Volume 4
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IOA Field Exchange

Early Warning, Alert and Response to Outbreaks

Integrated Outbreak Analytics (IOA)

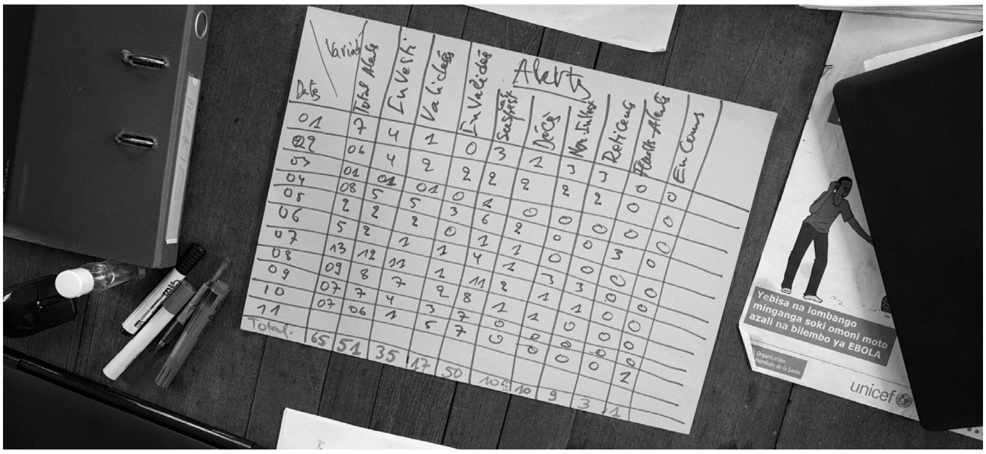
Partnership under
GOARN

In this issue

Integrated Outbreak Analytics (IOA), applies a multidisciplinary approach to understanding outbreak dynamics and to inform outbreak response. It aims to drive comprehensive, accountable, and effective public health and clinical strategies by enabling communities, and national and subnational health authorities to use data for operational decision-making. IOA embraces a holistic perspective of outbreak dynamics throughout: from the research questions to the data that are collected or accessed, to the interpretation of results and the recommendations that follow. In addition, IOA promotes co-development and monitoring of evidence-informed recommendations with Ministries of Health

The IOA Field Exchange

The aim of the IOA Field Exchange is to share Integrated Outbreak Analytics (IOA) initiatives and experiences from across the world, at different levels, to facilitate dialogue between and learning opportunities for individuals and organisations working in IOA. We aim to highlight the benefits of IOA to public health emergency response and evidence-based decision-making but also to discuss the realities of IOA in practice, the challenges and lessons-learned. IOA will always vary context to context and we respect and encourage that diversity.



'A list of Ebola alerts' at the WHO/partner camp in Itipo, Democratic Republic of Congo, 2018, ©WHO/ Lindsay Mackenzie.

Early Warning Alert and Response mechanisms in Emergencies and Integrated Outbreak Analytics

Marie-Amélie Degail, World Health Organization

EWAR (Early Warning, Alert and Response) is a system that provides an early warning of acute public health events, and then connects this function to an immediate public health response. It is one of the most immediate and important functions of a surveillance system.

EWAR encompasses the following components and processes (Figure 1).

- **Early warning** – the rapid detection of signals that may indicate potential acute public health events. Sources of early warning data may include notifications from health facilities, community members and other entities, which feed into indicator- and event-based surveil lance (IBS and EBS respectively) systems.
- **Alert management** – the systematic process of managing all incoming information from signal verification to risk assessment and characterisation, in order to decide if a response is required to mitigate the public health risk. For efficiency, all signals should preferably be channelled into a common system to be investigated and managed systematically.
- **Response** – public health actions trigge red by the detection of an alert.

Emergencies produce many risk factors that promote the emergence and transmission of communicable diseases, such as: food insecurity; sudden or progressive loss of livelihoods; disruption or breakdown of preventative or curative health and other essential services (e.g. access to safe water, sanitation); mass displacement of people into regimented or camp-like settlements or neighbouring host communities, increasing the risk of overcrowding; and/or rapid environmental change due to a natural disaster. Such risk factors can lead to excess morbidity and mortality due to outbreaks or large-scale increases in disease transmission among emergency-affected populations.

The overall aim of EWAR in an emergency is to reduce excess morbidity and mortality due to prioritized epidemic-prone diseases and other public health hazards, including:

- severe diseases and conditions with a potentially high case fatality ratio (CFR) and/or potential for spread (e.g., cholera, measles, meningococcal meningitis);
- emerging or re-emerging communicable diseases, including zoonotic diseases;
- diseases targeted for elimination or eradication (e.g. poliomyelitis); and
- diseases and hazards with potential for intentional release (e.g. anthrax, tularaemia, chemical poisoning).

To achieve this aim, EWAR systems must provide rigorous and continuous early detection and rapid response to such hazards in emergency-affected populations.

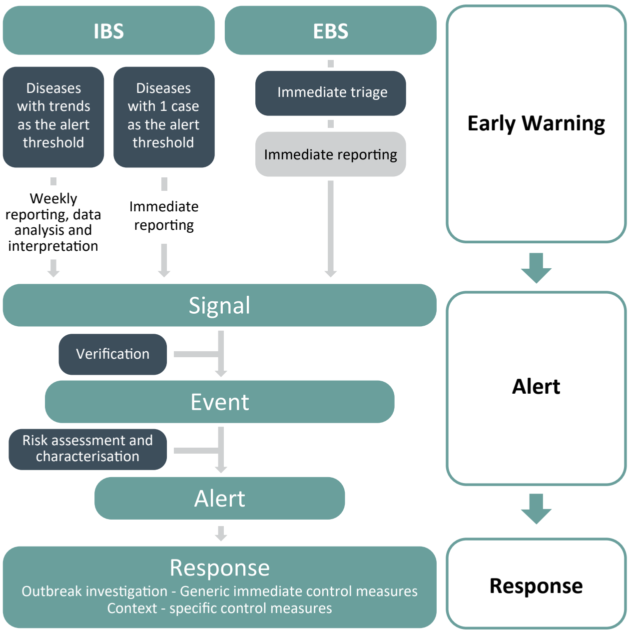


Figure 1. Components of an EWAR system

In this volume of the IOA Field Exchange, we explore holistic and community-based approaches to the Early Warning component of EWAR.

The earlier the detection, the smaller the outbreak. This is what Ruwan Ratnayake and colleagues from the London School of Hygiene & Tropical Medicine (LSHTM) show in a review of articles reporting on early detection mechanisms of and response to 76 cholera outbreaks in 34 countries.

Colleagues from the Somalia Red Crescent Society, Médecins Sans Frontières (MSF) in Ethiopia, and the Ministry of health of Brazil, respectively, present how they have used an integrated approach to improving EWAR systems through

- the deployment of community indicator-based surveillance mechanisms using Nyss[1] – a custom software platform for data collection, management and analysis – in internally displaced communities of Puntland State in Somalia for the successful detection of all health hazards in communities by volunteer community members;
- the implementation of community indicator- and event-based surveillance systems in Ethiopia through regular tea drinking meetings with community members that allow for a more sensitive and holistic approach to early warning; and
- the use of event-based surveillance to detect cross-border health threats in Brazil and Paraguay.

Finally, Resolve to Save Lives introduces a pilot project that aims to identify key multi-sectoral risk factors of the emergence and spread of infectious diseases, before the first case occurs and to mitigate those risk factors to avoid outbreaks. This project relies on multi-sectoral collaboration, coordination and trust. Could that be the future of Early Warning systems?

1 https://www.cbsrc.org/what-is-nyss

Looking backwards at an old foe: benchmarking and narrating what worked in the detection and response of cholera outbreaks

Summary of an article in BMC Medicine, published as part of the WHO GOARN Global Outbreak and Responses collection.

Ruwan Ratnayake, London School of Hygiene & Tropical Medicine

Any field epidemiologist (on Twitter or in real-life) will tell you that how fast outbreaks and other public health emergencies are detected will directly shape the public health response. This is a critical maxim for outbreaks in fragile and conflict-affected states, where early detection and containment while outbreaks are still small is critical for preventing the large-scale cholera epidemics, as recently witnessed in Somalia, South Sudan, and Yemen.[1,2] Any public health practitioner will also indicate that maintaining robust early warning and rapid response systems remains enormously difficult. Yet in the era of copious scale-up initiatives (i.e., Integrated Disease Surveillance and Response, Emergency Operations Centres, and EWAR), what factors can determine success and hasten failure in such precarious settings?

The field epidemiologist may also revel in the fact that there is no better place to look than the lived experiences and mechanisms of past outbreak responses. So, rather than become lost to the latrines of history, we exhaustively compiled quantitative information from 76 cholera outbreaks in 34 fragile and conflict-affected states between 2008—2019[3] (including, the number of days between the date of symptom onset of the primary case and different milestones such as the earliest dates of outbreak detection, investigation, response, and laboratory confirmation, as well as the way the outbreak was detected). 80% of the reports were from Africa (mainly Burundi, Chad, South Sudan, and Uganda) and 13% were from the Eastern Mediterranean region (mainly Iraq, Syria, and Yemen).

We benchmarked these outbreaks to understand the capacity for early detection and response in fragile and conflict-affected states. To do so, we calculated the median delays between symptom onset of the first assumed case and each milestone (detection or response). Paired with the delays, we carried out simple mathematical modelling to approximate the epidemic size. Median delays across indicators spanned one to two weeks, with the median delay to detection being 5 days (IQR 5–6) and to response being double that, at 10 days (IQR 7–18). When simulating 10,000 outbreaks of the size of 3 cases at detection (representing perhaps a single household), this resulted in the proportion of outbreaks that were less than a median of 20 cases being 98.6% and 92.6%, respectively. Around 20 cases could be containable, but if the outbreak was any larger at detection (which it usually is, so let us clock it at 10 cases, or multiple households), these figures plunge to <6% and <1% of cases being less than a median of 20 cases, respectively. However, we can also see that in general, the global delay to response has decreased annually by 5.2% (95% CI 0.5–9.6), and this decrease extend to other milestones (see Figure 1). There was not much of a dent in the delay of patients presenting to health facilities, though.

Figure 1. Scatterplot of cholera outbreaks by delay between date of symptom onset of the primary case and dates of (a) presentation, (b) detection, (c) investigation, (d) response, and (e) confirmation, and Loess curves, as a function of outbreak start date, 2008 to 2019. Red dots represent individual outbreaks over time and gray shading indicates 95% CI of the Loess regression

So how can we detect these outbreaks any earlier? We found that the signal for the vast majority (83.6%) of outbreaks originated from a near real-time alert system (i.e., a signal of a cluster from community health workers or health workers that they reported in immediately) versus the review of the weekly trend analysis of indicator-based surveillance. In fact, outbreak detection using alerts was associated with a reduction in delay to response of one week, from about 16 to 9 days.

Turning to the rich history hidden in outbreak reports, we sought to glean insight into how public health practitioners have set up surveillance and response systems that simply work in very trying circumstances. Descriptions of the arc of the investigation and response appear as narrative blurbs in the annex which help to elucidate some practical observations[3]. This includes a diverse set of tools to explicitly **promote early detection at health facilities** (i.e., sentinel site surveillance paired with rapid diagnostic testing and training for signal detection in Kathmandu, Nepal) **and in communities before patients appear at health facilities** (i.e., community-based surveillance built upon community health worker or Red Cross volunteer networks in Central African Republic and Haiti). The systematic use of rapid diagnostic tests in health facilities by trained health workers can help to ascertain a signal earlier. **Surveillance systems that are proactively integrated with preliminary investigation and response** appear to be capable of reducing the usual delays. This includes the provision of sufficient and trained district-level rapid response teams or failing that, health facility staff who could mount a preliminary investigation and generic response. Salient examples included Chad, where upon admission of two suspected cases, a preliminary investigation and an immediate community response for many cases found in a remote village were initiated by the local health facility staff. Also, in Afghanistan, upon detection using the national EWAR, a local nongovernmental organization was trained on the same day to extend a community investigation and response in an area where local health authorities recognized that they had poor access.

Following a signal on the same day to mount an investigation, and preliminary response, Eastern Equatorial Province, South Sudan (photo: Ruwan Ratnayake)

A main weakness of relying on published information on outbreaks is the overreporting of results from large outbreaks and outbreaks with positive outcomes. Still, our analysis cautiously suggests that the revitalization of cholera-focused policies, aspirational targets to integrate governments and society, and practices, including the reactive and preventative use of the novel oral cholera vaccine, as reinforced by the Ending Cholera roadmap[4] and Early Warning Alert and Response[5] initiatives, may indeed be narrowing the gap between detection and response. The narratives make starkly clear that the mechanisms that underpin new interventions matter more than ever and require renewed investment and energy: "Reducing delays in the timelines of patients presenting to health facilities, increasing capacity of health workers to recognize suspect cases of cholera, and reinforcing local investigation and response therefore remain as important as vaccination and other emerging tools."[3]

1 Gayer M, Legros D, Formenty P, Connolly MA. Conflict and emerging infectious diseases. Emerg Infect Dis. 2007;13(11):1625-31. doi: 10.3201/eid1311.061093. PubMed PMID: 18217543; PubMed Central PMCID: PMCPMC3375795.
2 Spiegel P, Ratnayake R, Hellman N, Ververs M, Ngwa M, Wise PH, et al. Responding to epidemics in large-scale humanitarian crises: a case study of the cholera response in Yemen, 2016–2018. BMJ Global Health. 2019;4(4):e001709. doi: 10.1136/bmjgh-2019-001709.
3 Ratnayake R, Finger F, Edmunds WJ, Checchi F. Early detection of cholera epidemics to support control in fragile states: estimation of delays and potential epidemic sizes. BMC Med. 2020;18(1):397. Epub 20201215. doi: 10.1186/s12916-020-01865-7. PubMed PMID: 33317544; PubMed Central PMCID: PMCPMC7737284.
4 Global Task Force on Cholera Control. Ending Cholera. A Global Roadmap to 2030. Geneva, Switzerland: WHO, 2017.
5 Schenkel K, Kannagarage NK, Haskew C, Guerra J, Cognat S, Nabeth P, et al. Early Warning, Alert and Response (EWAR): a key area for countries in preparedness and response to health emergencies. Weekly Epidemiologic Record (WER). 2018;20(93):269-72.

The detection of Mumps through community-based surveillance by volunteers of Somali Red Crescent Society (SRCS) – Mudug region, Somalia

Khadiija Mohamud, Community Health Programme Officer Galkayo branch, Somali Red Crescent Society

Mahad Yusuf Jama, Community Health Manager for Puntland State, Somali Red Crescent Society (Puntland State)

Julia Jung, Regional Community Based Surveillance technical advisor for Africa, Norwegian Red Cross.

Introduction

Community-based surveillance (CBS) has the potential to systematically and rapidly detect and report events of public health significance within the community by community members to prevent large scale disease outbreaks.

The Somali Red Crescent Society (SRCS) and the Norwegian Red Cross have implemented CBS activities in several regions since 2018. In 2021, the SRCS Galkayo branch kicked off their community health project, including CBS to reduce the continuously high risk of disease outbreaks due to limited access to health care, poor living and hygiene conditions, low vaccination coverage and to strengthen early warning, alert, and response to epidemics at the community level in those locations (Figure 1). SRCS has been collaborating with the Ministry of Health (MoH) in Puntland State since the beginning and involved them in the assessment, design and planning, and implementation phase. Since the implementation, several outbreaks have been detected.[1] This case study describes a specific field experience where SRCS volunteers within the CBS programme detected clusters of children with mumps in an Internally Displaced Persons (IDP) camp .

Methods

CBS is implemented as a combination of a syndromic indicator-based and event-based surveillance approach for epidemic preparedness and response. The SRCS branch has trained 119 volunteers in 54 locations – urban and rural – since 2021, in the detection and reporting of signs and symptoms of acute watery diarrhoea; fever and rash; fever, cough/difficulty breathing and tiredness; and acute flaccid paralysis. In order to capture less frequent signs and symptoms that could be suggestive of epidemic-prone diseases, volunteers are requested to report any cluster of three or more individuals (or deaths) showing similar signs or unusual illnesses.

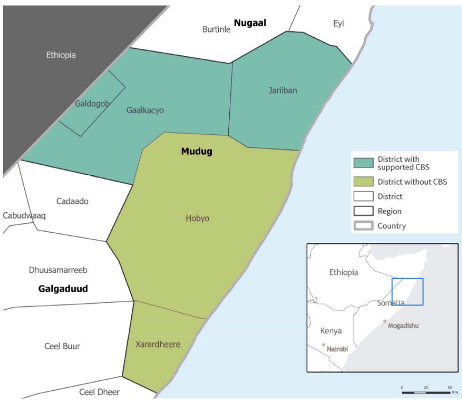
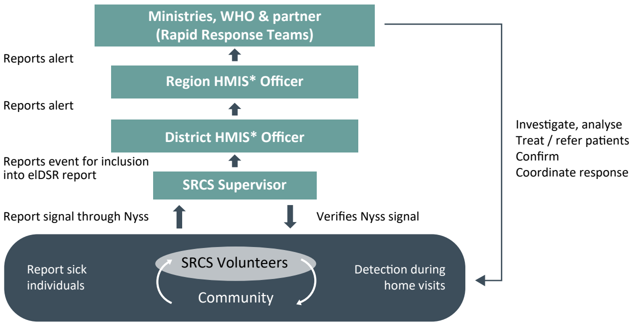


Figure 1. Somalia Red Crescent Society CBS implementation by district, June 2022 (credit: WHO)

Volunteers are informed by community members about sick people or identify them during their routine community health promotion activities (Figure 2). They report health signals from the community through coded SMS to their supervisor (an SRCS employee who will in turn verify the signal) via the CBS platform Nyss[2]. Nyss was developed by the Red Cross Red Crescent (RCRC) movement partners[3] to support CBS based on the local context and the assessment of needs at community level. The platform is set up according to the most likely and common health risks and events in the region, alert rules can be defined with the

MoH, feedback messages to the volunteers adjusted and translated to the local language and pre-set community case definitions can be adjusted to the national standards. It is a web-based platform which enables real-time reporting, notification, data analysis and management, and information sharing with all stakeholders, particularly with the MoH for further investigation and recording into their own surveillance tools in Integrated Disease Surveillance and Response (e.g., EWARN, DHIS2). CBS with Nyss aims to promote early action to limit the spread of an outbreak[4].



** HMIS: Health Mangement Information System*

Figure 2. Early Warning information flow in Galkayo district, Mudug region, Puntland State, Somalia, June 2022

Results

On Epi week 23, 2022, a child presenting with high fever and puffed out cheeks in Buulo Ba'ley IPD camp in Mudug region was detected. The volunteer called the SRCS supervisor as those symptoms were unfamiliar. They decided to investigate whether other children were showing similar symptoms. Between 15-23 June additional children showing similar symptoms were identified and reported the SRCS CBS supervisor through Nyss. After verifying these reports and the occurrence of a cluster of cases, the MoH was notified on 23 June 2022.

The MoH in Puntland State immediately raised the alert and on 25 June, the MoH and SRCS visited the camp for further investigation, and clinically confirmed several additional cases of mumps (in the absence of laboratory confirmation capacity). This IDP camp hosts about 1000 households affected by drought and conflict; the living conditions are poor with limited access to hygiene facilities hence the community is highly vulnerable to the emergence and spread of infectious diseases. As a preliminary response to this outbreak, SRCS encouraged the three volunteers in the camp to enhance community awareness on hygiene and sanitation and to practice physical distance as a preventive measure. SRCS volunteers particularly targeted school children. Their parents and teachers were advised to isolate the affected children from others. Volunteers referred the sick children to the nearest health facility to confirm the diagnosis and monitor possible complications. Despite the absence of vaccines, no additional case was reported after 25 June. In total, at least 15 clinical mumps cases were detected through CBS and reported from Buulo Ba'ley IDP camp between 15-25 June 2022.

A recent qualitative evaluation of the activities in the region with different stakeholders, documented great appreciation by the community members. Requests on extension of the activities to other locations, increase of volunteers (including from host and IDP communities), and inclusion of other health threats were requested by the leaders. The initial resistance by the community at the beginning of the programme, changed into a fruitful collaboration between the community, volunteers and SRCS, thanks to the constant engagement of the communities from the start of the activities. This allowed for a holistic approach to early detection of health threats. In addition, the MoH acknowledged the added value CBS brought to the timely detection of and response to health threats in remote communities. Discussions are ongoing with the MoH to make mumps vaccination available in the IDP camp.

Conclusion

This case study is one of several examples where CBS using the Nyss platform as a real-time reporting, alert and programme management tool has been demonstrated to be an effective, easy to use, and acceptable method to detect epidemic-prone diseases early1. SRCS in collaboration with the MoH, the Norwegian Red Cross and other partners will expand CBS programming to other regions of Somalia in the coming months.

1 Some are documented here: https://www.cbsrc.org/cbs-news
2 Nyss is Norwegian and means "having learned or found out about something"
3 By the Norwegian Red Cross in cooperation with the International Federation of Red Cross and Red Crescent Societies (IFRC), the Belgium Red Cross and during CBS implementations with national societies like SRCS in Somaliland.
4 https://www.youtube.com/watch?v=784IzOIkzJE

Tea team surveillance system in Somali region

Bashir Ali Dubad[1], Luke Baertlein[1] Turid Piening[1], Istifanus Chindong[1], Birhanu Sahelie , Mohammed Osman[3], Nathan Post[4], Beverley Stringer[4] Kate White[5] , Patrick Keating[4]

Médecins Sans Frontières (MSF) Doollo/Somali[1], Ethiopia, Médecins Sans Frontières (MSF) Addis Ababa , Ethiopia.[2] Somali Regional Health Bureau Jigjiga, Ethiopia. Médecins Sans Frontières (MSF) London, UK, Médecins Sans Frontières (MSF) Amsterdam, Holland

Context

Early warning and response surveillance systems rely on a combination of traditional indicator-based surveillance (IBS) as well as more participative event-based surveillance (EBS) components to ensure the rapid identification of and response to public health hazards. The latter approach (where community members simply report health events to authorities) is becoming increasingly important for public health.

MSF-Operational Centre Amsterdam (MSF-OCA) has been implementing humanitarian projects in the Somali region of Ethiopia since 2007. The region is characterized by recurrent drought, disease outbreaks, malnutrition crises and often a lack of resources. After 10 years' experience including piloting different surveillance approaches MSF established the "Tea Team surveillance system" incorporating health facility and community indicator- and event-based surveillance systems and collecting data from 32 locations (17 surveillance only and 15 non-permanent mobile clinic sites) and from other actors in Doolo zone.

The Tea team includes MSF surveillance staff and local volunteers dedicated to meeting with the community in their traditional tea drinking rooms and dialoguing with them about population and health-related needs. These tea shops are very popular information-sharing platforms in the local community. Two years after the establishment of the tea team surveillance system, MSF-OCA conducted a study to evaluate the usefulness of the data generated by the different components of the surveillance system.

Methods

A mixed method approach was used for this evaluation. Description of the surveillance system, quantitative analysis of retrospective data from February 2019 up to January 2021 and focus group discussions were the main methods used to evaluate the usefulness, acceptability, and other surveillance attributes. Quantitative analyses were done using R software (R Core Team (2014) while qualitative data analysis was performed with NVivo12 Pro[1].

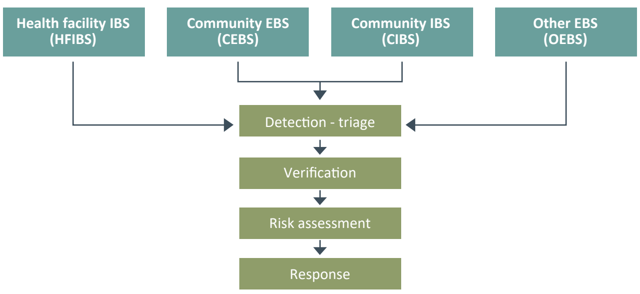


Figure 1. Tea Team four surveillance types

Results

Over 1200 signals were reported to the Tea Team surveillance system over the evaluation period, with the majority being reported via the community event-based surveillance (CEBS) component (Table 1). There was a total of 31 responses conducted between February 2019 and January 2021, and of those 22 (84.6%) originated from the CEBS system signals, 1 (3.8%) from the community indicator-based surveillance (CIBS) system, 2 (7.7%) from the health facility indicator-based surveillance (HFIBS) system, and 6 (23.1%) from the other event-based surveillance system (OEBS). Most responses were triggered by population movements, suspected measles and suspected acute watery diarrhoea. No responses arose from acute jaundice syndrome signals.

The surveillance system was acceptable to the community at large during emergency response periods particularly when they saw a substantial response as a reaction to the information they provided. However, when the system only collected the routine data with limited response activities, the community interest for participation diminished. In contrast, MSF staff found the surveillance system to be more acceptable in non-emergency times and indicated the system would be less acceptable during a crisis due to the data processing time and the rigid HFIBS online database analytical processes.

Surveillance type	Total signals received	Verified Signals / Events (% total signals)	Alerts (% total signals)	Responses (% signals)
CEBS	916	129 (14.0%)	46 (5.0%)	22 (47.8%)
CIBS	32	2 (6.3%)	1 (3.1%)	1 (100%)
HFIBS	196	4 (2.0%)	2 (1.0%)	2 (100%)
OEBS	62	37 (59.7%)	11 (17.8%)	6 (54.5%)
Total	1206	172 (14.3%)	60 (5.0%)	31 (51.7%)

Table 1: Signals, events, alerts, and responses by surveillance type, February 2019 through January 2021

The surveillance system revealed complex and inadequately defined data management procedures leading to potential underreporting of signals and difficulties with routine data quality monitoring . Project staff considered the CEBS and CIBS components as more flexible than the HFIBS; however, the HFIBS surveillance component was sufficiently flexible to integrate COVID-19 as a signal.

Lessons learned

These lessons learned come from both experiences of the day-to-day running of the surveillance system over the last two years and its formal evaluation.

In a setting where health facilities are not functioning optimally, CEBS can bridge the gap and generate impactful information for adapted decision-making, while facilitating a holistic approach to health threat detection, verification, alert, and response. Our experience in the Somali region precisely demonstrated that - as CEBS generated more alerts and responses than all other surveillance types combined. When working with local informants (volunteers) with limited medical knowledge, simplifying alert definitions and reducing the number of signals to be reported seemed to improve the accuracy of reports received and the overall sustainability of the system.

Moreover, strengthening the role of women is key for a community surveillance system. The majority of our local informants were men, but we also realized that given their key role in the community women should be systematically incorporated into the CEBS. This should include selecting at least one woman informant in each village (surveillance site). Elderly women and traditional birth attendants are preferable as they are already involved in community service.

Another important factor for community participation is the frequency and consistency of the feedback given to the community involved. When we consistently shared feedback with the communities, their collaboration with us flourished. We also learned that communities prefer the feedback mechanism to be an ongoing process rather than waiting when there is an issue like an intervention or response.

Digitizing the surveillance data can help improve data management efficiency and reduce data errors and facilitate easier routine monitoring of data quality.

Finally, several comments made by CEBS volunteers highlighted the need for an integrated approach between animal health and human health, in a pastoralist community, to significantly increase the effectiveness of both surveillance systems.

1 QSR International Pty Ltd. (2018) NVivo (Version 12), https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home

Event-based surveillance detection of a non-tuberculous mycobacteria outbreak in the border region of Brazil and Paraguay

Rafaela Borges Curvelo[1], Marco Aurélio de Azevedo[1], Matthew de Paula von Glehn[2], Talita Gomes da Silva Batista[2], Aline Schio de Souza[3], Griselda Salcedo[4], Lorena Romero[4], Camile de Moraes[2], Pedro Henrique Presta Dias[1], Carlos Henrique Micheles Frank[1], Janaína Sallas[1], Sandra Fabiola Ocampos Ojeda[4] and Igor Goncalves Ribeiro[2]

[1]General Coordination of the Strategic Information Center in Health Surveillance; [2]Training Program in Epidemiology Applied to SUS Services – EpiSUS; [3]State Health Surveillance Coordination of the State Health Department of Mato Grosso do Sul; [4]Paraguay Field Epidemiology Training Program – FETP Paraguay;

The Brazil National Health Surveillance System (SNVS) has among its actions and services the Center for Strategic Information on Health Surveillance (CIEVS), the Applied Epidemiology Program of the Services of the Unified Health System (EpiSUS), and the National Hospital Epidemiological Surveillance Network (Renaveh). The SNVS defines public health events as any situation that may pose a threat to public health, such as outbreaks, epidemics, diseases, or injuries of unknown cause; changes in the epidemiological pattern of known diseases considering the potential for spread, the magnitude, severity, social consequences, vulnerability, as well as epizootics as public health events. Among its actions, CIEVS conducts surveillance based on rumors and events (Event-based surveillance, EBS), including the detection, verification, assessment, and early warning alerts for potential public health events that could constitute a health emergency. CIEVS routinely uses the Epidemic Intelligence from Open Sources (EIOS) system for the early detection of potential health threats[1]. The EIOS system brings together a variety of sources of official and unofficial information and makes it possible to perform structured research for any health threat, such as outbreaks, epidemics involving diseases, known and unknown diseases, epizootics, disasters, and others, allowing for the early detection, verification, assessment, and risk communication for public health events.

On April 7, 2022, the National CIEVS detected a report through its routine EBS entitled “Silicone and lipo: three Brazilian women were infected by mycobacteria in cosmetic procedures in Paraguay” in the state of Mato Grosso do Sul, Brazil. A request was sent to the CIEVS of the state of Mato Grosso do Sul (CIEVS MS) and the National Health Surveillance Agency (Anvisa), the technical organization responsible for the surveillance of infections related to healthcare to verify the possible occurrence of a mycobacterial outbreak involving patients from both countries. Non-tuberculous mycobacteria disease is not classified as a mandatory notifiable disease in Brazil, but when it is suspected in relation to a public health event, it must be immediately reported to the three levels of the Brazilian Unified Health System management; it is also important to emphasize that this disease is not among the list of diseases, injuries, or situations in Annex II of the International Health Regulations (IHR). On April 8, 2022, CIEVS MS and Anvisa verified the signal and, on the same date, a communication was made to the Paraguay International Health Regulations National Focal Point, which confirmed the occurrence of the event in a hospital in Pedro Juan Caballero, the capital of Amambay Department which borders the Brazilian city of Ponta Porã in Mato Grosso do Sul State. These two municipalities have merged in a continuous urban area across the border (Figure 1). Subsequently, arrangements were made to conduct a joint epidemiological investigation in order to verify the outbreak situation, which allowed for the sharing of experiences between the countries' Field Epidemiology Training Programs (FETPs).

The subsequent joint epidemiological investigation in Brazil and Paraguay allowed for the identification of 10 confirmed cases of *Mycobacteroides abscessus* subsp. *abscessus* in surgical wounds out of a total of 108 cosmetic surgeries performed by a single professional. All surgeries were performed in a private hospital in the city of Pedro Juan Caballero, Paraguay, between August 2021 and April 2022 (Table 1). Consequently, preventive actions were taken, including infection prevention and control (IPC) measures in the physician's cabinet; IPC inspections at the hospital to verify if sterilization processes were respected; assessment of water quality in the hospital; sensitization of plastic surgeons; and case management of affected women. The local laboratory network was urged to notify Anvisa of newly suspected cases of infection. No new cases have been reported so far.

Month of surgery	No.	Cases	Incidences (%)
August 2021	10	0	0.0
September 2021	9	0	0.0
October 2021	8	0	0.0
November 2021	19	1	5.3
December 2021	21	4	19.0
January 2022	11	5	45.4
February 2022	11	0	0.0
March 2022	13	0	0.0
April 2022	6	0	0.0
Total	**108**	**10**	**9.3**

Table 1. Surgeries performed, confirmed cases and incidence per month of surgery: Outbreak of *M. abscessus* subsp. *Abscessus* in Pedro Juan Caballero, Paraguay, from August 2021 to April 2022.

This experience resulted in important lessons, such as the need to strengthen border surveillance among South American countries in order to facilitate joint interventions on health hazards, and the importance of strengthening the decentralization of the CIEVS network throughout the national territory in order to promote a more coordinated response among all spheres of the Brazilian government. CIEVS' experience in EBS was triggered by the routine use of EIOS, which allows us to demonstrate its application for surveillance actions and alert and response to public health events in the country.

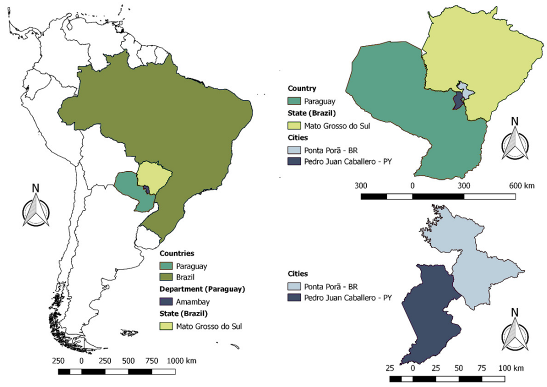


Figure 1. Border region between Brazil and Paraguay. Geographical location of the outbreak of M. abscessus subsp. abscessus in Pedro Juan Caballero, Paraguay, from August 2021 to April 2022.

1 https://www.who.int/initiatives/eios

Enhanced Situational Awareness (ESA): Risk Identification, Monitoring, and Early Action

Lauren Brown and Coby Wilkason, Resolve to Save Lives

Overview

Hazard identification, risk monitoring and early public health action are essential components of early warning systems for global health threats. However, National Public Health Institutes (NPHIs) currently limit the trigger for response actions to the detection of a health event; pre-identified hazards and associated risks are not monitored regularly; and thresholds for risks do not often trigger action. To address this, Resolve to Save Lives (RTSL) is collaborating with NPHIs in Ethiopia, Uganda, and Nigeria to pilot a program called Enhanced Situational Awareness (ESA) which focuses on:

1. identifying and monitoring pre-existing risk factors (predictors or signals for potential outbreaks); and
2. using pre-determined thresholds to link risk monitoring to early action, in order to mitigate the impact of potential outbreaks.

ESA builds off disaster risk reduction principles[1], namely that public health crises can be prevented and mitigated through risk monitoring and early action. By identifying multisectoral risk factors, ESA connects risk monitoring teams across sectors to accelerate action. It also allows for these teams to use simple tools, instead of relying on complex modelling, to track factors known to increase the risk of health events. For example, seasonal calendars can easily display the seasonality of relevant diseases and give preparedness teams lead time to activate activities meant to reduce risk before the disease event occurs.

ESA uses the epidemiological triad2 as the base conceptual model for ESA, defining the interplay of risk between the infectious agent, the vulnerability of hosts to that infection and the environment in which the infection is occurring. The second dimension to the conceptual framework of ESA delineates risk into two categories:

1. dynamic or sudden risk factors such as flooding, droughts, or conflict, which can be identified through risk assessment and included in hazard planning; and
2. contextual risk factors which are defined as those driving vulnerability and are not sudden, such as population density, income status and gender.

Implementing ESA

The end goals of ESA are to:

1. anticipate a change in risk of hazards/events before their occurrence;
2. mitigate risks of those events;
3. improve the positive predictive value of early warning systems; and
4. link early warning systems and risk alerts to action.

The ESA pilot programs are using three steps to accomplish these end goals (Figure 1):

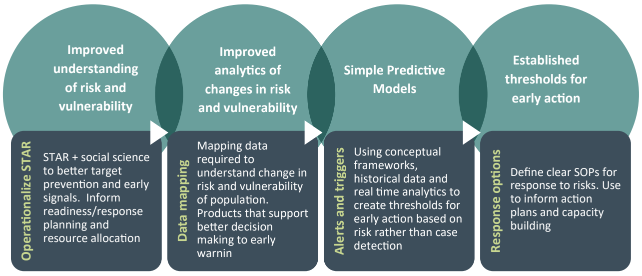


Figure 1. Steps of the Enhanced Situation Awareness program, Resolve to Save Lives

Step 1: Hazard prioritization

ESA aims to operationalize tools such as the WHO Strategic Toolkit for Assessing Risks (STAR)[3], an all-hazards risk assessment conducted at the national and sub-national levels. In the three countries where ESA is being implemented, the STAR tool was used to prioritize hazards based on factors such as likelihood, impact, and scenario planning. To test the ESA concept, NPHIs in each country selected no more than 10 hazards to prioritize, with the end goal of ensuring that readiness action occurs.

Step 2: Risk identification and data mapping

Through multi-sectoral meetings, risks and associated data pipelines were identified for each hazard selected. Dynamic risk factors in particular tend to be monitored by many departments, agencies or partners, requiring multisectoral coordination and trust. NPHIs currently implementing ESA have selected 1-2 dynamic risk factors, related to seasonality, weather or conflict. However, NPHIs plan to expand the scope to include additional risks factors and are already focusing on the impact of food insecurity on health outcomes in Ethiopia and Uganda. In addition, NPHIs have not yet integrated contextual vulnerability factors such as population density or static WASH infrastructure, but plan to do so during annual national planning.

Step 3: Linking risk monitoring to early action

For each risk factor, NPHIs defined country/disease specific thresholds which trigger readiness, prevention, or response activities. These data thresholds are linked with operational planning such as contingency, multi-hazard and disease specific plans to promote efficient decision-making to better prepare for events. As an example, in Uganda, readiness activities identified during ESA were included in multi-hazard planning meetings with an emphasis on seasonal readiness, as this data is readily available.

When possible, NPHIs have also linked risk thresholds to associated actions, calling those "alert levels". These serve as an internal mechanism for determining specific activities ranging from readiness to response based on the threshold reached. In all pilot countries, seasonal calendars linked to alerts are being utilized to drive action.

Lessons Learned

ESA has been in a pilot phase since early 2022. Though this is often difficult to determine, RTSL in collaboration with NPHIs, has already started measuring the impact of basic surveillance and early response activities to hazards through the data story, Epidemics That Didn't Happen[4].

The primary learnings thus far are:

- A shift is needed in what is thought of as an early warning system in public health. NPHIs are able to utilize existing data sources and information about what drives the risk for outbreaks, but are not currently using this data effectively. These basic tools and changes to workflows can easily promote the integration of risk as an early warning indicator without huge budgets or data pipeline overhauls.
- Data pipelines for multisectoral data outside of the health sector can be difficult to identify, monitor, and automate, and require stakeholders' engagement and coordination.
- NPHIs have decided to focus on a limited number of hazards/risks during the pilot and plan to expand once methodology is refined.
- Readiness action will depend on the frequency and quality of the monitoring of triggers, associated planning, and the availability of resources to address risks.

Next Steps

While the initial stages of implementation of ESA continue, the RTSL team is developing a toolbox for country teams to use that range from simple tools like the seasonal calendar, to more complex data-informed early warning systems complementary to disease surveillance that can inform changes in risk for outbreaks at the national and subnational levels.

1 https://en.unesco.org/disaster-risk-reduction
2 https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section8.html
3 https://www.who.int/publications/i/item/9789240036086
4 https://preventepidemics.org/epidemics-that-didnt-happen/

IOA Approach

1. To drive comprehensive, accountable, and effective public health and clinical strategies for outbreak management and control
2. To produce data from multidisciplinary perspectives that can rapidly and systematically inform operational decisions
3. To drive a holistic understanding of outbreak dynamics, and highlight the impacts of both the outbreak and response control interventions
4. To advance mechanisms and methods for relevant, useful, and rapid evidence-generation
5. To build, strengthen and scale-up sub-national and national, regional, and global capacity to conduct IOA
6. To provide support via field deployment, remote assistance (analytics/helpdesk), technical and normative guidance, tool development or dissemination and online trainings.

IOA is produced through partnerships and a multi-disciplinary community of practice (a network of agencies and organisations that work or are interested in working with this approach have come together under the Global Outbreak Alert and Response Network (GOARN)[2]. It is primarily a field-based initiative that leverages support from national, regional, and international experts to reinforce pre-existing local capacity. The IOA partnership welcomes all individuals, actors, agencies to contribute, learn and exchange in ways which are best suited and adapted to their needs.

IOA Core Team Contacts

- Simone Carter, UNICEF
- Marie-Amélie Degail, WHO
- Pascale Lissouba, MSF-Epicentre
- Christine Dubray, CDC
- Esther van Kleef, ITM
- Lina Moses, GOARN Research
- Ruby Siddiqui, UNICEF
- Nina Gobat, WHO
- Emelie Yonally Phillips, MSF-Epicentre
- Dante Bugli, CDC
- Hana Rohan, LSHTM
- Sara Hollis, GOARN Research

IOA Field Exchange is published quarterly and we invite you to contribute!

If you have an idea for an article or would like to write about your own IOA experiences, please feel free to contact us. The focus of the IOA Field Exchange is field experiences, how IOA contributed to the understanding of an outbreak or public health emergency, how it has been used to influence decision-making, or how IOA has been applied to improve community health outcomes.

We look forward to hearing from you.

To access other IOA resources:

Cellule d'Analyse Intégrée (CAI) in DRC

YouTube

GOARN-IOA and Previous IOA Field Exchanges

Graphic design and Layout: Chris Ngoma (ngobayis.ch@gmail.com), DRCongo

2 GOARN is a network of over 250 technical institutions positioned to respond to acute public health events. Established by WHO as a mechanism to engage the resources of technical agencies, GOARN partners have collective expertise in rapid identification, confirmation and response to public health emergencies of international concern (PHEIC).(7) Driving outbreak-related research and analytics to strengthen outbreak response is a key strategic objective of the GOARN network