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Digital surveillance for enhanced detection and response to outbreaks

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In 2014, the Director-General of WHO declared two public health emergencies of international concern: poliomyelitis and Ebola virus disease. These declarations have refocused attention on the use of the *International Health Regulations* (2005) to identify public health emergencies and to the challenges that state parties face in their assessment. The *International Health Regulations* (2005) is the principal document that governs international surveillance and response to global public health risks and emergencies.¹ The document aims to strengthen state parties' abilities to monitor, detect, assess, and report public health hazards in a way that does not adversely affect crossborder travel and trade.² The regulations contain a decision-making matrix that guides state parties' assessment and notification of potential public health emergencies of international concern.² The ultimate declaration of a potential public health emergency is made by the Director-General on the basis of information provided by state parties; WHO's decisionmaking algorithm; the advice of an emergency committee; scientific evidence; and an assessment of risk to human health, of international spread, and of interference with international traffic (article 12.4), and this might include the use of digital surveillance (article 5.4).

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For a **HealthMap infographic on Ebola** see <http://www.healthmap.org/ebola>

For a **HealthMap infographic on polio** see <http://www.healthmap.org/polio>



Denis Balibouse/Reuters/Corbis.

Many issues contribute to states parties not being able to do the necessary surveillance for the 2005 regulations. Low-resource counties are often already overburdened by endemic diseases such as diarrhoea, pneumonia, and HIV/AIDS. Countries affected by conflict, such as Afghanistan and Iraq, have had a deterioration in public health surveillance systems and have a scarcity of qualified physicians, epidemiologists, and laboratory workers.^{3,4} Most state parties exclusively rely on data generated by ministries of health, without much surveillance capacity from other ministries.⁵

In recent years, many public health events notifiable under the *International Health Regulations* (2005) have been identified through informal sources.^{6,7} This improvement is attributed, in part, to technological developments in surveillance capacity, including the emergence of web-based systems.⁸ Web-based early warning systems, such as HealthMap, BioCaster, Global Public Health Intelligence Network (GPHIN), MedISys, and ProMED-mail, collect disease-specific data from informal sources such as local news and social media. Web-based queries and participatory systems also produce cost-effective data for syndromic surveillance.^{9,10} Combined, these systems enhance both the timeliness and sensitivity of early disease detection.¹¹

Retrospective review of polio and Ebola outbreaks reported through digital surveillance channels show this enhancement of reporting time. When reports of polio emerged in Cameroon on Oct 1, 2013, ProMED and GPHIN picked up the story from the Global Polio Eradication Initiative and published reports on Oct 24. The official WHO report was not

published until Nov 21; 51 days after the outbreak began. Similarly, reports about polio were first made in Equatorial Guinea on Jan 19, 2014. ProMED published information on March 21, followed by a GPHIN alert on March 27. The official WHO report was published on April 17; 88 days after reports first occurred. WHO declared the polio epidemic a public health emergency of international concern on May 5, 2014. For all seven WHO-reported polio outbreaks in 2013 and 2014, digital reports preceded official reports by an average of 14.6 days (range 0–40 days).

The first public notification of the Ebola outbreak was retrieved on March 14, 2014, by HealthMap from a French news website with headlines reporting of a strange fever in Macenta, Guinea. The report described the deaths of eight people, and symptoms of anal and nasal bleeding that resembled Lassa fever. On March 22, WHO and the Sierra Leone Ministry of Health released a statement that Ebola might have spread into Sierra Leone; official case information was released on March 23. WHO declared the Ebola outbreak a public health emergency of international concern on Aug 8, 2014.

As shown with polio and Ebola outbreak detection, digital surveillance could improve early detection and response to public health emergencies of international concern, and should be viewed as an essential complement to the available formal surveillance structure. Encouragement of countries to use digital surveillance should be a global public health priority.

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