Africa (02): Uganda (QI)

27 Jan 2020 Novel coronavirus (21): China, Canada, Sri Lanka ex China

27 Jan 2020 Black spot, citrus - Tunisia: 1st report

27 Jan 2020 Novel coronavirus (20): China, wildlife trade ban

26 Jan 2020 Novel coronavirus (19): China (HU) transmission dynamics

View printable version Share this post:

Published Date: 2020-01-28 11:25:51
Subject: PRO/AH/EDR> Crimean-Congo hem. fever- Africa (02): Uganda (QI)
Archive Number: 20200128.6924924

CRIMEAN-CONGO HEMORRHAGIC FEVER - AFRICA (02): UGANDA (KAGADI)
****
A ProMED-mail post
http://www.promedmail.org
ProMED-mail is a program of the
International Society for Infectious Diseases
http://www.isid.org

[1]
Date: Tie 27 Jan 2020
Source: EpiCore Global Surveillance Project [edited]

ProMED-mail

- The Program for Monitoring Emerging Diseases (ProMED-mail) reports on outbreaks of diseases of infectious or toxic etiology, whether natural or intentionally released
- Open to all sources and free of charge, ProMED-mail exploits the speed and ubiquity of the Internet to serve as an early warning system for the detection of emerging disease outbreaks
- ProMED-mail monitors diseases of plants and animals of agricultural importance in addition to zoonoses because of their key role in disease emergence
- Source: **CID 2004:39 (15 July)**

ProMED-mail facts

- Reports are screened and placed in an appropriate context by commentary and references from a panel of expert moderators
- Reports are posted to the Web and sent by e-mail to subscribers
- Reports are selected and interpreted by a panel of specialist moderators who provide expert commentary, supply references to previous reports and to the scientific literature, and put the report in perspective
- Supported by donations and foundation grants

ProMED's focus

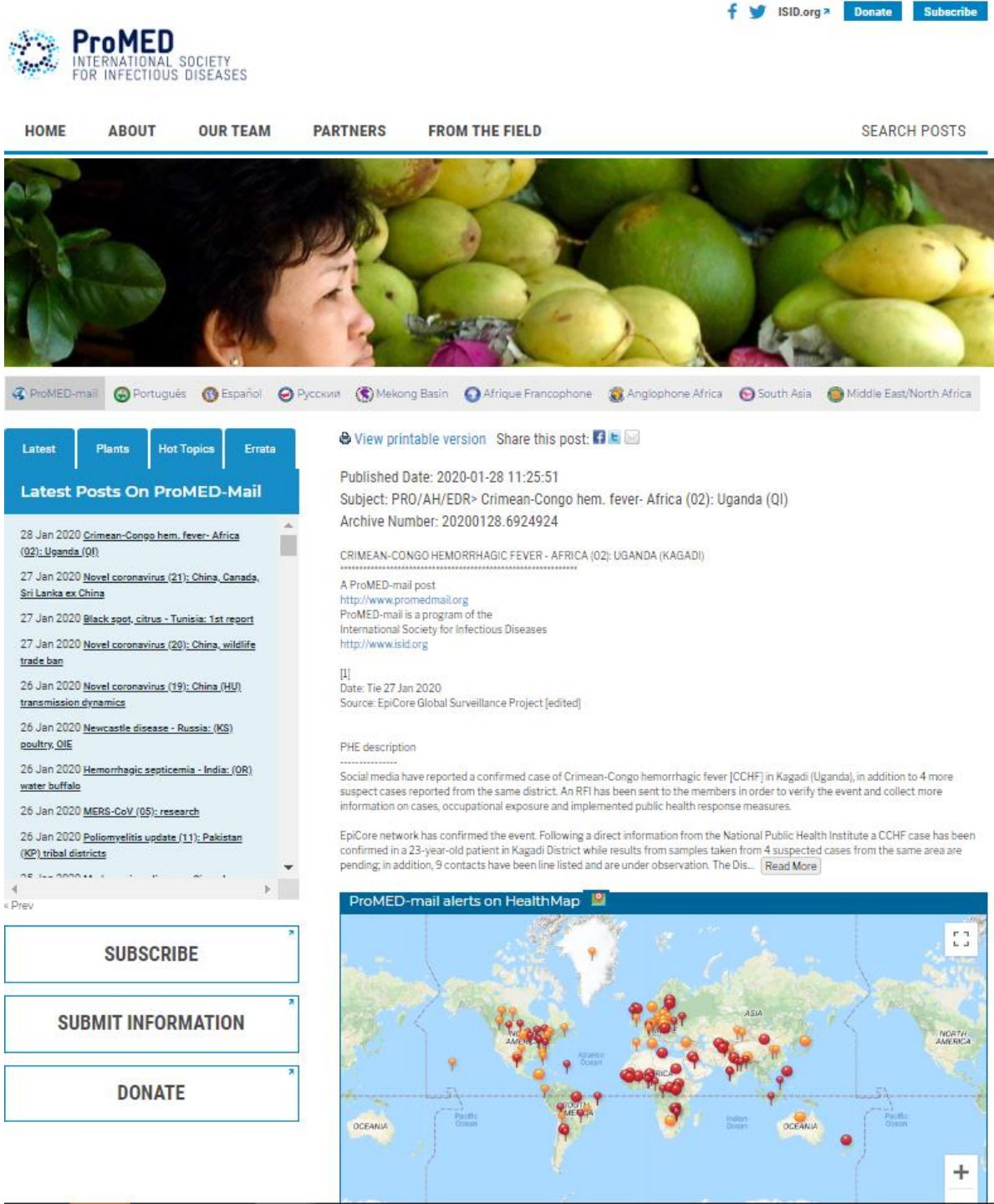
- Newly described or unknown diseases, epidemics, and outbreaks
- Emergence of diseases in new areas or populations
- Emphasis on diseases of plants and animals that might affect human populations
- Upholds "One Health" and recognizes the importance of diseases that affect plants and animals of agricultural importance, as well as zoonoses

ProMED caveats

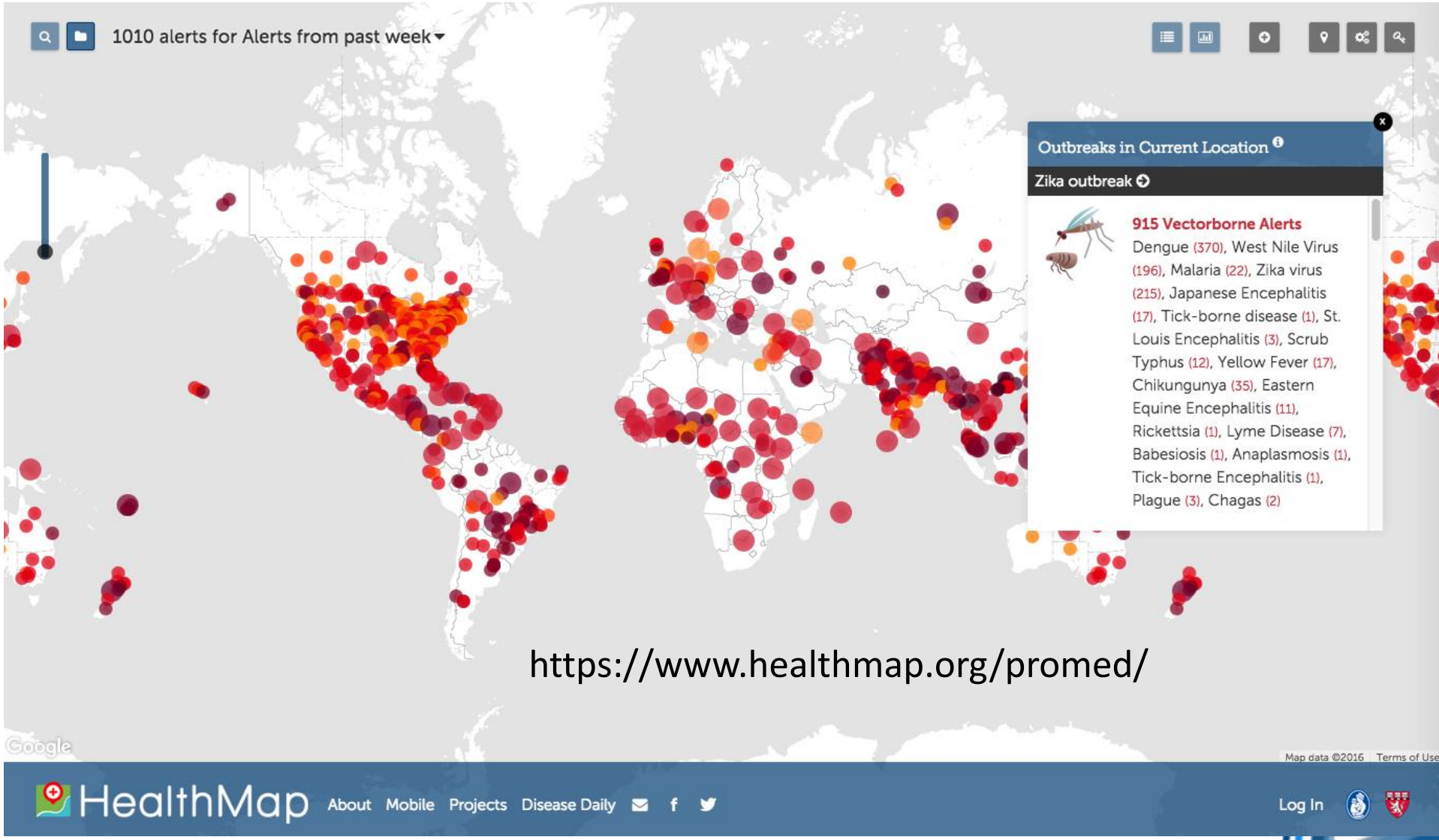
- Very sensitive reporting system
- Media reports are included in distribution
- Media reports may not contain verified information
  - Moderator may note this in context provided

ProMED website

http://www.promedmail.org/



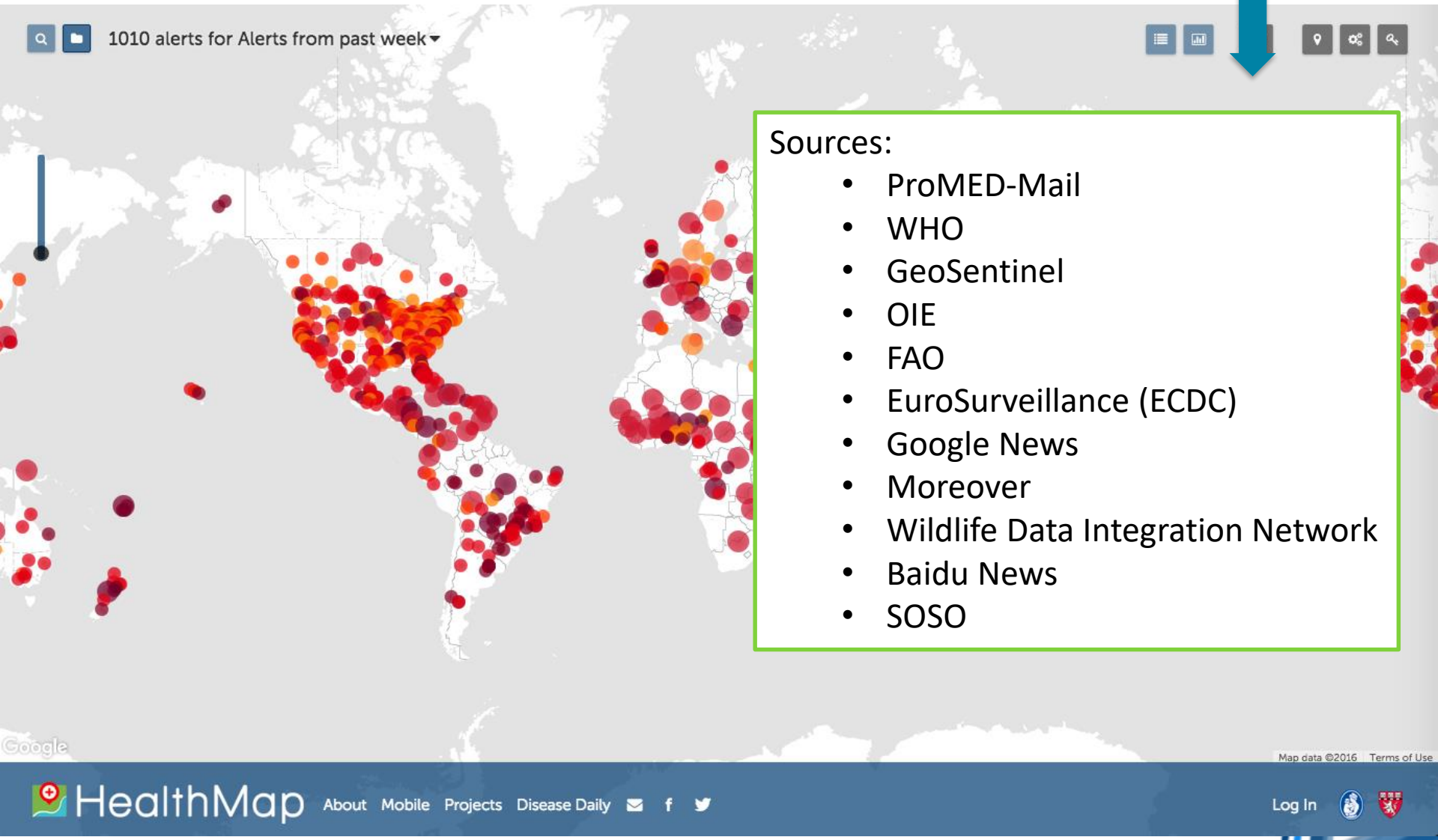
HealthMap focuses primarily on infectious diseases



https://www.healthmap.org/promed/

HealthMap uses open sources and tools

Information feeds or services



Sources:

- ProMED-Mail
- WHO
- GeoSentinel
- OIE
- FAO
- EuroSurveillance (ECDC)
- Google News
- Moreover
- Wildlife Data Integration Network
- Baidu News
- SOSO

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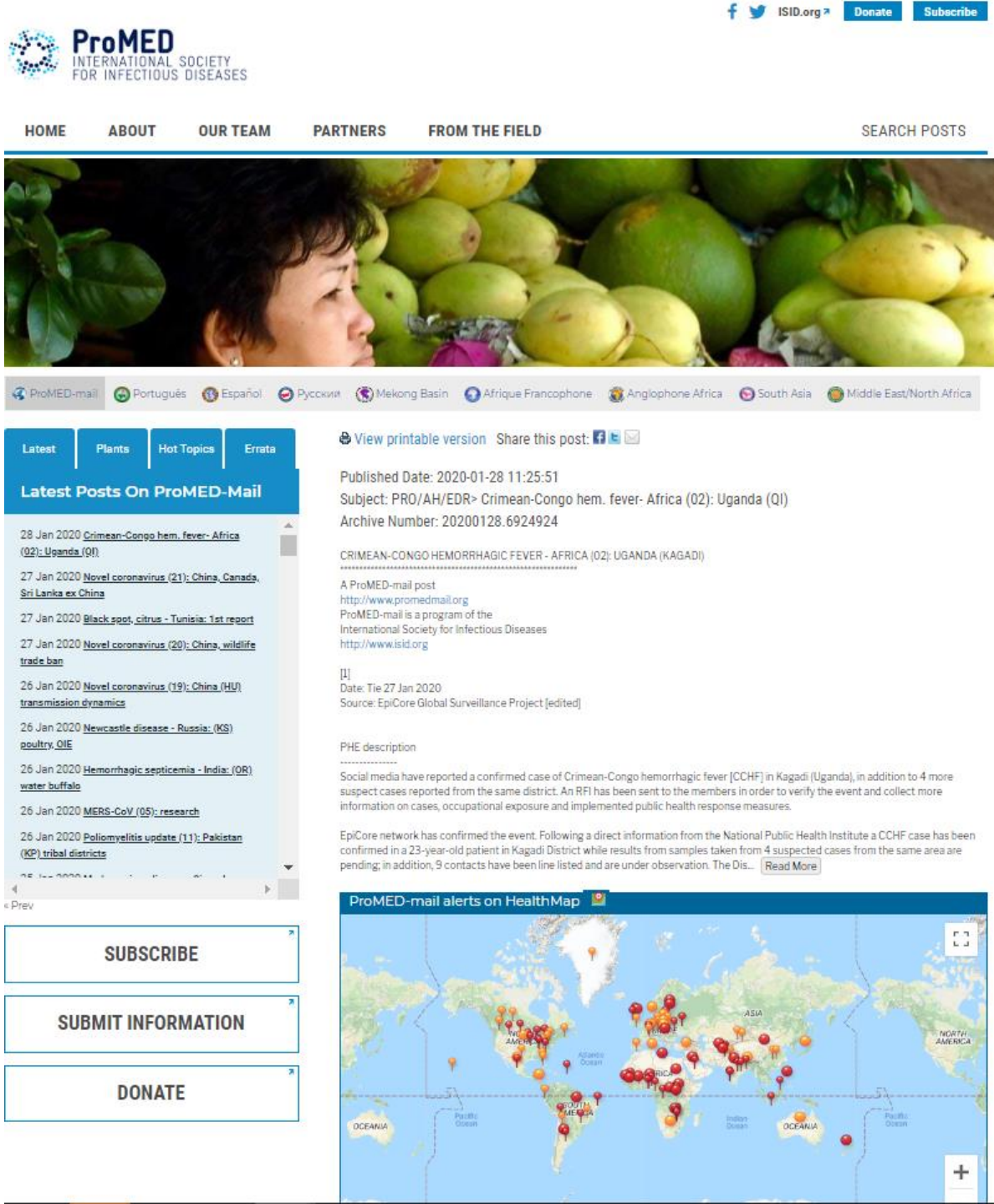

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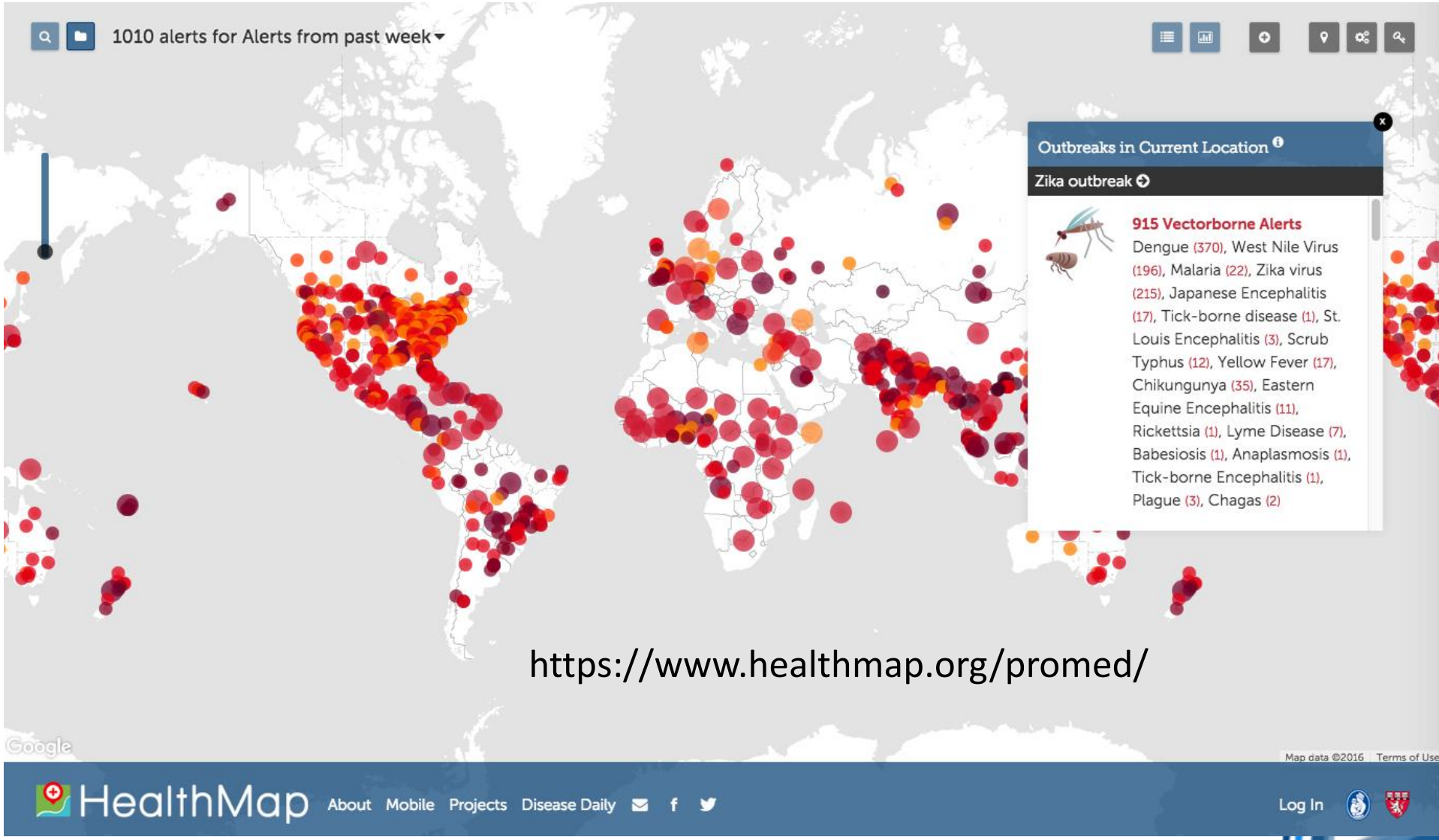

https://www.healthmap.org/promed/

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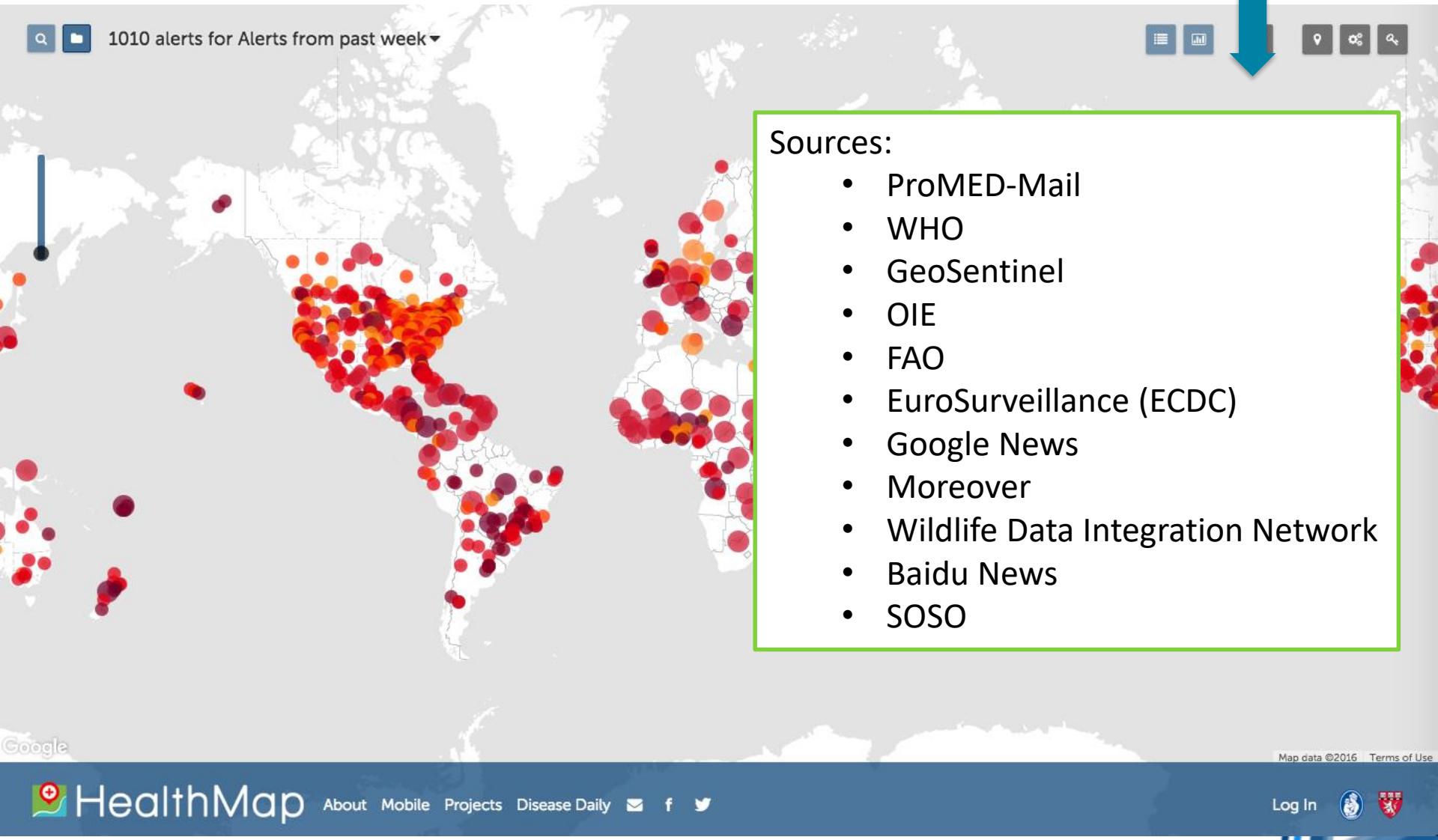


Sources:

- ProMED-Mail
- WHO
- GeoSentinel
- OIE
- FAO
- EuroSurveillance (ECDC)
- Google News
- Moreover
- Wildlife Data Integration Network
- Baidu News
- SOSO

GPHIN is a secure internet-based early warning system

Data retrieved from news feeds every 15 minutes

More than 30,000 sources worldwide in 9 languages

Feeds from a large variety of national and local newspapers

Algorithms scan and filter results

About 3,000 hits per day

Systems automatically

- Aggregate data
- Eliminate duplicates
- Insert metadata
- Categorize
- Score relevancy
- Automatically publish highly scored data

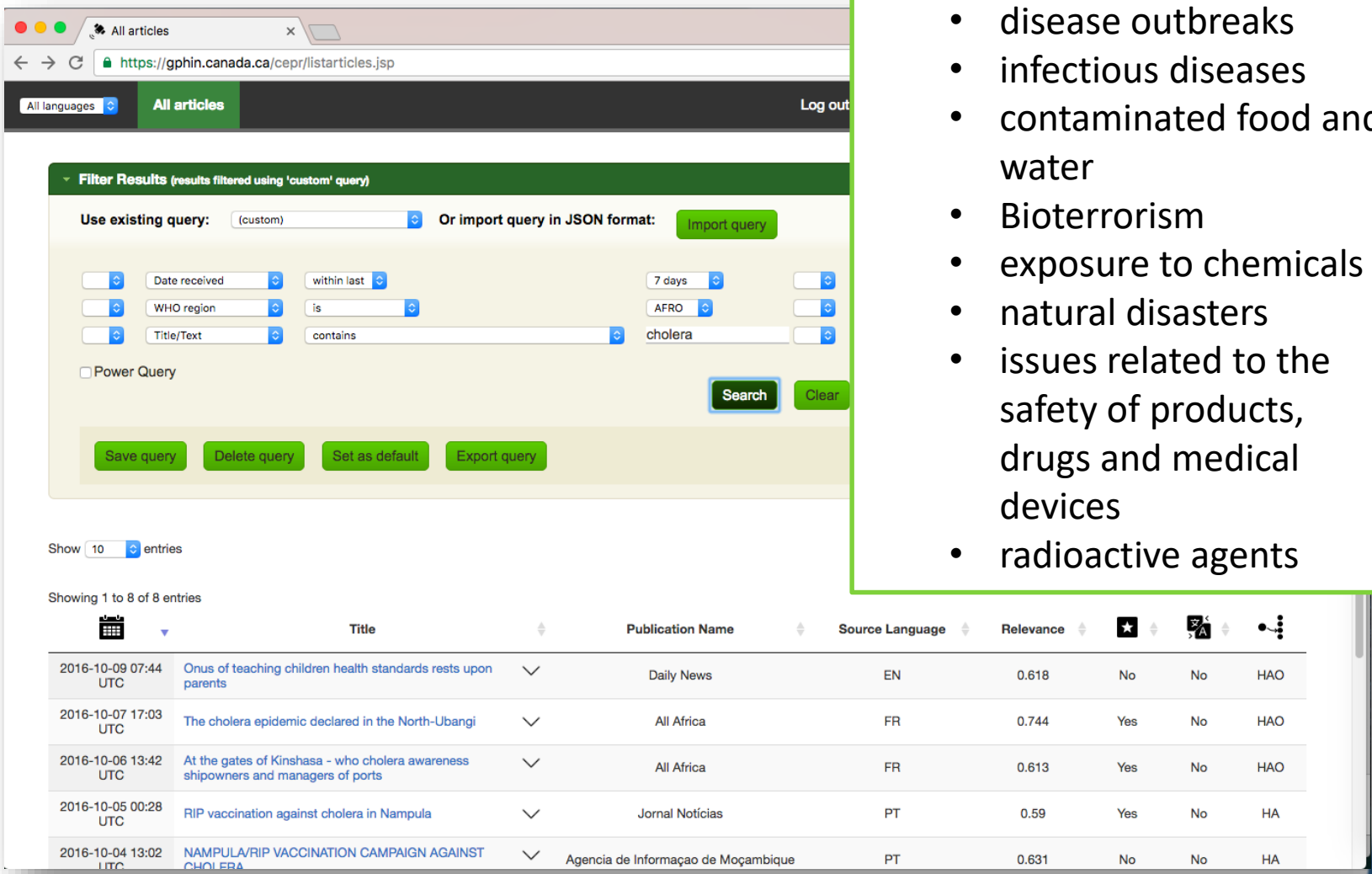
Human analysts assess results

Multilingual, multidisciplinary GPHIN analyst team evaluates reports below publish threshold

Decide to publish, issue an alert, or dismiss

Additional analysis

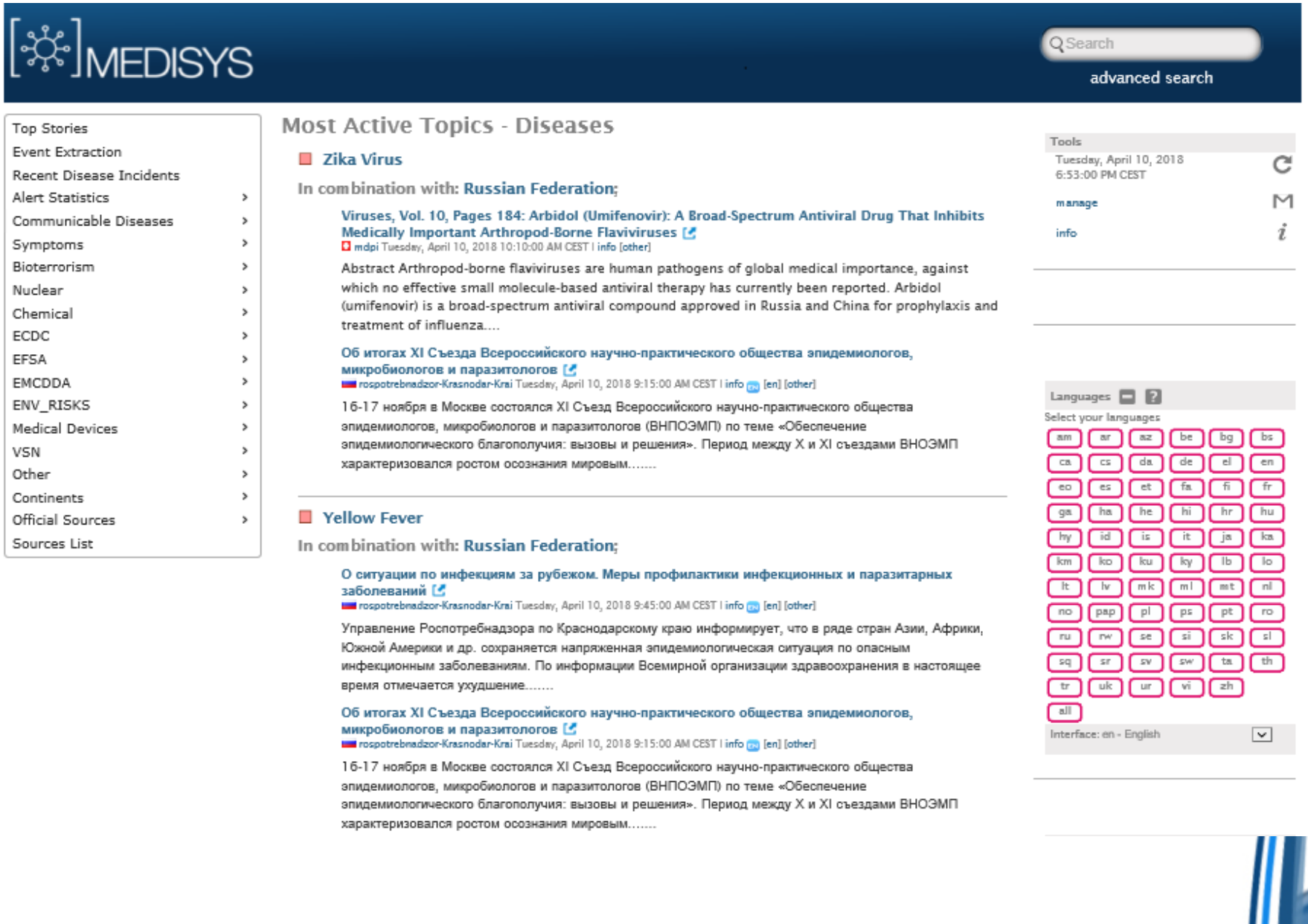
GPHIN focuses on a broad range of public health threats



Areas covered:

- disease outbreaks
- infectious diseases
- contaminated food and water
- Bioterrorism
- exposure to chemicals
- natural disasters
- issues related to the safety of products, drugs and medical devices
- radioactive agents

Searching MEDISYS



More to come!

Epidemic Intelligence from Open Sources (EIOS)

- **A “system of systems”: One stop shop for IB EBS**
  - **Existing media aggregators just reviewed will feed into EIOS**

- **EIOS System Training – 28-30 October, 2019**
  - WHO HQ and WHO AFRO to facilitate

PRIORITIZING DISEASES & CONDITIONS FOR SURVEILLANCE

Triage of EBS raw information helps minimize analysis of duplicate or irrelevant signals

Filtering - the process of screening out duplicates and information which is not relevant for EWAR

- **Identifying duplicates** (the same event reported by the same source)
- **Identifying and discarding information not relevant to EWAR** (information that matches the criteria for public health events but is irrelevant for early warning, such as a generic review of a disease)

Selection: the sorting out of information according to national priority criteria

- **Discarding information that is not relevant for early warning** (for example, reports related to a non-prioritized mild disease or an increase in disease cases that is consistent with known trends and seasonal variations)

National context of priority public health events for EBS

- The national EWAR surveillance objectives will depend on the characteristics of the disease or hazard, such as:
  - Diseases (e.g. measles)
  - Syndromes (e.g. hemorrhagic fevers)
  - Hazards (e.g. contamination of drinking water source)
  - Unexpected/unusual events (e.g. unexplained mortality)

National context of priority public health events for EBS (cont.)

- The objectives will also depend on the characteristics of the disease or hazard, such as:
  - Attack rate
  - Morbidity and mortality
  - Environment
  - Mode of transmission, including but not limited to:
    - Person-to-person
    - Point source
    - Toxin exposure
    - Public health interventions required to mitigate spread.

International context of priority public health events for EBS

- International obligations – for example, potential public health emergencies of international concern, as defined in Annex 2 of the International Health Regulations (IHR)

Considerations for developing a list of priority diseases for EBS

- No country can monitor every potential source of information for every potential event. A country-specific list of priority diseases for EBS should be established.

- Ensuring sensitivity of EBS program: disease coverage
  - Are we selecting all important events?

- Ensuring sustainability of EBS program: human resource bandwidth
  - How easily can the defined surveillance program be maintained over time without undermining other public health programs?

Thank you!

Global Disease Detection Operations Center (GDDOC)
Email: GDDOC-Outbreak (GDDOUTBREAK@CDC.GOV)