Event-based Surveillance

Key Points

- Event-based surveillance (EBS) describes the detection and immediate generation of alerts from unstructured reports from a predefined network of trained community members and healthcare workers
- EBS may provide the earliest detection of any acute public health event, particularly those that are not well detected by indicator-based surveillance (IBS), e.g.:
  - Emerging infectious diseases not yet captured by IBS
  - Outbreaks driven by community transmission, before they become a large enough to be detected through IBS
  - Non-infectious events (e.g. chemical hazards)
- EBS remains less institutionalized in national surveillance systems.

insert infographic of a EBS tying together sources, type of data transmitted, and frequency of reporting expected

The basics of EBS

Event-based surveillance (EBS) describes the detection and immediate generation of health events or risks based on unstructured reports from a predefined network of trained community members and healthcare workers. EBS is monitored and responded to immediately, producing real-time alerts.

While indicator-based surveillance (IBS) produces weekly {alerts/signals} based based on standardized case definitions used in health facilities, EBS has the potential to provide real-time detection of any acute public health event, particularly those that are not captured well through IBS or those that occur outside health facilities.

A summary of the key characteristics of EBS is shown in Table 1. See Box 1 for a note on differences between national and field-level EBS and global EBS.

Table 1 Updated Key characteristics of EBS

Characteristic	Description
Key strength	Real-time alerts of disease outbreaks and other public health events not reflected by IBS case definitions. This includes: - Emerging infectious diseases not yet captured by IBS - Outbreaks driven by community transmission, before they become large enough to be detected by IBS - Non-infectious events (e.g. chemical hazards)
Data sources and sectors	- Community members - Community health workers/volunteers - Healthcare facilities - Telephone hotlines - Non-governmental organizations (sector) - Media (sector) - Animal health (sector)
Characteristics	- Unstructured reports - May have a less formal definition for infectious disease or non-infectious hazard - Informal format for reporting - All hazards - No alert thresholds
Process	- Structured and trained network - Reporting sites submit {alert/signals} as needed - Ad-hoc frequency as needed - Emphasis on real-time reporting of {signals/alerts}, followed by rapid verification and determining of public health actions

Note on Global EBS and its relationship to field-level EWAR

An important aspect of the overall process of epidemic intelligence is the scanning of publicly available news reports at a global level.

In this global EBS, large amounts of data are scanned and require evaluation evaluated. The terminology used within the detection, verification and assessment process may differ from that used in a given national surveillance systems.

This is facilitated by a WHO-run system called Epidemic Intelligence from Open Sources (EIOS) which aggregates several media scanning tools including the the Global Public Health Intelligence Network (GPHIN), HealthMap, ProMED, and EpiCore. Given the specific nature of this computer-based scanning system and our focus on field-level implementation of EBS, global EBS will not be described in this guidance.

Although EBS includes unstructured information, like other forms of surveillance it requires a predefined network, list of priority diseases and other hazards, and a well organised system for reporting.

This section describes the principles for selecting priority hazards, criteria for {signals/alerts}, a strategy for data collection, standardizing reporting, and defining a verifying mechanism.

Who should be involved?

The same personnel involved in the design and implementation of IBS should also be engaged in EBS as far as possible. EBS should not be implemented in isolation but as an integrated function within a wider EWAR system.

The following key stakeholders should be involved in the implementation of EBS:

- **A multi-disciplinary team of public health coordinators, medical officers, epidemiologists and community mobilization experts** must identify the EBS objectives and strategy, including selection of priority diseases and other hazards, and sources of data both instead and outside the health system.
- **Health informaticians or epidemiologists** to support the design of field-based tools, including paper-based and electronic systems to facilitate timely collection, reporting and analysis of data.

- **Frontline community health volunteers/workers, and other health staff** , from networks including Red Cross, Ministry of Health and other partners, who need to be trained on best practices for collecting and reporting data from health facilities.
- **Epidemiologists** working at national and subnational level to support the interpretation and use of data, including the design of epidemiological bulletins. It is important to match the level of analysis with the level of trained professionals available.
- **National and subnational public health officers** involved in the interpretation and use of EBS data in epidemiological bulletins, including their role in managing {signals/alerts} (see Module 5).

1. Select priority diseases and other hazards

Note

EBS should focus on diseases and conditions not well captured through IBS. This includes: - Emerging or re-emerging infectious diseases not yet known to an area or no longer prevalent; - Small outbreaks of infectious diseases at the community-level, that are not yet large enough to be detected through IBS in health facilities; - Non-infectious hazards (e.g. chemical and environmental hazards) that are not well-covered by case definitions of national surveillance.

EBS will be overwhelmed if it tries to cover all diseases and hazards captured in IBS. It is recommended to first proceed through the IBS disease and conditions selection process, and then focus on the gaps which can be addressed by EBS (see Box 3).

The list of diseases and conditions targeted by EBS should be regularly reviewed, to reflect the epidemiological context and any emerging hazards.

Note

Criteria to guide selection of diseases and conditions for EBS: - What are the gaps in the epidemiological and environmental profile of diseases and conditions covered by IBS? - What diseases could emerge or re-emerge and how would they be detected through EBS? - What food safety threats may exist? - What non-infectious hazards have presented public health emergencies recently? (e.g., the emergence of severe lead poisoning in Northern Nigeria in 2010)? - Does the disease or non-infectious hazard have the significant potential for a high impact on morbidity, disability, and/or mortality? - Does the disease have significant potential for sudden epidemics (e.g. EVD)? - Is the disease a specific target of a national, regional or international control programme? - Will the information to be collected enable significant, rapid, and cost-effective public health action?

An example of a shortlist of diseases and hazards selected for EBS in Vietnam is shown in Table 2.

Table 2 Diseases and hazards selected for EBS in Vietnam (Clara et al. 2018)

Disease / Hazard	Reason for selection
Rabies, flooding	High public health impact
Cholera, dengue, severe acute respiratory infections, vaccine-preventable diseases	Epidemic-prone and with high public health impact
Avian influenza	Previously prevalent and may re-emerge (and not captured well by routine surveillance)
Poliomyelitis, neonatal tetanus	Planned for eradication or elimination

2. Define event definitions

EBS events can be formalized for healthcare workers. This is especially useful for training on a predictable set of events. See Box X below.

Events appropriate for healthcare workers

Alert	Information to provide in comments box of weekly report form
ARI	Have you noted any clusters of severe pneumonia/severe acute respiratory illness in the same block/neighbourhood?· Have you seen an unexpected increase in the number of deaths from severe acute respiratory illness/pneumonia?
AWD	Have any cases had severe dehydration requiring hospitalisation?· Have there been any deaths?· Were there any cases from the host community?
Bloody diarrhoea	Have cases required hospitalisation?· Have there been any deaths?· Were any cases clustered in the same block? If yes, how many?
Unexplained fever	Have you noticed an increase in severe cases with fever or deaths?· Are you suspecting any specific clinical condition that may explain this increase? If so, please provide further details.

3. Define event thresholds

4. Agree on strategy for data collection

EBS provides healthcare workers with a means to immediately report unusual events and patterns observed in practice. It can also use non-health sources including community networks and animal health sources.

Note

Implementing basic and effective EBS can be as simple as implementing a nationwide hotline for healthcare workers to report unusual trends in admissions, treatment responses, or other patterns in the provenance of suspect cases of disease. The key is that the hotline enables rapid transmission and verification of {signals/alerts} that enables rapid early response and containment.This is often the main strategy for EBS in emergencies.

EWAR should aim to build capacity of EBS detection at each stage of health seeking behaviour: before presentation to health care; community-based health care; and among health workers in health facilities.

An important part of any EBS strategy is to assess the capacity for early detection at these stages, at local community level.

See Table 3 for a list of EBS sources and characteristics. Note that community members, community health networks, and animal health sector all describe the potential to detect {signals/alerts} through EBS before patients present to a healthcare facility.

Table 3 EBS sources and comparative advantages and challenges for EWAR

Data sources	Advantage for EWAR	Challenges for use in EWAR
Community members	Rural, remote areas and emergencies not covered by healthcare facilities/IBS	Untrained personnel Speed of reporting limited by poor mobile phone coverage Expect very low specificity (increased noise); Large amount of resources required to assess reports and respond to events.
Community health worker/volunteer network	Rural, remote areas and emergencies not covered by healthcare facilities/IBS Strong connection with local communities	Personnel with minimal training Speed of reporting limited by poor mobile phone coverage Expect very low specificity (increased noise); Large amount of resources required to assess reports and respond to events.
Animal health sector	Possess information on changing health among domestic and wild animals which have risks to humans (i.e. poultry die-off and risk of avian influenza)	Data collection systems for animal health surveillance are generally underdeveloped
Healthcare facilities	Ad-hoc reports on unusual patterns in admissions and diagnoses; clusters of patients not responsive to treatments, etc. HIgher specificity	Healthcare facility reporting is biased toward people seeking health care Late reporting as intense community transmission may have been occurring before patients presented to healthcare facilities
Healthcare facilities supported by NGOs, Red Cross, etc.	Emergency-affected populations Higher specificity	Healthcare facility reporting is biased toward people seeking health care Late reporting as intense community transmission may have been occurring before patients presented to healthcare facilities

4.3.4 Community-based surveillance

Community based surveillance (CBS) is the systematic detection and reporting of events of public health significance within a community, by community members.

Based on existing networks of community health workers, Red Cross/Red Crescent (RC) Movement volunteers, and other volunteer networks based within communities, there is an

increased potential to detect initial clusters of disease and suspected cases before or during an established outbreak in rural and remote communities.(*5, 6*)

Such community-based surveillance (CBS) networks supplement routine health-facility based surveillance in order to provide a more structured communication mechanism between community members and public health authorities. CBS volunteers can signal events related to disease transmission (i.e. clusters of cases of a similar, unusual set of symptoms) or simplified case definitions (i.e. rash and fever as suspected measles). IFRC and WHO highlight four contexts where CBS can be used to provide early warning:

- During an outbreak to widen the reporting network coverage, monitor trends, and inform the response (e.g. plague in Madagascar; use of real-time ORP-based reporting of cholera by CHWs);
- During emergencies where the routine surveillance system is non-functional, to monitor high-risk, epidemic prone diseases as a more structured, community-based supplement to an EWAR (e.g. HEV in South Sudan)(*7*);
- In complex environments, to fill gaps where routine surveillance is not functional, has poor coverage, and where community-based reporting provides the only surveillance information (e.g. malaria in Central African Republic)(*8*)
- In communities lacking social cohesion, i.e., large and urban communities or those divided among ethno-linguistic differences

CBS is a community health system that incurs the difficulties of implementation at scale with a cadre of volunteer staff. Engaging communities in community-based surveillance is not straightforward and requires pre-planning to be effective. Risks and considerations for operational implementation and sustainability are given in Table 4.

Table 4 Planning considerations for community-based surveillance

Theme	Risk	Considerations
Planning	- Poor community acceptance - Poor vigilance by CHW/RCs - Poor coverage	- Does the community want to input into the system? What are the potential negative consequences for CHWs and communities in reporting suspected diseases/outbreaks? - Is the CHW/RC network is able to effectively handle the additional workload on top of other activities (i.e., iCCM, malnutrition screening, health promotion, AFP, etc)? - Is the CHW/RC network distributed amongst all rural and remote areas of risk? - What incentives are needed?
Human resources	- Poor CHW/RC technical capacity - Miss-specification of events - Overburdening CHW	- What is the most effective and sustainable community network to use? - RC volunteers (who have basic health training) - iCCM CHWs (who have basic health training) - CHVs doing malnutrition screening (no health training) - Are data collection tools are appropriate for the level of literacy and numeracy?
Sustainability	- Waning effectiveness - Unmet community expectations - Expenses outstrip funding - Logistics management and operational costs	- What are the incentives, either monetary or in-kind (i.e., clothing designating affiliation with the program) and is this sustainable? - Can training, supervision, and monitoring be ensured past the acute phase, in order, to keep adequate levels of quality in reporting and vigilance? - Is sustainability beyond the acute emergency desired? If so, how will incentives and supervision be funded?
Specificity and verification system	- System overwhelmed - Low contribution of relevant alerts to EWAR	- Balancing sensitivity and specificity of CBS as simple and broad signal definitions make CBS more sensitive but less specific - Is there a reliable verification for the many community alerts which will come in? Normally, this requires a separate filtering step and staff, and is not handled by the EWAR itself. - Is the system set up to be as specific as possible? A system that is too sensitive (i.e., due to too many reportable events, event descriptions which are too vague, poor training, etc) will risk a high number of false positives.
Analysis, and		

5. Standardise and strengthen reporting

Frequency

EBS {signals/alerts} are reported **immediately** to facilitate detection and response in real-time. This function produces more sensitive data to detect acute public health events as early as possible at the expense of a higher proportion of false positive reports. Weekly or monthly reporting would be too infrequent for the purpose of immediate detection and verification of {signals/alerts}.

What is reported

Data to be collected on priority events should be formatted according to a standard template which may include basic information that orients the {signal/alert} to person, time, and place:

- Unique identifier
- Smallest geographical area of event or person(s) affected
- Date of reporting and contact information of reporter
- Date and time when event occurred
- Description of event
- Action taken to date, if any (verification, isolation of suspected case(s) and other early response

The {signal/alert} tools may differ according to source and for non-health sources like community members, will likely contain few details to help ascertain risk. These can be quickly verified later (see Box 4 for a list of additional information needed to characterize events).

Standard parameters for an EBS alerts

- Nature of the event/agent/disease
- Source
- Location
- Potential origin (infectious, chemical, radio-nuclear, etc.)
- Date of event or date of onset
- Number of case(s)/death(s), severity of case(s)
- Number of people potentially exposed to hazard
- Group affected (e.g., age, sex, occupation, high-risk group)
- Clinical characteristics
- Likelihood of intentional release
- Likelihood of group intoxication/contamination
- Potential for importation of cases to the country (for international events)

The {signal/alert} tools may differ according to source and for non-health sources like community members, will likely contain few details to help ascertain risk. These can be quickly verified later.

The initial report should be sufficiently descriptive for timely and appropriate action, but concise enough to enable efficient verification of incoming {signals/alerts}.

Zero reporting (the mandatory reporting of "0" cases if none are seen) of EBS {signals/alerts} is strongly recommended from community based sources (e.g., community health workers). Zero reporting avoids misinterpretation of the missing number, while also allowing the identification of non-responsive or "silent" reporting sites.

Standard reporting tools should be provided to staff to ensure data is good quality and well collected. Paper-based tools are often appropriate for EBS collected at community-level. These can be completed by electronic tools to support data entry and reporting (see Module 9).

Reporting should also be strengthened through regular monitoring and supervision, to motivate staff (see Module 10) and through providing epidemiological bulletins with EBS information directly to staff and feedback on system performance and with examples of how EWAR data is being used (see Module 11).

References

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