INTERNATIONAL

IssueBRIEF

So O'Neil, Divya Vohra, and Brenna Rabel

EpiCore: Harnessing a Network of Health Professionals for Verification of Public Health Events

> EpiCore is an innovative public health system designed to verify the presence of outbreaks and other public health events faster than existing mechanisms alone.

EpiCore is an innovative public health system designed to confirm the presence of outbreaks and other public health events faster than existing mechanisms alone. The system relies on a global membership network of human, animal, and environmental health professionals to provide information to verify events reported into it. In its first year and a half of operation, the EpiCore network has grown to 1,817 qualified members from a range of backgrounds. In addition, the system has sent out 484 requests for information (RFIs) about potential public health events to these members for verification. As the platform continues to evolve, EpiCore partners are reflecting on its progress to date and considering its path forward in terms of partnering with other surveillance networks and systems, as well as membership growth and training.

THE CURRENT DISEASE SURVEILLANCE LANDSCAPE AND CHALLENGES

Disease surveillance aims to provide information to support public health action by systematically collecting, analyzing, and interpreting data on the presence and spread of diseases. Over time, the disease surveillance landscape has become increasingly complex and fragmented, with the emergence of parallel systems, advances in information technology, multiple communication channels, and new standards for emergency preparedness and response.

Within this context, it is not surprising that current disease surveillance systems face several challenges, particularly in providing timely assessments and responses while maintaining flexibility to adjust to new events and changes in the environment. These challenges can be illustrated by examining two main types of surveillance systems:

1. **Official disease surveillance systems,** typically operated by governmental and intergovernmental agencies, have high accuracy in identifying outbreaks and other public health events because their main sources of information are health care professionals and laboratories. However, relying on health care professionals limits the types of events the systems capture to those that are observed and diagnosed in health care settings. In addition, identification of potential outbreaks or other public health events can be delayed, as official systems often require laboratory testing.

2. **Innovative disease surveillance systems** may use the same types of information as official systems, but they may also use information from outside the official health network, such as media reports and other unofficial channels, to identify outbreaks and other public health events. These innovative systems capture a wider set of events more quickly than official systems, but with less specificity and more "noise."

The ideal system would combine the speed and flexibility of innovative systems and the high level of accuracy of official systems to improve the timeliness and accuracy of responses. Given this, it is important to ask: *How can events identified using data from various existing disease surveillance systems be compiled, and quickly and accurately verified, to prompt an appropriate public health response?* The remainder of this brief discusses EpiCore and its progress in its first 16 months toward answering this question.

POSITIONING EPICORE TO MEET CURRENT CHALLENGES IN THE DISEASE SURVEILLANCE LANDSCAPE

To complement and leverage existing systems, the Skoll Global Threats Fund (SGTF), in partnership with HealthMap, ProMED, and the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) launched EpiCore in November 2015. EpiCore supports a global network of human and animal health experts in the field to help verify outbreaks and other public health events that surveillance systems have detected.

The current conduit to EpiCore's network is through ProMED moderators, who act as "requesters" and create requests for information (RFIs) about potential events; information for RFIs may come from requesters' review of ProMED mail or other sources. Requesters submit these RFIs to responders, who are EpiCore members, to review and verify the existence of an event. ProMED moderators then review all responses and disseminate a summary of the verification data and their implications.

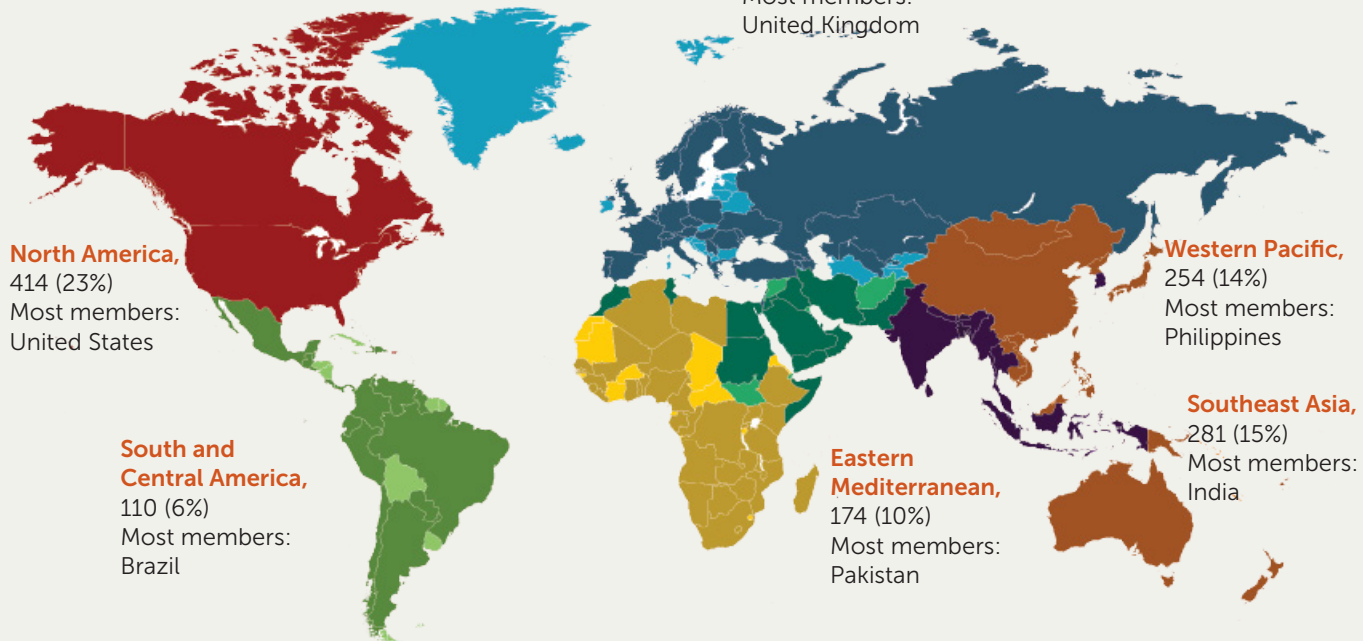## BUILDING A GLOBAL NETWORK OF EPICORE MEMBERS TO VERIFY PUBLIC HEALTH EVENTS

EpiCore's ability to verify and update information about events depends on its network of members (responders) and their ability to respond rapidly and accurately to RFIs in the

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Structure of EpiCore

Goal: Use a global network of health professionals to quickly and accurately verify public health events identified by other sources. Core stakeholders include:

- **Skoll Global Threats Fund** provides oversight and resources for the system
- **HealthMap** designs and maintains the platform
- **ProMED** screens potential EpiCore members, staffs ProMED moderators, and provides day-to-day support to users
- **TEPHINET** implemented trainings for EpiCore members
- **Requesters** (currently ProMED moderators) submit requests for information (RFIs) on possible outbreaks and other public health events through the system
- **Responders** are EpiCore members from around the world who receive RFIs and provide the requested information to verify the presence of outbreaks and other public health events

EpiCore membership by region
(Total = 1,817 members)

Europe,
239 (13%)
Most members:
United Kingdom

North America,
414 (23%)
Most members:
United States

Western Pacific,
254 (14%)
Most members:
Philippines

South and Central America,
110 (6%)
Most members:
Brazil

Southeast Asia,
281 (15%)
Most members:
India

Eastern Mediterranean,
174 (10%)
Most members:
Pakistan

Source: EpiCore administrative data November 15, 2015, through February 8, 2017.
Note: WHO groups member states from North and South America into one region. However, EpiCore member data distinguish North America from South and Central America; the analysis included them as separate regions to capture any variations between them.
Countries in lighter colors within a region represent those without EpiCore members.

system. This requires a far-reaching network of members with suitable credentials and training.[1] As a group, EpiCore members are located in all regions and offer diverse types of expertise needed to verify a variety of public health events.

Global coverage of the EpiCore membership network. As of February 2017, EpiCore's membership network included 1,817 human, animal, and environmental health professionals. The network extends around the globe, particularly in areas where diseases could spread most rapidly and harm large populations. The current membership covers 140 countries across all regions, with the highest concentration of members in the most densely inhabited regions with urban centers. Very few countries have no current EpiCore members.

Even with this substantial progress, EpiCore still has ample potential to grow and increase its reach. For example, more than 3,500 applicants have been accepted to date; if all of them

completed the final training step in the EpiCore membership process, the network would almost double in size. In addition, membership coverage is not representative—for example, the United States account for 20 percent of members and less than 5 percent of the world's population. Thus, expanding recruitment activities and investigating factors that facilitate completion of the required training in underrepresented countries could accelerate EpiCore's membership growth over the next few years.

Expertise within the network. EpiCore members bring diverse types of expertise in human, animal, and environmental health; and work in various sectors, including government and inter-government, non-governmental and non-profit, and private. The members are mainly mid-level career professionals with more than five years of experience; about one-quarter have formal training in field epidemiology provided by nationally and internationally recognized programs.

EpiCore member characteristics

Characteristic	N	Percentage
Total members	1,817	100%
Types of experience[a]		
Human health	1,425	78%
Animal health	450	25%
Environmental health	463	26%
No reported health expertise	30	2%
Sector of employment		
Government	1,089	60%
Non-governmental/ non-profit	435	24%
Private	292	16%
No reported sector	1	<1%
Years of Experience		
Less than 3 years	141	8%
3-5 years	247	14%
6-10 years	456	25%
More than 10 years	973	54%

[a] EpiCore administrative data from November 15, 2015 through February 8, 2017.

Note: Health experience categories are not mutually exclusive. Percentages may not add to 100 due to rounding.

LEVERAGING EXISTING INFORMATION TO FURTHER DISEASE SURVEILLANCE

A key feature of EpiCore is that requesters can leverage information across official and innovative systems to produce RFIs. Currently, the system's main source of information about potential public health events is ProMED moderators, who act as requesters and create RFIs based on information received through ProMED mail or other sources. However, EpiCore is designed to be a flexible system, with requesters from multiple organizations issuing RFIs based on information from a wide range of official and innovative sources.

EpiCore's implementation to date demonstrates the types of information currently being reported into the system. Requesters had issued 484 RFIs through the system as of February 2017. These RFIs have included events in all

regions, covering 95 countries; the events have had known and unknown etiology and infectiousness, and have affected various susceptible populations. For the small proportion of RFIs related to events with known etiology, EpiCore sought additional information, such as the event's origins and spread. Almost half of the suspected events had unknown etiology, comprising a range of syndromes.

EPICORE'S CONTRIBUTIONS TO PUBLIC HEALTH EVENT VERIFICATION TO DATE

As a system to *verify* the presence of public health events, surveillance system performance measures (such as sensitivity and positive predictive value) do not apply to EpiCore. Instead, EpiCore's contribution to disease verification can be measured in terms of (1) the timeliness of members' responses and (2) the proportion of RFIs resulting in information from members that is sufficient to verify the presence or absence of an event.
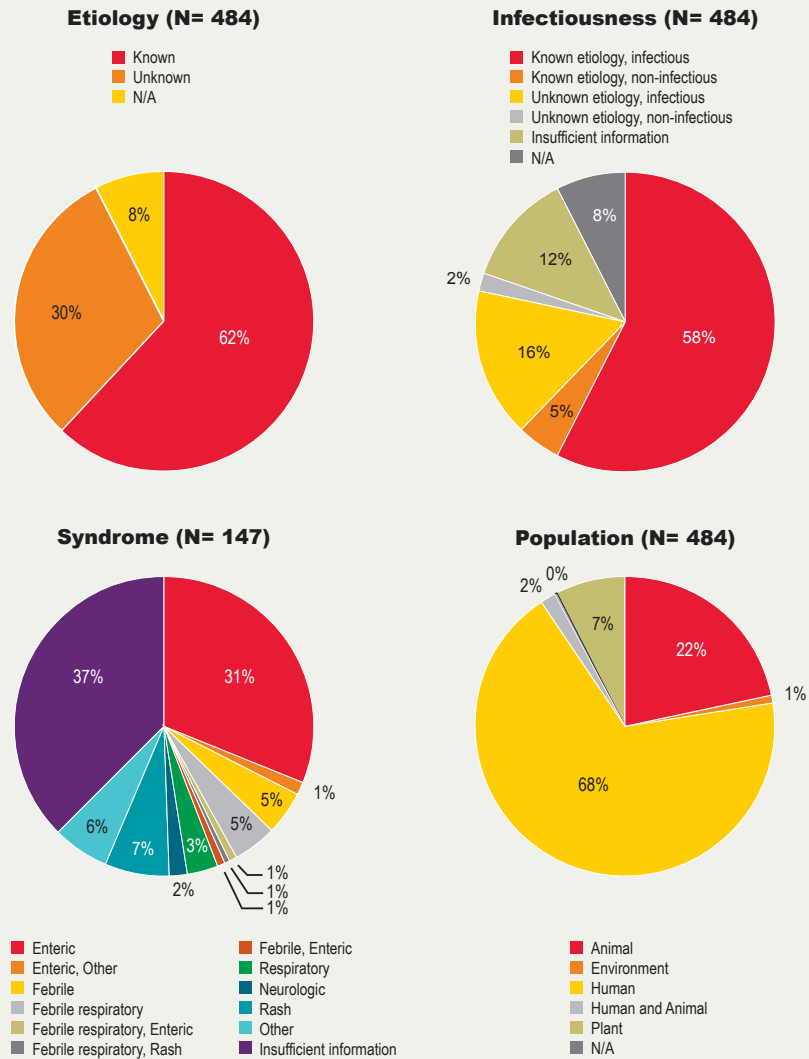
Timeliness of members' responses. Members responded to 304 of the 484 RFIs issued as of February 2017 (with no particular geographic or membership patterns among RFIs that did not receive a response). On average, members responded to RFIs within nearly one day of issuance. EpiCore members' time to respond was similar regardless of disease type. However, the EpiCore membership network did not perform consistently across geographic areas; members in some countries, such as the United States, lagged a full day behind those in other countries in responding.

Verification. Among the 304 RFIs that received one or more responses, members verified 127 of them as either an event (107 RFIs) or a non-event (20 RFIs).[2] The percent of RFIs verified did not vary by disease type or region of the suspected event. However, whether a suspected event was verified (as either an event or non-event) was influenced by the number of responses members provided—71 percent of RFIs that received 15 or more responses were verified, in comparison to 36 percent of RFIs that received 1 to 4 responses.

[2] RFIs' verification status was coded as either a verified event, a verified non-event, unverifiable (due to lack of sufficient information in the responses), or having no contribution (meaning that all responses were blank). A small number of RFIs that did not ask for information about an event were labeled as "N/A".

Classification of RFIs by disease type

Etiology (N= 484)

- ■ Known
- ■ Unknown
- ■ N/A

Known 62%
Unknown 30%
N/A 8%

Infectiousness (N= 484)

- ■ Known etiology, infectious
- ■ Known etiology, non-infectious
- ■ Unknown etiology, infectious
- ■ Unknown etiology, non-infectious
- ■ Insufficient information
- ■ N/A

58%
5%
16%
2%
12%
8%

Syndrome (N= 147)

31%
37%
6%
7%
2%
3%
5%
5%
1%
1%
1%
1%

- ■ Enteric
- ■ Enteric, Other
- ■ Febrile
- ■ Febrile respiratory
- ■ Febrile respiratory, Enteric
- ■ Febrile respiratory, Rash
- ■ Febrile, Enteric
- ■ Respiratory
- ■ Neurologic
- ■ Rash
- ■ Other
- ■ Insufficient information

Population (N= 484)

22%
1%
68%
7%
0%
2%

- ■ Animal
- ■ Environment
- ■ Human
- ■ Human and Animal
- ■ Plant
- ■ N/A

Source: EpiCore administrative data November 15, 2015 through February 8, 2017.

Note: 36 RFIs were excluded from classification because they were duplicates of diseases or events noted in other RFIs, were in a different language that could not be translated, or did not request information about a public health event and thus could not be classified. These are represented as "N/A".

RFIs about events in conflict areas

EpiCore's structure allows individuals to report anonymously about emerging crises, including public health events in areas of warfare. Twenty-eight RFIs were issued for events occurring in the ISIS conflict areas of Iraq and Syria. Fifteen of these were for infectious diseases; the other 13 were classified as non-infectious, with 11 described as known or suspected chemical weapons use. Although little can be inferred from one example, these findings point to EpiCore's potential to verify unexpected or emerging public health crises, including incidents related to warfare and bioterrorism.

Source: EpiCore administrative data November 15, 2015, through February 8, 2017.

EpiCore mean time to response and verification by region, among RFIs with at least one response

Region	Mean response time (days)	Total RFIs	Total verified		Public health event		No public health event	
		N	N	%[a]	N	%[a]	N	%[a]
Total	1.4	304	127	42%	107	35%	20	7%
Africa	1.6	38	24	63%	20	53%	4	11%
Eastern Mediterranean	0.9	87	36	41%	30	34%	6	7%
Europe	2.6	44	13	30%	9	20%	4	9%
North America	2.3	33	8	24%	8	24%	0	0%
South East Asia	1.7	64	29	45%	25	39%	4	6%
South and Central America	1.0	12	5	42%	5	42%	0	0%
Unknown/Multiple	0	7	3	43%	2	29%	1	14%
Western Pacific	0.7	19	9	47%	8	42%	1	5%

Source: EpiCore administrative data from November 15, 2015 through February 8, 2017.

[a] Percentage of total RFIs with at least one response.

Note: WHO groups member states from North and South America into one region. However, EpiCore member data distinguish North America from South and Central America; the analysis included them as separate regions to capture any variations between them.

LOOKING FORWARD

The first iteration of the EpiCore system has demonstrated global interest and willingness to participate in a system that uses information from both official and innovative sources to verify or rule out disease outbreaks and other public health events. Members bring a broad range of expertise, and requesters have issued RFIs on a diverse set of suspected public health events. As EpiCore enters its next phase, several strategies will help it reach its full potential and address the needs for increased speed and accuracy in disease surveillance:

- **Bolster membership growth and development.** Strengthening member recruitment and training will increase the reach and quality of response from Epi-Core. Collaborating with existing training programs, such as TEPHINET's field epidemiology training program, could further improve EpiCore members' capacity to provide informative responses.

- **Expand relationships with other innovative surveillance networks and partners.** Through purposeful partnerships with innovative surveillance networks and other organizations, EpiCore can continue to capitalize on the proliferation of information and communication technologies to capture suspected events for verification. Beyond ProMed mail, other innovative systems include HealthMap and the Global Public Health Intelligence Network. Other potential partners could include Doctors Without Borders and other international nongovernmental organizations.

- **Partner with official surveillance networks and systems.** EpiCore's global network could add value to official disease surveillance and outbreak detection mechanisms. In turn, partnering with these entities could help EpiCore meet its goal, as these entities have the capacity to use the information from EpiCore to mount a public health response. Such entities include national ministries of health and intergovernmental agencies; World Organization for Animal Health, Food and Agriculture Organization of the United Nations, and other global health-related organizations; and WHO International Health Regulations' national focal points.

- **Enhance information management.** As EpiCore expands and adds requester systems beyond ProMED, the partners will need to consider how EpiCore will manage increased information flows. One possibility is to introduce an EpiCore manager to oversee the systems interface with partner organizations, and an EpiCore top moderator (or a small team of top moderators) to review and monitor RFIs from all requesting partners and responses from all members. These new staff could help manage the larger volume of requests and responses, including identifying duplicate posts and conflicting information coming through the system from multiple sources.

Implementing these strategies will require careful consideration as complexity will increase with more information and players. Setting clear guidelines and rules of behavior for information sharing will encourage participation by (1) reconciling any differences in member organizations' standards about the use of information and (2) allaying concerns about member and data confidentiality.

CONCLUDING REMARKS

EpiCore has made progress toward complementing, leveraging, and enhancing existing disease surveillance systems; however, it has not reached its full potential. EpiCore's partners are committed to incorporating lessons learned over time, to promote the system's evolution. The key measure of EpiCore's future success will be its ability to process the signals received, reduce the accompanying "noise," hone in on the relevant information, and produce actionable results. To achieve this vision, EpiCore will require committed partners, ongoing investments, and strong management.

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