Innovative Disease Surveillance and EpiCore
EpiCore Partners

- Skoll Global Threats Fund
- ProMED Mail
- TEPHINET
- HealthMap
Why Does Disease Surveillance Exist:
Traditional disease surveillance

Traditional disease surveillance is the systematic **collection, evaluation and analysis of health information.**
Traditional Information Sources for Disease Surveillance:

- Reports from investigations
- Primary healthcare facilities and laboratories
- Disease prevalence/incidence surveys
- Sentinel surveillance sites
Traditional information sources for global disease surveillance

• Ministries of Health/Agriculture/Environment
• National Institutes of Public Health
• WHO/FAO/OIE Regional and Country offices
• WHO collaborating centers
• Civilian and military laboratories
• Academic institutes
• Non-governmental organizations (NGOs)
Disease Surveillance Realities – How Gaps Occur

Community and local health sector interaction – “the cluster”

Case 1

Case 2

Case 3

Case 4

Case 5
Disease Surveillance Realities

Community and local health sector interaction

Case 1

Case 2

Case 3

Case 4

Case 5
Disease Surveillance Realities

Community and local health sector interaction

Case 1

Case 2

Case 3

Case 4

Case 5
Disease Surveillance Realities

Community and local health sector interaction

Case 1

Case 2

Case 3

Case 5

Case 4
Disease Surveillance Realities

Community and local health sector interaction

Case 1

Case 2

Case 3

Case 4

Case 5
Disease Surveillance Realities

Community and local health sector interaction

Case 1

Case 2

Case 3

Case 5

Case 5

Case 5

Case 5
Disease Surveillance Realities

Community and local health sector interaction

Case 1

Case 2

Case 3

Case 4

Case 5

*reporting unit*
Disease Surveillance Realities

Community and local health sector interaction

Case 1: Disease surveillance not reported due to lack of awareness.

Case 2: Disease surveillance reported to the health sector.

Case 3: Disease surveillance reported, but not taken further due to lack of action.

Case 4: Disease surveillance reported, leading to intervention and recovery.

Case 5: Disease surveillance not reported due to fear of stigmatization or punishment.

*reporting unit*
Disease Surveillance Realities

Community and local health sector interaction

Case 1

Case 2

Case 3

Case 4

Case 5

*reporting unit*

*astute clinician*
## Pros and Cons of Traditional Surveillance

<table>
<thead>
<tr>
<th>PROS</th>
<th>CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accurate information from credible sources</td>
<td>Slow detection</td>
</tr>
<tr>
<td>Opportunity to provide incentives to overcome non-reporting</td>
<td>May miss novel diseases or those with vague case definitions</td>
</tr>
<tr>
<td>Able to access detailed, protected information from government and healthcare facilities</td>
<td>Uses only confirmed information, from a limited number of sources</td>
</tr>
</tbody>
</table>
Improving Disease Surveillance

Gaps that need to be addressed:

• Delays in official reporting
• Capturing unusual disease events
• Limited reach of traditional systems
Innovative Surveillance
What is Innovative Surveillance?

In today’s world of rapid, electronic communication, you may get a report of a health event through an email, a blog post, an online media source, or an online innovative surveillance platform long before the event is detected, confirmed and reported by the formal surveillance system.
What is Innovative Surveillance?

• Being adaptable and attentive to *new sources of information* is incredibly important in today's technology-driven world.

• While it is informative, innovative surveillance should not replace traditional surveillance.

• *IT IS COMPLEMENTARY*
Non-traditional information sources are also known as:

- informal
- non-governmental
- unofficial
- off-the-record
- unconfirmed
- unstructured data
- rumors
- event-based surveillance
Informal Information Sources

An information source that is outside of the routine surveillance network.
Factoids:

• 75% of newly emerging diseases in humans are zoonotic

• 70% of newly emerging diseases in animals come from wildlife
The one health concept recognizes the important links between human, animal and environmental health.
Innovative Surveillance
Pioneers and Available Tools
Non-traditional sector Digital Disease Detection initiatives
Participatory surveillance initiatives
1. Doctor Me

- The first and the most downloaded mobile application for health in Thailand.
- Over 400,000 visits per month

- provides users with:
  - free health-related advice,
  - a tool to locate the nearest hospital,
  - and a service to send for an ambulance in the case of emergency.

- The tool also allows user to self-report their symptoms and receives advice on how to treat those symptoms.

Get the app!
http://www.doctorme.in.th/
Innovative Surveillance at Work

2. Flu Near You

- is a website and mobile application that allows the public to report their health information using a quick weekly survey.

- Using participant-reported symptoms, Flu Near You graphs and maps this information to provide local and national views of influenza-like illness.

- As of September 2015, 67,000 active users receive a weekly email to report symptoms for themselves and 30,000 household members.

- Over 1.3 million cumulative weekly surveys have been submitted since inception.
Observation:

• Studies have shown a more than 50% reduction in time to detect an outbreak with the use of innovative disease surveillance methods in conjunction with traditional disease surveillance methods.
Why is Early Disease Detection so Important?

These example epidemic curves show how different surveillance techniques impact the time to detection. Faster detection leads to earlier response, resulting in a reduced number of cases.

Impact on epidemic curve for a measles outbreak
Why is Early Disease Detection so Important?

1. Routine disease reporting

Regular reporting on specific diseases by clinicians and laboratories, as required by public health legislation.
Why is Early Disease Detection so Important?

2. Astute Observer Reports

Reports of unusual disease occurrence by a clinician or other individual who is very perceptive, and shows an understanding of behaviors and situations.
Why is Early Disease Detection so Important?

3. Sentinel Surveillance
Monitoring a disease at a single facility or a small number of facilities. Generally, incidence rates cannot be derived from sentinel surveillance data since the population covered is rarely known and the data obtained may not be representative of the catchment area. However, sentinel surveillance usually requires fewer resources than population-based surveillance.
Why is Early Disease Detection so Important?

4. Innovative Surveillance
The use of digital sources, web searches, and other technology to surface early signals of disease outbreaks and improve the ability to stop the spread of contagious diseases.
Why is Early Disease Detection so Important?

5. Future innovations

New approaches to help shorten the time to disease detection, including community engagement (through enhanced participatory surveillance).

And even more reductions for zoonotic diseases if we do surveillance on wildlife and animal populations.
Case studies on Innovative Surveillance Methods
MERS-CoV
A new human coronavirus was isolated from a patient with pneumonia at the Virology Laboratory of Dr Soliman Fakeeh Hospital Jeddah Saudi Arabia.

The virus was isolated from sputum of a 60 year old male patient presenting with pneumonia associated with acute renal failure. The virus grows readily on Vero cells and LLC-MK2 cells producing CPE in the form of rounding and syncetia formation.

The isolate was initially tested for influenza virus A, influenza virus B, parainfluenza virus, enterovirus and adenovirus, with negative results. Testing with a pancoronavirus RT-PCR yielded a band at a molecular weight appropriate for a coronavirus. The virus RNA was tested also in Dr. Fouchier's laboratory in the Netherlands and was confirmed to be a new member of the beta group of coronaviruses, closely related to bat coronaviruses.
The Health Protection Agency (HPA) can confirm the diagnosis of one laboratory confirmed case of severe respiratory illness associated with a new type of coronavirus. The patient, who is from the Middle East and recently arrived in the UK, is receiving intensive care treatment in a London hospital.

In recent months, this new human coronavirus was also identified in a patient with acute respiratory illness in Saudi Arabia, who subsequently died. This new virus, however, is different from any that have previously been identified in humans. ....no evidence of illness in contacts of these 2 cases, including healthcare workers.
I would be interested to know whether the outbreak of severe respiratory disease of unknown origin in Jordan in April [2012] is now being reviewed for evidence of this new coronavirus.


An outbreak of a respiratory illness was reported on [19 Apr 2012] by the Ministry of Health in an intensive care unit in a hospital in Zarqa, Jordan. 7 nurses and one doctor were among the 11 affected. One of the nurses died. ...all cases had high fever and lower respiratory symptoms. ...the origin of the infection is likely viral....laboratory results are not available to date.

WHO confirmed as MERS-CoV on 30 Nov 2012
MERS-CoV

Distribution of confirmed cases of MERS-CoV by first available date, and probable place of infection, March 2012 – 4 February 2016 (n=1 657)

ECDC Communicable Disease Threats Report 6 February 2016
Impact of using non-traditional information sources

- Rapid official confirmation of ongoing outbreaks
- Rapid recognition of cases in other geographic areas
Disease Surveillance Norms

Which infectious diseases are reportable?

- Countries often develop a list of reportable diseases based on certain context-specific criteria, such as the
  - potential for an outbreak
  - severity of the disease
  - possibility of prevention

- The WHO has also developed regulations for mandatory member country reporting of public health emergencies of international concern. This global reporting system is defined within the WHO’s International Health Regulations, the only binding international legislation for public health.
Challenges of Innovative Surveillance

• False positives
• False alarms

Hence, the need to validate the information received.
## Pros and Cons of Innovative Surveillance

<table>
<thead>
<tr>
<th>PROS</th>
<th>CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast detection and reporting</td>
<td>Information captured might not be accurate or significant*</td>
</tr>
<tr>
<td>Not constrained to certain events</td>
<td>Sources may present biased information</td>
</tr>
<tr>
<td>Multiple sources of information (e.g., clinicians, labs, media reports, internet blogs)</td>
<td>Uses broad case definitions</td>
</tr>
<tr>
<td>Leverages publicly available information, increasing transparency</td>
<td>No standard data format, takes additional time to synthesize</td>
</tr>
</tbody>
</table>
Enter.... EpiCore...
EpiCore

- EpiCore is an initiative directed at facilitating communication about a potential infectious disease outbreak between public health disease/outbreak surveillance professionals and epidemiologists on the ground, in the area of the rumored outbreak.

- The goal of providing this direct channel of communication is to expedite early identification of an outbreak.

When you respond to a request for information on EpiCore, you are helping to improve the speed and validity of health information.
Goal: Overcoming Barriers to Information Sharing
The traveling organism
Minimum Credentials to be an EpiCore Member

At least 2 of the following:

- An advanced degree in public health or related field.
- Health certification or licensure (MD, DVM, RN, etc.)
- 3-5 years of experience in animal or human health.
- Current affiliation with a relevant institution / organization.
- FETP
How EpiCore Works

• How the EpiCore platform works:

1. Trained EpiCore moderators will submit requests for information (RFIs) to the platform

2. These RFIs will then be directed to a select group of EpiCore trained health professional volunteers in the area of a possible or suspected event.

3. EpiCore volunteers submit responses through the EpiCore platform.

4. From there, an EpiCore moderator helps to validate the information.
EpiCore Flow

1. EpiCore moderator needs more info

2. Creates RFI

3. Sends RFI to EpiCore Volunteers

4. EpiCore volunteer responds to RFI

5. Validation information shared
ProMED-mail

<http://www.promedmail.org>
What Type of Information Should You Include in an RFI Response?

Person

Place

Time
How to use EpiCore: Step 1

• As previously mentioned, Requests for Information will arrive in your email inbox.

Epicore Message Bot via amazons 1:06 PM (0 minutes ago) ✨

to me

We are writing to request for information on the event:

Title: Demo Salmonella Outbreak in Boston
Location: Boston, MA, United States

This is just a demo of the Epicore system. There are rumors of a salmonella outbreak in Boston. Can you confirm?

To respond to this message, please visit: http://epicore.org/##/fetp/5154ab4bb65bb688601030f81f7a2c7c16
How to use EpiCore: Step 2

Click “Continue to EpiCore”
Using EpiCore: Step 3

Click “Yes” if you have anything to contribute regarding this outbreak.
Using EpiCore: Step 4

Outbreak Verification Request Reply

The following is a response to your request:

Title: Test Event
Location: Houston, TX, United States

EpiCore moderators may:
- paraphrase this response when reporting on the event in other forums.
- quote this response but may not provide any details on my identity (location, position, etc.)

Response Email Text:

[Blank field for response text]
Using EpiCore: Step 5

Select your level of confidentiality for this response.
Personal Security Options:

- Yes, you can be quoted (include name and affiliation)
- Yes, your information can be disseminated, but request withholding your name)
- Withhold name and please paraphrase your response
- No do not use info, just FYI
Using EpiCore: Step 6

Click “Submit”
Using EpiCore: Other Features

Request for Information list

Open events | Closed events

<table>
<thead>
<tr>
<th>Title</th>
<th>Location</th>
<th>Date Sent To You</th>
<th>Response Date</th>
</tr>
</thead>
</table>

Click "Review" at any time to see RFIs awaiting your review.
REMEMBER!

SOME INFORMATION IS ALWAYS BETTER THAN NO INFORMATION!
ProMED-mail post with response to RFI

Date: Sat 2 Jan 2016
Source: Epicentre Global Surveillance Project [edited]

Re: ProMED-mail post Pneumonia - Pakistan: (PB) children, RFI 20151214.3861544

The samples collected were negative for influenza A/H1N1 and also tested negative for MERS CoV as well. [The samples] will be processed for RSV [respiratory syncytial virus] now.

Regarding the [hospital] admissions, multiple admissions on 1 bed/incubator were observed in both tertiary care hospitals (Benazir Bhutto Hospital and Holy Family Hospitals). This shows the priority of government and scarcity/limitations of health facilities in Pakistan and especially in Punjab. This is routine practice to admit more than 1 child per bed, providing an opportunity for infection transmission.

Communicated by:
ProMED-mail
<promed@promedmail.org>

[Rawalpindi’s large hospitals are seeing hundreds of patients daily with acute respiratory tract infections (RTIs) with the onset of winter; 70-80 percent of the illnesses are upper RTIs, but nearly 20 to 30 percent are lower RTIs, including mild to severe pneumonia: 50 to 60 children with severe pneumonia per day are requiring hospitalization. The majority of patients with pneumonia are told are infants around the age of 6 months. However, no etiologic agents had apparently been identified at the time of the report.

For a discussion of pneumonia in children, please see my moderator comments in prior ProMED-mail posts below. ProMED-mail thanks the responder for the above response to a request for information concerning identification of the etiologic agents responsible for this outbreak and if pediatric admissions were being placed more than 1 to a bed or isolate, a practice that would facilitate nosocomial transmission of infectious agents.
We live in a global village
Questions?