

IDSR AS A PLATFORM FOR IMPLEMENTING IHR IN AFRICAN COUNTRIES

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Of the 46 countries in the World Health Organization (WHO) African region (AFRO), 43 are implementing Integrated Disease Surveillance and Response (IDSR) guidelines to improve their abilities to detect, confirm, and respond to high-priority communicable and noncommunicable diseases. IDSR provides a framework for strengthening the surveillance, response, and laboratory core capacities required by the revised International Health Regulations [IHR (2005)]. In turn, IHR obligations can serve as a driving force to sustain national commitments to IDSR strategies. The ability to report potential public health events of international concern according to IHR (2005) relies on early warning systems founded in national surveillance capacities. Public health events reported through IDSR to the WHO Emergency Management System in Africa illustrate the growing capacities in African countries to detect, assess, and report infectious and noninfectious threats to public health. The IHR (2005) provide an opportunity to continue strengthening national IDSR systems so they can characterize outbreaks and respond to public health events in the region.

THE INTERNATIONAL HEALTH REGULATIONS (IHR) (2005) target infectious and noninfectious health threats to national and international public health security and trade. According to the IHR (2005), countries should be able to detect, assess, and respond to all events that may constitute public health emergencies of international concern (PHEICs) and report them to the World Health Organization (WHO).¹

Rather than requiring countries to report to WHO on a fixed list of notifiable diseases or conditions, countries use a decision instrument (Annex 2 of the IHR) that describes 4 situational criteria for assessing whether an event requires notification to national and international authorities. The situational criteria assess whether the public health impact

of the event is serious, whether it is unusual or unexpected, whether there is significant potential for international transmission, and whether there is any significant risk of international travel or trade restriction. If national decision makers determine that an event meets at least 2 of these criteria, the national focal point for IHR notifies WHO and participates with WHO in further assessment of the event.

For a country to report a PHEIC, its national public health surveillance and response system should be able to function as an early warning system capable of detecting, confirming, and responding to epidemic-prone diseases and other public health emergencies.² As a result, Annex 1 of the IHR (2005) includes the core capacity requirements for surveillance and response functions at each level of the health system.¹

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The emphasis on functional outcomes encompassed in the IHR (2005) agreement allows countries flexibility in determining how best to meet their IHR (2005) obligations within the context of existing systems and resources. Thus, rather than requiring countries to create a new system, the IHR guides countries in meeting the core capacity requirements through strengthening existing surveillance systems.³ In the African region, Integrated Disease Surveillance and Response (IDSR), a WHO-AFRO strategy for improving national public health surveillance and response capacities, is an existing opportunity for implementation of IHR core capacities.

ACHIEVING IHR PRIORITIES THROUGH IDSR

In the mid-1990s, several countries across the WHO African Region (WHO-AFRO) experienced a series of devastating outbreaks due to emerging and reemerging pathogens that cause yellow fever, cholera, meningococcal meningitis, and Ebola and Marburg hemorrhagic fevers.⁴⁻⁶ These outbreaks resulted in a high number of cases and deaths and risked cross-border transmission. Consequently, ministries of health asked WHO-AFRO and their partners to develop strategies that would allow countries to detect and confirm these largely preventable diseases in time to do something about them and to strengthen surveillance capacities at each level of national health systems. In 1998, the member states of the WHO Regional Committee for Africa adopted the Integrated Disease Surveillance strategy (later expanded to Integrated Disease Surveillance and Response, or IDSR).⁷ The IDSR strategy aims to develop and implement comprehensive surveillance and response systems that meet African priorities. The vision of the strategy is to improve the use of data at community, health facility, district, and national levels, resulting in more timely detection of and response to the communicable and noncommunicable diseases that are the leading causes of illness, death, and disability in African countries.

The IDSR strategy initially focused on integrating the guidance and requirements for collecting, analyzing, and reporting data on 19 priority diseases at the district level, aiming to reduce the inefficiencies caused in many countries by parallel disease-specific surveillance programs. A generic matrix of activities and tasks (incorporating the disease-specific recommendations for these 19 diseases) required to fulfill each function of surveillance at each level of the health system became the planning framework for developing IDSR materials, tools, and approaches.⁸ WHO-AFRO suggested a systematic approach to implementing the IDSR strategy, beginning with a national assessment of disease surveillance and response systems, development of an action plan, and adaptation of guidance materials, followed by training, implementation from the central to the community level, and monitoring and evaluation.⁹ To support implementation of the strategy, WHO-AFRO

developed IDSR technical guidelines and training materials to assist health personnel in member states in building capacities for early detection and timely responses to major public health events.⁸

For the past decade, IDSR has been the framework used in 43 of the 46 countries in the WHO African region to enhance surveillance for priority public health diseases, conditions, and events. These include epidemic-prone diseases requiring immediate reporting, such as viral hemorrhagic fevers, cholera, suspected pandemic influenza, and meningococcal meningitis. Also included are diseases targeted for elimination or eradication (eg, measles, poliovirus, and dracunculiasis) and endemic diseases that cause outbreaks among vulnerable populations, including malaria, tuberculosis, and HIV/AIDS. Each national IDSR strategy defines its disease priorities, administrative processes, key actors, and nongovernmental partners. In the WHO-AFRO region, public and private sectors have developed national disease reporting systems using the IDSR framework to report priority diseases and unknown events in their geographic areas. The private sector (eg, nongovernmental and faith-based organizations and commercial providers) works with the public sector at local and intermediate levels of government by contributing to coordination of response actions, adaptation of tools, and training of health staff.

Enhanced surveillance for meningococcal meningitis provides an example of how countries employ IDSR recommendations and skills to detect, confirm, notify, and respond to a priority disease. Meningococcal meningitis has a long history of afflicting communities in the “meningitis belt” of Africa, an area that extends across the continent from Senegal to Ethiopia and is expanding. Because of the heavy burden of disease, complicated by shifting subtypes, affected countries conduct enhanced surveillance for meningitis as a priority disease in the context of IDSR. Adaptation of the IDSR guidance to meet the national context ensures that standards for surveillance tools and processes comply with recommendations for meningitis control and response. This involves the systematic weekly collection, compilation, and analysis of epidemiologic data. The enhanced surveillance is supported by the adequate collection, transportation, and analysis of laboratory specimens using standard operating procedures (SOPs) elaborated in the IDSR technical guidelines and WHO disease-specific materials. Countries use standard case definitions, and all suspected cases are recorded. Reporting forms are sent weekly to district and national levels, and countries are encouraged to collect data to monitor and evaluate the performance of surveillance functions (eg, timeliness of reporting summary and case-based data to the next level of the health system, trend analysis, etc) and laboratory functions (eg, timeliness of reporting, adequacy of specimens transported to a referral laboratory, reliability of results, and quality control/quality assurance measures). Cerebral spinal fluid (CSF) samples are drawn from suspected cases for identification of the causative pathogens and subtypes.

At the district level, weekly trends in cases are monitored against alert and action thresholds, which are predetermined based on attack rates in a given population. For example, for populations between 30,000 and 100,000, an alert threshold is reached at an attack rate of 5 cases per 100,000 inhabitants per week; an epidemic threshold is reached at 15 cases per 100,000 inhabitants per week. Exceeding an alert threshold triggers specific actions for additional investigation, assessment, and outbreak response. When the epidemic threshold is reached, a meningitis epidemic is declared, and additional actions are taken. Results from the subtyping of the causative pathogen and antibiotic sensitivity testing influence the choice of vaccine deployed in the epidemic district and the appropriate antibiotic treatment according to national protocols. Throughout the outbreak, antibiotic sensitivity patterns are monitored weekly.

Weekly district monitoring data is compiled at the national level and shared with stakeholders within and outside the countries. For example, in the first 24 weeks of 2011, 13 countries that participated in enhanced surveillance for meningococcal meningitis reported a total of 18,214 cases and 1,600 deaths (Table 1). The case fatality ratios (CFR) ranged from 3.9% (Mali) to 28.4% (Côte d'Ivoire), with a mean CFR of 8.8%. During this time period, 50 districts in the affected countries reached the alert threshold, while 43 additional districts reached the epidemic threshold. In all, 96.6% of the districts in 13 countries reported their data as recommended by IDSR guidance.

Despite excellent reporting across the affected countries, the meningitis CFR during some outbreaks exceeded 10%. Standard operating procedures for meningitis control and prevention recommend a target CFR of less than 10%.¹⁰ Table 1 includes 2 of the relevant performance indicators recommended for monitoring IDSR performance at the country level. The range of results for completeness of reporting reflects the variation in capacities across different countries. The reported case fatality ratios also serve as a proxy indicator for the efficacy of health systems' performance, revealing the challenges that national programs face in mounting an effective response through mobilizing communities and health systems for early treatment. Although IDSR results have been mixed across the region, the example of countries in the meningitis belt suggests that progress in improving core capacities is possible with commitment to shared objectives and resources from all stakeholders for improved public health surveillance.

IDSR AS A PLATFORM FOR IMPLEMENTING IHR

The IHR (2005) core capacities requirements and the IDSR framework share common goals (Figure 1). Both focus on improving systems for timely response to acute public health events through early detection, confirmation (verification), notification (reporting), and response.

Table 1. Cumulative weekly monitoring for meningococcal meningitis in 13 countries: weeks 1 through 24, 2011.

<i>Country</i>	<i>Cases</i>	<i>Deaths</i>	<i>CFR (%)</i>	<i>Districts in Alert Phase</i>	<i>Districts in Epidemic Phase</i>	<i>Reported Weeks</i>	<i>Completeness in Reporting (% districts)</i>
Benin	158	34	21.5	0	0	01-24	100.0
Burkina Faso	2,745	468	17.0	5	2	01-24	100.0
Cameroun	2,426	154	6.3	2	10	01-21	68.8
Centrafrique	264	34	12.9	1	2	01-17	100.0
Côte d'Ivoire	74	21	28.4	0	0	01-24	100.0
Ethiopia	229	9	3.9	0	0	01-22	No data
Ghana	533	55	10.3	7	1	01-24	97.1
Mali	309	12	3.9	0	0	01-24	100.0
Niger	1,134	131	11.6	2	0	01-24	100.0
Nigeria	713	41	5.8	0	1	01-23	100.0
RD Congo	3,532	348	9.9	22	10	01-20	31.7
Tchad	5,796	257	4.4	9	17	01-24	100.0
Togo	301	36	12.0	2	0	01-24	100.0
Total	18,214	1,600	8.8	50	43	01-24	96.6

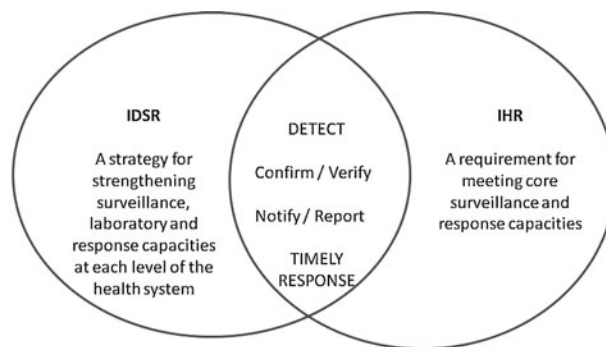


Figure 1. Implementing IHR Through IDSR

Consequently, member states in the WHO African region declared that IHR (2005) would be implemented through the existing IDSR strategy.¹¹

In response to this declaration from the member states, WHO-AFRO and the US Centers for Disease Control and Prevention (CDC) revised the IDSR Technical Guidelines in 2010 to reflect IHR requirements at the operational level. The revision expanded the list of priority diseases, syndromes, and conditions to include diseases or events of international concern and updated disease-specific guidance for the new diseases or events. The guidelines take into account recommended tools and approaches from the IHR (2005) to augment early warning capabilities in national surveillance systems and to address not only infectious diseases but other threats to public health. This includes a foundation for event-based surveillance. For example, the revised guidelines encourage countries to require health facilities to record rumors in a formal log and investigate them as warranted, to consider sources of information outside the clinical and human public health sectors in district-level surveillance, and to expand community-based surveillance.²

WHO-AFRO and CDC then revised the IDSR training modules for district health teams to assist health staff with implementation of the updated IDSR recommendations and guidelines. To ensure the relevance and acceptability of the training modules, the modules were pilot-tested in Uganda in May 2011. Ministry of health personnel from the central epidemiology unit and 6 district health management teams participated. The teams were composed of district health officers, health information managers, surveillance officers, laboratory focal points, environmental health officers, and district health nurses. Observations from the pilot test were used to finalize the program. Subsequently, the modules were translated into French and Portuguese. By December 2011, 8 countries—Central Africa Republic, Cameroun, Guinea, Democratic Republic of Congo, Kenya, Uganda, Tanzania, and Zimbabwe—had adapted the training materials to their respective national contexts. Six of these countries conducted national-level training of trainers on IDSR with the revised materials.

The training modules focus on strengthening the skills and knowledge of health staff at each level of the health system to identify and report cases and deaths (using standardized case definitions), analyze data, investigate and respond to outbreaks, prepare for outbreaks in advance, monitor the quality and performance of the surveillance system, and provide feedback to health staff and the community about analyzed results and any public health actions that followed. The modules emphasize practical skills required for clinical and public health surveillance, and the skills that laboratory workers need to support the IDSR/IHR core surveillance and response functions, from analysis and reporting of epidemiologic data to scenario-based exercises in processes such as case-based reporting and using the IHR decision instrument to determine whether a disease, event, or condition constitutes a potential PHEIC.²

IDSR, IHR, AND EARLY WARNING OF EVENTS

With implementation of this updated IDSR strategy, a case of a potential PHEIC may require immediate notification to WHO through the country's early warning system. An early warning system is a timely national surveillance system that collects information on public health conditions and events of national or international concern and uses the information to trigger a prompt public health intervention. This information should be transmitted by the fastest means possible from the community or health facility level to the national level, where the IHR national focal point (NFP) is notified. The IHR NFP initiates the national process for assessing the event, according to the situational criteria detailed in the IHR (2005), and for reporting the event to WHO.

To support this requirement, WHO-AFRO enhanced its connection to national public health surveillance systems, serving as the region's early warning system through WHO's event management system (EMS). The EMS is a web-based WHO public health intelligence system aimed at detection, verification, assessment, and response operations for acute threats to public health security.¹² EMS supports management of all types of acute public health events that have the potential to affect international public health and may require coordinated, complex responses. Information from official country reports, media, rumors, and other sources is entered into the EMS by trained users at all levels of WHO. In the case of reports from sources other than an official report, WHO issues a request for verification of the event to the affected country. The public health risk is assessed, and the event is classified by national IHR focal points and onsite partners. When an event is verified, information including response is regularly updated in the EMS and can be accessed by all users in real time.

In essence, the early warning system is a country's capacity for early detection of an acute event through its

national disease surveillance and response system, while EMS is a WHO information tool for managing outbreak data and notification. Once a decision has been made at the national level to report an event to WHO, the WHO country office enters data into the EMS, informing the regional response coordination at the WHO-AFRO level.

Evaluating the events reported through EMS throughout the course of a calendar year illustrates the national capacities for event detection and reporting under the IDSR/IHR frameworks. In 2011, a total of 103 public health events were reported to WHO-AFRO from 33 countries in the WHO African region, 32 of which had adopted IDSR (Figure 2). Eighty-four percent of the reported events were due to infectious diseases. Events of zoonotic origin such as anthrax and noninfectious events such as chemical poisoning, humanitarian disasters, and nutritional deficiencies were also reported to WHO. Five reported events were classified as undetermined. One undetermined event (acute neurological syndrome) resolved before confirmation; 3 events were discarded after a thorough investigation (suspected viral hemorrhagic fever, beri beri, and a burst oil pipeline with burns); and 1 event is still under investigation (new cases of nodding disease syndrome in additional districts in Uganda).

Humanitarian disasters were reported to the EMS from Kenya, Mali, Republic of Congo, and Benin. Countries in the Horn of Africa, including Kenya, experienced severe

drought resulting in famine, subsequent severe malnutrition, and population displacement into camps. An encamped population later experienced a cholera outbreak.

A zoonotic event with cases of anthrax confirmed in humans who had consumed or had contact with meat from hippos infected with *Bacillus anthracis* exemplifies how early warnings of events detected through national IDSR capacities are linked to WHO's EMS. In late August 2011, health facilities in Chama district, Zambia, noted an increasing number of patients presenting with skin lesions. These patients reported eating or touching meat from hippos that had died from unknown causes. Health staff reported suspected cutaneous anthrax to the district using the case definition provided in the IDSR guidelines. Within 2 days of the notification, the district's multisectoral response team began investigating the outbreak in the affected areas. (In the context of IDSR/IHR, multisectoral rapid response teams can include public and private sector health actors from various clinical, public health, and laboratory disciplines, as well as animal health and/or environmental health personnel or other specialists, depending on the type of public health event and the risk assessment.) The team identified additional cutaneous anthrax cases. They also found many unusual animal deaths in hippos, elephant, baboon, and kudus. All cases were recorded and blood samples taken for laboratory confirmation.

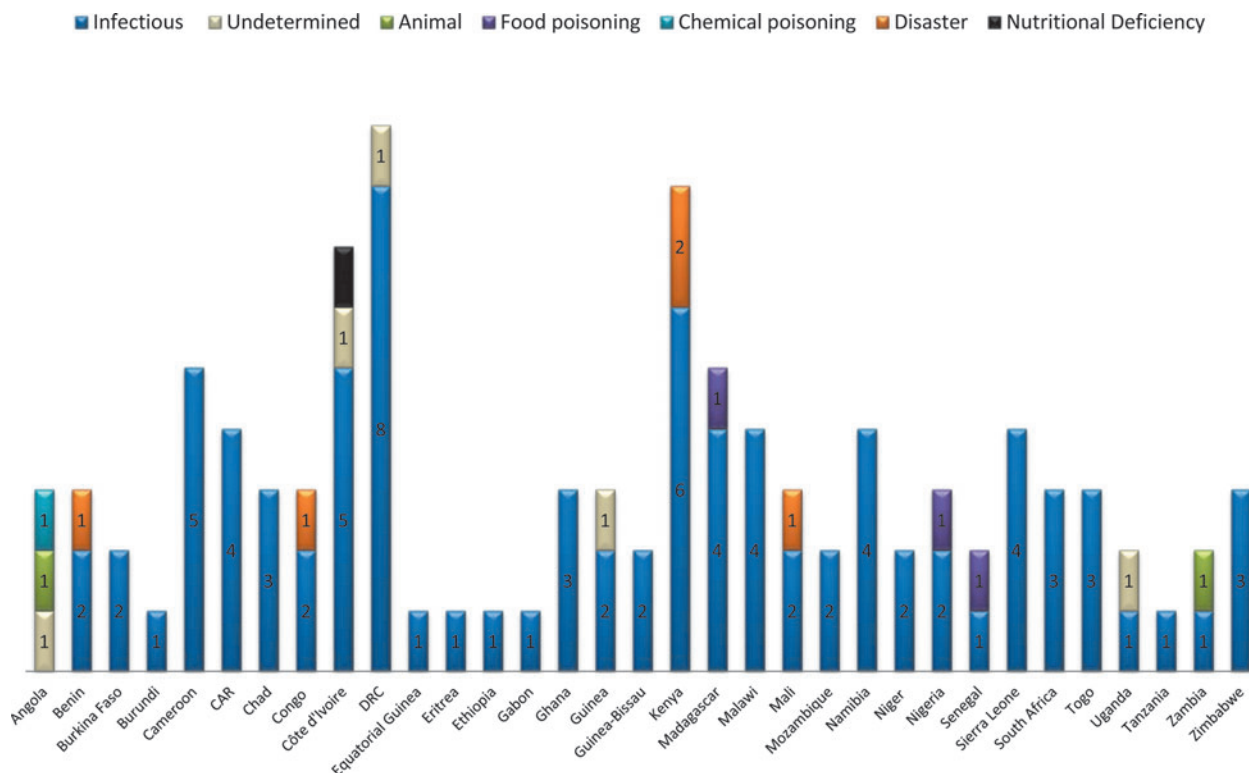


Figure 2. Number and Type of Acute Public Health Events Reported in WHO African Region, January-December 2011 ($n=103$). Color images available online at www.liebertpub.com/bsp

The epidemic was reported in the first week of September to the ministry of health and was also reported to the WHO country office, which alerted the WHO regional response coordination unit to assist in supporting the response. A national rapid response team was assembled and deployed the following week to provide additional support for further investigation and response. Response efforts included active case finding, confiscation of infected meat from households, finding and disposal of carcasses, and intensive health education to discourage touching or consuming meat from animals in the area whose cause of death is unknown. In total, there were 511 suspected cases reported, including 5 deaths, with the last case seen on September 29, 2011. Eighty-one hippo deaths were also reported during the course of this outbreak.

Ideally, as recommended in the IDSR guidelines, a response to stop disease transmission should be mounted within 48 hours. Although the surveillance systems in this outbreak, both human and animal, were able to alert authorities to a suspected outbreak on time and trigger the recommended investigation, this event points to logistical, social, and geographic challenges in carrying out a complex response in a resource-limited area. For example, the outbreak occurred in a remote area of a national park with limited road access. Locating and destroying (through burning and burial) the large number of infected hippo carcasses that were spread over a wide geographic area involved the use of heavy earth-moving equipment. In spite of best efforts for intensive health education, it took time for the community to be convinced of the disease transmission risks associated with touching or consuming the infected hippo meat.

Based on this experience, follow-up actions to prevent or limit future outbreaks of anthrax in the area included the involvement of stakeholders and opinion leaders in ongoing activities to educate the community about the risk of transmission associated with this disease. However, challenges remain for enhancing the efficiency of early warning, particularly in rural areas. On one hand, the increasing use of SMS and ubiquitous cell phone coverage presents potential for rapid communication about acute public health events. On the other hand, members of remote communities may simply not know when to report an event. Implementation of the community component of IDSR remains limited. More significantly, rapid notification may still not ensure a rapid response, which requires complicated actions depending on technical, logistical, and financial resources.

CONCLUSIONS

Both IDSR and IHR (2005) highlight global and regional priorities for more timely detection, reporting, verification, and response to public health events. The specific objectives of IDSR are to strengthen, coordinate, and streamline

multiple disease surveillance activities to achieve an integrated, comprehensive public health surveillance system that serves all public health priorities at each level of the health system. IDSR focuses on priority diseases, syndromes, and conditions that afflict African communities. It also emphasizes the use of data for action. IHR (2005) expands the priority events for national surveillance from specific infectious and zoonotic diseases to include public health risks such as food safety, chemical, and radionuclear events. With the focus on core capacity requirements in the IHR (2005), attention to strengthening national IDSR systems is a priority for ensuring that countries can effectively characterize and promptly respond to emergent and existing threats in African countries. As well, IDSR not only meets national and local priorities but also offers a practical infrastructure for implementing IHR (2005) core capacities and for allowing IHR-relevant surveillance, response, and laboratory capacities to be measured through performance-based indicators.

The ability of countries to report a range of disease and nondisease health events as seen in the WHO EMS suggests an increasing early warning capacity in African countries. There are also examples of cooperation between human and animal surveillance activities to inform future improvements in other countries. At the same time, the EMS results point to socioeconomic, behavioral, geographic, and logistical challenges that countries face in mounting timely and effective responses. Improving these response capacities is possible through targeted planning based on the shared goals of the IDSR framework and the IHR (2005) core capacity requirements. Meeting IHR (2005) fully through implementation of IDSR will contribute to the reduction of illness, death, and disability in African countries.

The experience of implementing IDSR in the WHO African region has also helped inform the development of similar strategies by countries in WHO's Eastern Mediterranean and Southeast Asian regions.^{13,14} IDSR was instrumental in deliberating the IHR monitoring and evaluation indicators and thus has global impact and could continue to be a source of lessons learned for countries seeking systems approaches to developing and sustaining the capacities to detect, assess, report, and respond to public health events under the revised IHR.

ACKNOWLEDGMENTS

The authors gratefully acknowledge Mary Harvey and the United States Agency for International Development for supporting the technical collaboration between WHO-AFRO and CDC to improve disease surveillance and response in the African region. JF and RK received funding for work on IHR implementation in the WHO-AFRO region from the US Defense Threat Reduction Agency, the US Department of State, and the US Centers for Disease Control and Prevention. We would like to sincerely

acknowledge Dr. Robert Fontaine for his comments on early versions of this article.

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Manuscript received March 21, 2013;

accepted for publication June 6, 2013.

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