Health Information System Strengthening:
Standards and Best Practices for Data Sources

MODULE 10:

Public Health Surveillance System

This module is one of 12 HIS data source modules in *Health Information System Strengthening: Standards and Best Practices for Data Sources*. The full series of modules (available at https://www.measureevaluation.org/resources/publications/tr-17-225) is intended to provide health authorities and other health information stakeholders with a reference guide that, along with other sources, can help align the HIS data sources with international standards and best practices.

Type of Data Generated: Reportable Diseases and Conditions and Public Health Threats

Description

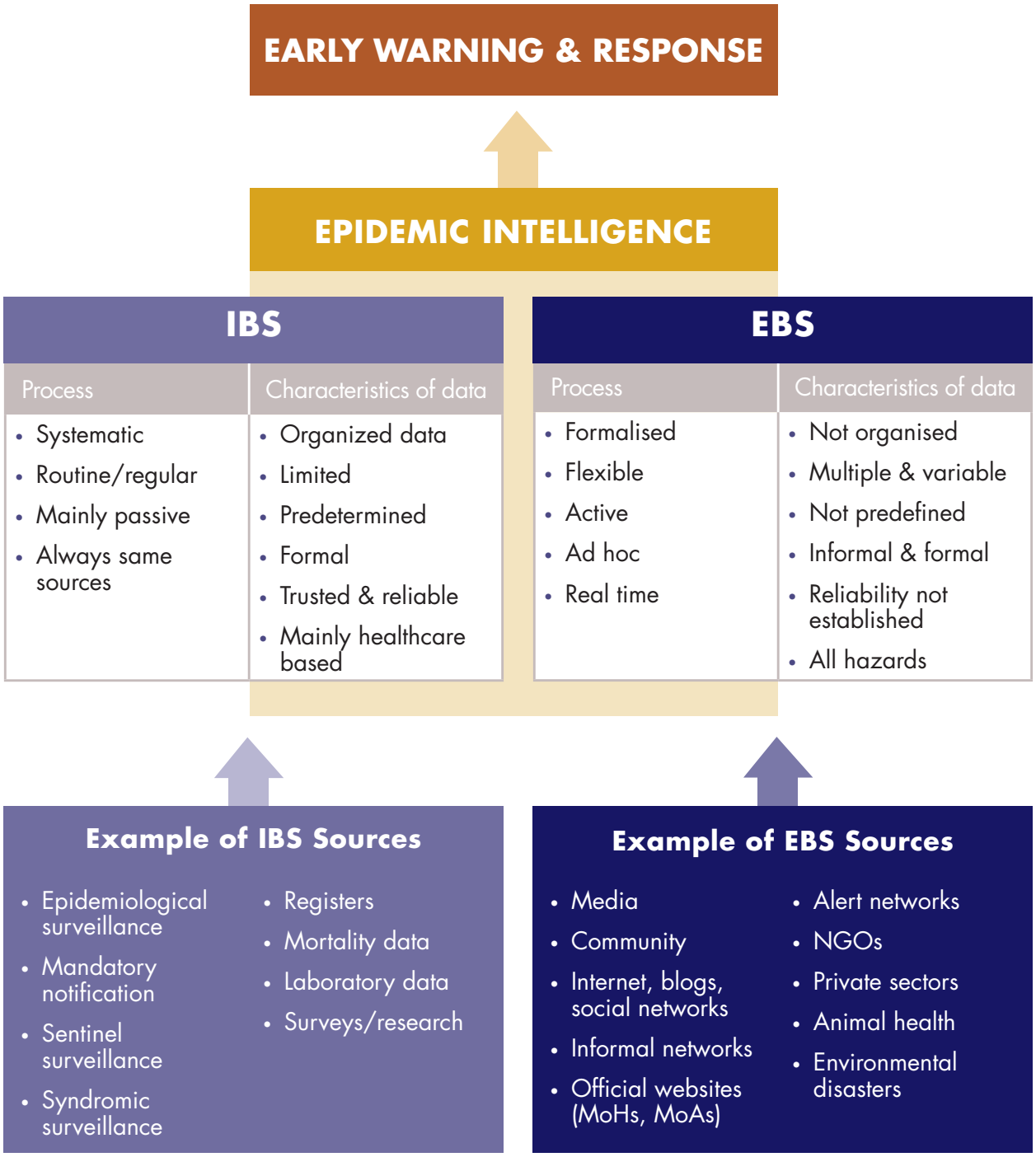
A public health surveillance system is an essential public health function defined by ongoing systematic collection, compilation, analysis, and dissemination of data on reportable diseases and other events that present a potential threat to public health security (Thacker & Berkelman, 1988). The system is designed to monitor routine and ad hoc data within and outside the health system and to use them to assess risks to public health. If predefined risk thresholds are surpassed, the system triggers rapid response activities. The response activities, including coordinating investigative and control measures, are carried out by officers in the Ministry of Health and by other emergency response teams, depending on the origin of the threat. This module focuses on surveillance activities rather than response mechanisms because they are the data source for monitoring public health threats.

A national surveillance system consists of two main components: indicator-based surveillance (IBS) and event-based surveillance (EBS) (WHO, 2008, 2014; European Centre for Disease Prevention and Control, n.d.). Indicator-based surveillance represents the classic functioning of a surveillance system designed to monitor the frequency, origin, and distribution of reportable national and international diseases. It is passive surveillance in the sense that cases are reported through the routine health information system from disease surveillance sites, laboratories, central medical stores, and other routine reporting channels. The data are typically structured according to case definitions, and they enter the health system through a patient encounter at an outpatient consultation or inpatient admission, or a patient encounter with a health worker in the community. One of the shortcomings of passive surveillance is that reportable cases remain unidentified if symptomatic persons, for whatever reason, are not captured through a routine reporting system.

The EBS component is designed to recognize events and emerging public health threats that may not otherwise enter the surveillance system (WHO, 2014). This mechanism complements IBS by actively scanning the Internet, media, and sources of big data, and by making ad hoc contact with health providers and others in the community (such as at schools, workplaces, border control) to detect potential risks. EBS does not necessarily adhere to case definitions, and unstructured data must be analyzed to determine the presence of a public health risk. An example of EBS is monitoring the patterns of flu and dengue data that are collected by Google Internet search engines (Google, 2015).

Together, the IBS and EBS surveillance components constitute "all hazards" surveillance and require an early warning and response (EWAR) mechanism (Figure 4).

Figure 4. Indicator-based surveillance and event-based surveillance



Source: WHO (2014, p. 13, Figure 3)

In summary, the core activities of a surveillance system are as follows (WHO, 2001, 2006a):

- Prioritization of diseases and events in the surveillance system
- Detection of reportable diseases according to a case definition
- Assessment of other potential public health threats
- Registration of standardized cases

- Confirmation of cases (clinical or laboratory confirmation)
- Notification and reporting of confirmed, probable, or suspect cases[20]
- Analysis and interpretation (updating information and visualization products, including maps, to assess trends, patterns, and risks)
- Triggering of response and control measures (epidemic preparedness and outbreak investigation)
- Provision of information, education, and communication
- Provision of feedback to data providers

Types of Indicators

The EBS system works with unstructured, ad hoc data and therefore is not associated with pre-defined indicators. The IBS system, however, generates indicators that correspond to each notifiable (reportable) disease or condition. Because each condition is recorded in a standard format, the following types of indicators are derived from individual or aggregated reported cases:

- The number of cases according to each case definition (disease-specific or syndromic)
- Survival status of cases (clinical diagnosis of morbidity or mortality)
- Laboratory diagnoses
- Classification of cases (suspected, probable, or confirmed)

Surveillance officers should monitor the number of cases for each disease or event frequently and produce a sufficiently detailed epidemiological description to track its origin and distribution. Indicators should be broken down by selected individual characteristics (such as sex and age), geographical location, and time period. These dimensions, referred to as "person, place, and time," are necessary to identify subpopulations and areas that are prone to outbreaks so they can be targeted for intensified preventive measures, such as information, education, and communication; immunization; vector control; and sanitation efforts (Centers for Disease Control and Prevention [CDC], 2012).

Alternative Data Sources

None

Standards

The WHO publishes international health regulations to help control the international spread of disease. The World Health Assembly adopted the first International Health Regulations (IHR) in 1969. In subsequent decades, increases in global travel and trade have resulted in increased risks of disease spreading across borders, and the IHR were substantially revised in 2005 (WHO, 2005). In addition to defining a limited list of predefined, notifiable diseases, the new IHR introduces a decision instrument for countries to use to determine whether an event constitutes a public health emergency and must be reported to WHO (WHO, 2005). These emergencies can be any unexplained illness or condition, regardless of origin or source, which could present significant harm to humans. The IHR also require countries to develop and maintain core capacities for surveillance, throughout the country and at points of entry, to prevent and respond to acute public health risks (WHO, 2010; 2013).

[20] Notification is the formalized mandatory communication process through which reportable diseases or events are communicated in national or international surveillance systems (WHO, 2014).

International Notifications

The national IHR focal point notifies the WHO contact point of the first new or suspected case within 24 hours and all cases thereafter that meet any of the following criteria (WHO, 2005):

- Four diseases *must be* reported to WHO: smallpox, poliomyelitis, human influenza caused by a new subtype, and severe acute respiratory syndrome.
- Other diseases with high epidemic potential (cholera, pneumonic plague, yellow fever, and viral hemorrhagic fever) *may be required* to be reported to WHO if they are considered an international public health concern according to the IHR decision instrument.
- According to the IHR decision instrument, these diseases and events should also be reported: "Any (other) event or disease of potential international public health concern, regardless of the origin (e.g., biological, radiological, nuclear, chemical, contaminated food or natural disasters), including those of unknown causes or sources (WHO, 2005)."

Regional and National Notifications

The Centers for Disease Control and Prevention and the WHO Regional Office for Africa developed technical guidelines for integrated disease surveillance and response (IDSR) in the African region to streamline surveillance activities and standardize the flow of information among and within the levels of the health system. Integrated disease surveillance and response is a strategy to strengthen surveillance, laboratory, and response capacities at each level in the health system, in line with IHR (WHO & CDC, 2010). The IDSR technical guidelines provide a wealth of guidance, including a list of priority diseases in the region; standard case definitions for each disease; model forms for reporting; and recommendations for and examples of analyzing reported and confirmed cases by person, place, and time.

National public health policy should establish a country-specific list of notifiable diseases and conditions. The list should be reviewed about once every five years to determine whether changes are needed, such as (1) discontinuing surveillance for low-ranking diseases or events; (2) revising the surveillance and response procedures at each level of the health system for notifiable diseases or events; or (3) incorporating new, high-priority diseases and health threats. Surveillance activity would typically focus on a list of approximately 20 diseases, although each country determines the number, given its prevailing risks and resources. WHO provides guidance on undertaking this type of regular prioritization exercise (WHO, 2006b).

Countries should also comply with IHR 2005 if they implementing the EWAR mechanism. The WHO interim document on implementing EWAR, with a focus on EBS, is an excellent reference (WHO, 2014).

Best Practices

- Conduct an evaluation using the **Joint External Evaluation Tool** (WHO 2016) to assess country capacity to prevent, detect, and rapidly respond to public health threats.
- Formulate and implement a public health surveillance **monitoring and evaluation strategy** and set of procedures.
- Ensure that every reportable disease has an explicit **case definition** that describes the condition, the laboratory criteria, and the case classification.
- Employ **standard reporting forms** for each reportable condition, including international standard reporting forms where they are available.
- Take advantage of **affordable technologies** to streamline the surveillance system.

- Obtain **complete and accurate reports** of all reportable diseases and events from all public and private health facilities required to notify cases.
- Periodically review the **official list of priority surveillance diseases** and events about once every five years and revise as necessary.
- In collaboration with WHO, the Ministry of Health, and stakeholders, carry out a **five-year external assessment** of the implementation of the surveillance and response strengthening efforts, as well as the multi-disease approach. Undertake **annual internal reviews.**
- Apply the **IHR decision instrument** to determine whether a public health event constitutes a public health emergency and requires notification to WHO through the IHR focal point and WHO contact person (WHO, 2005).
- In the WHO African Region, use **IDSR** as a vehicle for IHR implementation, including integrating **standard case definitions, reporting instruments, and other regional strategies** as applicable.
- Have procedures and tools in place to monitor and assess early threats detected through **event-based surveillance.**
- Empower **local leaders** to support surveillance activities, particularly to detect reportable cases and work with public health authorities to alert potential threats in their communities.
- Monitor surveillance data continuously and assess them for outbreaks and public health risks, with particular attention to person, place, and time, which **trigger responses to targeted subpopulations** most in need of interventions.

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