

Delivering together: A framework for sustainable ownership of early warning and health emergency surveillance technologies in low- and middle-income countries

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Abstract

Previous health and natural disasters have all had a significant impact on human life. However, there is a consensus that the technological advances of our time would have allowed us to better understand and respond to these situations in a more holistic manner. Early Warning and Health Emergency Surveillance technologies are therefore more than essential for improved proactivity. While in developed countries, their implementation is facilitated by the existence of proven mechanisms, this is not often the case in low and middle-income countries. Our practical experience in deploying Early Warning and Health Emergency Surveillance systems in resource-constrained environments led us to develop and propose an approach that is intended to be effective in the execution of such interventions. When implemented in low and middle-income countries, our approach, which promotes the Bottom-to-Top concept, has succeeded in federating and strengthening all the forces in the public, private and international development sectors around the implementation of these crucial technologies for better emergency management, especially in health. Engaging all stakeholders, developing an inclusive modus operandi, promoting a sustainable strategy, and effectively empowering recipients in a coordinated manner is the recipe for the successful implementation of such technologies in low and middle-income countries.

Introduction

With one of the highest internet penetration rates in the world at 50.40%,¹ low and middle-income countries are resolutely turning to digital technology. Health, a key sector, must take full advantage of this for a better management of health events, greater awareness, and improved resilience.

Indeed, the IHR (International Health Regulations) emphasized the need for sur-

veillance of public health events of diverse origins, for multisectoral/multidisciplinary approaches, and for strengthening national surveillance with early warning of public health risks and the initiation of rapid, coordinated and proportionate responses.²

Given nearly 5 billion digital devices users, the potential for technology to undertake a significant part in delivering/promoting health care, is becoming more apparent, especially in low- and middle-income areas.³ Technology can also assist professionals carry out better by disseminating medical results, educational contents, and recalls, especially in disadvantages remote areas.

In addition, the Global Health Security Agenda (GHSA) and the Strategic Plan for the Zoonotic Diseases Action Package (ZDAP) call for a “OneHealth” approach and enhanced surveillance to minimize the risk of disease or their possible transmission to human populations.^{4,5}

Engaged for several years in a process of digitization of health information,⁶ low- and middle-income countries are now facing the problem of information feedback in real time and the exploitation of acquired data. Thus, when technological solutions are proposed to them, they open up to change with great enthusiasm.⁷ While this change holds the promise of a bright future, very often it is abandoned, by recipients, due to the lack of an inclusive approach to implementation or a viable technology transfer plan.

Objectives of early warning and health emergency surveillance systems

The primary purpose of early warning and health emergency surveillance systems is the generation of signal/knowledge based on a phenomenon observed on a continuous/regular/unannounced basis and the transfer of information to a database centralizing all data. This database is very often equipped with a system that facilitates the interpretation of the data (generation of graphs) and the follow-up or the taking of action according to the established response plan.

- i. Speed: the processing of information must not suffer from any significant latency. From its generation to its transmission, the data must be able to be routed in real time to the main information processing unit;
- ii. Resilience: the information must be able to be transmitted and processed using very few computational resources, especially with simple cell phones that are very accessible to professionals in low/medium income countries.

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National Health Systems must be ready to deal with problems of new infectious illnesses as well as current ones. Therefore, reliable early warning and surveillance systems are extremely beneficial in preventing and controlling diseases (Figure 1).

The operationalization of an early warning and surveillance system for health emergencies will therefore ultimately aim to achieve what we have defined as the triple A:

- i. Alert: Alerting has enormous potential for early detection of cases, for appropriate treatment of cases, and even for prevention/education. The establishment of a system for triggering, receiving and responding to all health alerts is

one of the main objectives. Taking into account the technological, economic and social context will thus allow the identification of adapted solutions.

- ii. **Analyze:** Analysis allows us to give life to the information previously collected. The cornerstone of any information system, analysis offers the possibility of exploiting data. Taking into account the context and proposing solutions to quickly draw the necessary conclusions in real time is one of the tasks to which adequate responses must be provided.
- iii. **Act:** Decision-making is the keystone of the monitoring system and is also one of the issues under study. As the data collected and analyzed should lead to better informed actions for a proactive, effective and efficient health system, this step is one of the most crucial. The decisive importance of this step leads us to prioritize the inclusion of all stakeholders in its definition and implementation.

The triple-A allows us to grasp the essence of early warning and health emergency surveillance systems, which consist of a perpetual process of gathering information, analyzing it, interpreting it, and disseminating it in order to take rapid evidence-based action.

Critical elements to be taken into account

With the vision, in the long run, of developing, implementing and sustaining an early warning and surveillance system for health emergencies at the national, regional and international levels, several contributions are expected.

These different expectations can be categorized into three main groups:

- i. **Implemented tools:** Several tools will be designed and implemented for the deployment of the early warning and surveillance system for health emergencies. These will facilitate communication and coordination of health personnel and interaction with the population through a digital terminal and telecommunication channel previously identified and adopted after evaluation.
- ii. **Capacity building:** Several capacity building sessions will be organized, supported and implemented. These sessions will mainly aim at transferring skills in the management and administration of both technical and functional aspects of the tools deployed. These sessions will also see the participation of all the technical departments of the Public Authorities concerned.
- iii. **Documentation:** The establishment of a documentation is a crucial step in the

support that comes to support the capacity building. The documentation not only informs on the use of the tools, but also facilitates their maintenance by the supported services. This phase is part of the quality and sustainability objectives that are essential in the implementation of such actions.

The collective intelligence approach promoted from the very first hours of support will be the result of the meeting between the opportunity offered by this tool and the enthusiasm of the stakeholders for the possibilities offered by the system.

The strong ownership of the objectives of this project by the public authorities is therefore essential and a policy of reinforcing the visibility of the project should be established to catalyze the impact of the good results that will be obtained as soon as it becomes operational. The undeniable advantages of the system will push more actors to join the coalition and reinforce the action.

Once the system is operational and its mechanisms well oiled, the next major step will be to insert it into the global edifice so that it becomes one with the outside world while taking into account the specificities of the country or region. Among the most significant actions of synergy, we can mention among others:

- i. **Improving operational efficiency:** Relying on early warning to carry out territorial or regional sanitary surveillance, both of humans and animals, guarantees a better reactivity to sanitary events that may occur anywhere in the country or region;
- ii. **Demand-driven and country-controlled:** Initially driven by a request from the government, this support will make them completely independent in the use

and management of this tool to strengthen the system as a whole;

- iii. **Respects and promotes international standards:** From the GHSA,⁸ to the OpenHIE,⁹ through the ZDAP,¹⁰ the implementation of this tool and its various components both technically and functionally, should be a clear example of promotion and use of standards and good practices in this area;
- iv. **Encourages an active commitment from the public and partners:** The assistance that could be granted to the support requests around this tool in addition to the strong involvement of both the Public Authorities, its branches and other partners are as many assets to achieve effectively and sustainably the desired goal.

Thus, in deploying and operationalizing a system of early warning and monitoring of health emergencies, we must not lose sight of the larger whole, which is intended to be harmonious. The presence of specialized health entities such as WHO (World Health Organization), UNDP (the United Nations Development Programme), UNWomen (the United Nations entity dedicated to gender equality and the empowerment of women), UNFPA (the United Nations Population Fund), or UNICEF (the United Nations Children's Fund), to name a few, allows for building more resilient systems on a larger scale.

Challenges to be addressed in depth and proactively

There are several challenges to deploying such a large system. These challenges are very often caused by the vulnerability of the environments in which the system is to be deployed. While many of these challenges are usually uncovered during pre-

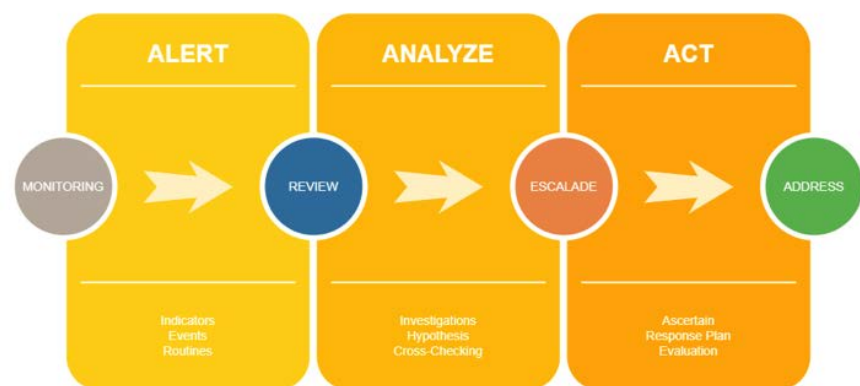


Figure 1. Operationalization of Early Warning and Health Emergency Surveillance Technologies with the Triple-A' Approach.

implementation assessment missions, some are the result of unspoken or personal conceptions (Figure 2).

Addressing these challenges diplomatically and tactfully is a whole part of the intervention that will need to be addressed with due regard for the cultural sensitivity of the recipients. These challenges are classified into six major groups, namely:

- i. Structural (Undefined mandate): The absence of a clearly designated entity responsible for the infrastructure of alert and surveillance of health events throughout the territory has resulted in a vacuum often characterized by uncontrolled interventions.
- ii. Hardware (Lack of infrastructure): The lack of adequate computer equipment for the effective implementation of the system has led to the use of online services, despite the considerable economic costs and the integrity of the health information.
- iii. Physical (Inadequate setting): Need to establish an adequate, stable and resilient environment in terms of energy and connectivity for the proper functioning of the technological infrastructure.
- iv. Documentation (Sustainability of Efforts): Non-existent documentation of IT systems in use within public entities. As this documentation is highly crucial for targeted interventions, it is very often necessary to study the existing systems in detail to identify the levers

for possible interoperability between systems.

- v. Capacity (Upgrading): There is a real need to strengthen, through training sessions and skills transfer, the technicians of the Public Authorities in the management and daily operation of the infrastructure.
- vi. Security (Need for formalization): Lack of procedures and mechanisms for computer security in terms of granting access to the system, monitoring security, and managing internal and external interventions.

Faced with all these challenges, inherent to the nature of the host environment, which is in full mutation with low- and middle-income countries that tend to improve the daily life of their populations and to offer them a greater well-being, mitigation techniques must be developed and deployed in a proactive and inclusive spirit for a greater impact.

Conclusions

Recent improvements in ICT-based health systems have resulted in the use of digital means to assist in such crucial surveillance activities. As joint activities can achieve greater coherence in supporting national and regional priorities in terms of early warning systems and surveillance of health emergencies, our proposal aims to pool energies in order to allow public

authorities to take greater ownership of the intervention and the results generated.

Thus, from the outset, a common work plan must be established in consultation with all stakeholders around the goals and objectives related to the deployment and operationalization of this new technology. This approach will need to follow the following four guiding principles (SNCT):

- i. Standardization: The implementation of the project must be able to capitalize on the efforts made to date in strengthening the system in response to health events. The use of a single platform should ensure the harmonization of interventions for greater efficiency.
- ii. Nationalization: The use of the platform thus produced should not be limited to the most developed regions but should also take into account the rural areas which are most often neglected in the realization of this kind of interventions. In real time, the Authorities will be able to inform themselves of the state of health of the populations and deploy their policies based solely on the data.
- iii. Capability: Through a transfer of skills deployed on all the components of the infrastructure, the technicians of the Public Authorities must be able to operate all the necessary technical tasks. This serves as a bridge to the last guiding principle of the SNCT.
- iv. Transferability: The use of this tool by governments should be applicable across all sectors with the same need. The implementation of this program will establish the basis for technology transferability to other structures that express the need, this time by the agents who have benefited from the transfer of skills throughout the execution of the project.

While detecting outbreaks may appear as the primary goal of such technology, it appears relevant to emphasize its importance to tackle silent pandemics such as Gender-Based Violence which has seen a spike during lockdown periods across the World and most especially in Low-Middle Income Countries. The simplicity of monitoring and effectiveness of response should be prioritized in countries with low public health system capability.

Our proposal, which is based on the various interventions we carried out in recent years on behalf of Governments, Intergovernmental Organizations, and Non-Governmental Organizations aims to facilitate interventions regarding the establishment of Early Warning and Health Emergency Surveillance Technologies in low and middle-income countries.

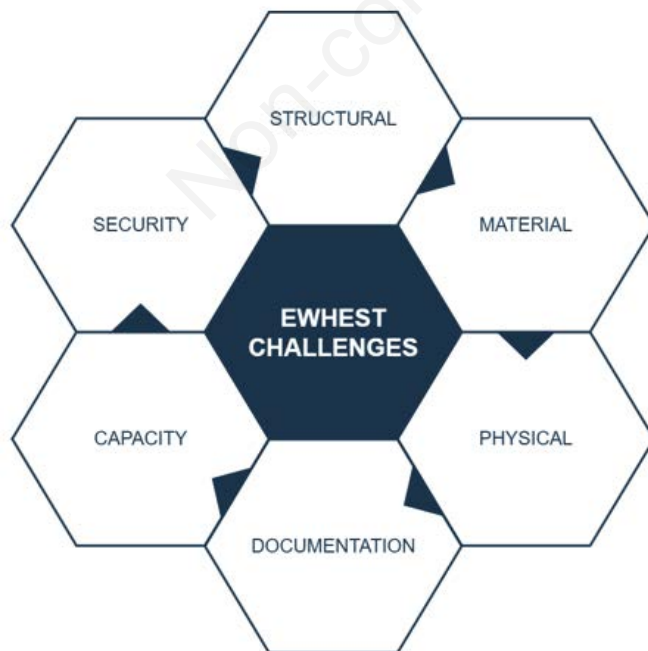


Figure 2. Challenges Faced When Deploying Early Warning and Health Emergency Surveillance Technologies in Low-Middle Income Countries.

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