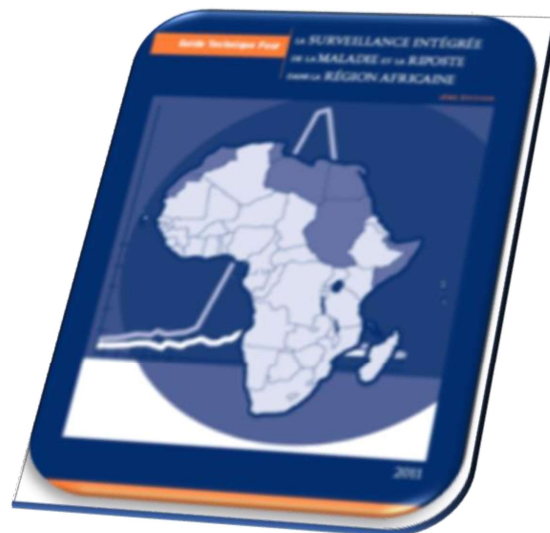


INTEGRATED DISEASE SURVEILLANCE AND RESPONSE TECHNICAL GUIDELINES

THIRD EDITION



MODULE 9: ELECTRONIC INTEGRATED DISEASE SURVEILLANCE AND RESPONSE (eIDSR)

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9. ELECTRONIC IDSR (EIDSR)

Electronic IDSR (eIDSR) is the application of electronic tools to principles of IDSR to facilitate prevention, prediction, detection, reporting and response. It is based on:

- a) standardized interoperable and interconnected information systems administered within the national context; and
- b) rapid collection, analysis, reporting and use of disease/events data in real time for appropriate public health action.

Using paper-based tools for implementation of IDSR has been an instrumental strategy for strengthening public health surveillance in the African Region since IDSR was adopted in 1998. With the adoption of the International Health Regulations IHR (2005), which requires countries to strengthen capacity for disease surveillance and response, application of electronic tools to enhance real-time surveillance can improve timeliness of outbreak detection.

In recent years, technological and analytical innovations have emerged as an approach which can be used to facilitate rapid transmission of public health surveillance information, thus aiding timely detection of and response to outbreaks and other public health events. Application of e-tools in the health sector has the potential to provide real-time validated data for public health surveillance, investigation and prompt outbreak response. eIDSR provides new opportunities for accelerating achievement of the IHR (2005) core capacities.

9.1 eIDSR in the context of HMIS Health Management

Health Management Information Systems (HMIS) are used by countries to facilitate routine collection of data to support planning, management and decision-making in health service provision. HMIS routinely collect data about diseases, events and conditions, as well as other administrative and service-provision data. The primary source of these data is the health facility outpatient (OPD) or inpatient (IPD) register. The most widely used electronic platform of HMIS is DHIS2. It is used in low- and middle-income countries. In Africa, it has coverage of more than 30 countries.

In both HMIS and eIDSR, source data are derived from health facility OPD or IPD registers. eIDSR is an enabling platform for reporting in real time for IDSR priority diseases. In the eIDSR

platform, there is an active and timely means of collecting data on IDSR priority diseases, and conditions which are extracted from either OPD or IPD registers, including patients' folders, and they are reported immediately, weekly or monthly.

9.2 eIDSR in the context of eHealth

In 2013, the African Region adopted an eHealth resolution (AFR/RC60/R3) to address the use of Information and Communication Technologies (ICT) for health and health-related fields, including disease surveillance. Recommended actions of the resolution included development of national policies, strategies, norms and appropriate governance mechanisms resulting in long-term strategic plans and frameworks for eHealth capacities in countries. eHealth encompasses a range of services and systems, including:

- (a) health and medical informatics;
- (b) tele-health, which means transmission of health-related services or information over the telecommunications infrastructure;
- (c) e-learning which means using technologies to access education outside of the traditional classroom; and
- (d) m-health, which is a general term for use of mobile phone and other wireless technologies in medical health.

Member States echoed the same sentiment in the recent Seventy-first World Health Assembly, and unanimously agreed that digital health solutions should complement and enhance existing health service delivery models. Subsequently, they adopted the new resolution on Digital health, which underscores the importance of nationally-supported digital health strategies, supporting and investing in the digital health enabling environment (including policy, standards, capacity, interoperability, privacy and security, and more), and transitioning to sustainability and government ownership.

Digital health, which is sometimes called eHealth, provides cost-effective and secure use of ICTs in health and health-related fields. Digital health, as defined by the Broadband Commission for Sustainable Development, is an umbrella term that encompasses all concepts and activities at the intersection of health and information and communications technologies (ICTs). This includes delivery of health information, using ICTs to improve public health services, and using health information systems to capture, store, manage or transmit information on patient health or health facility activities. ICTs are defined as tools that facilitate communication, and processing and transmission of information by electronic means, and these encompass a full range of tools like radio and television to telephones (fixed and mobile), computers, and the Internet.

eIDSR, which is part of eHealth, is one of the essential innovations for implementation of recommendations of the WHO Regional Committee for Africa on use of information

technology, which is core in achieving IHR (2005) requirements by countries. Standardization of electronic tools, and sustained infrastructure across the Region will promote easy generation and sharing of country and regional profiles of priority diseases, conditions and events.

9.3 Rationale of eIDSR

Limitations of the current approaches to IDSR data collection and transmission are attributed to the fact that many countries still use manual procedures and paper-based methods to collect and transmit data. Submitting and transmitting data on time is a challenge, as health workers have to travel long distances on difficult terrains to submit their files. This leads to delays in getting information on time for action, especially in the event of a suspected outbreak.

The eIDSR system aims to facilitate the work of every staff member in a health system, by improving disease surveillance using electronic tools, and hence strengthening surveillance and response capacities, while, in the long term reducing morbidity and mortality due to epidemic-prone diseases as well as other public health events.

eIDSR is thus likely to improve the following:

- (a) Timeliness and completeness of reporting
- (b) Early detection, investigation, and response to outbreak or public health events
- (c) Manual data entry that is prone to errors
- (d) Systematic information sharing across levels and sectors
- (e) Combining data streams
- (f) Data use, analysis, analytics

Recently, there have been various supporting initiatives and resolutions, regionally and globally, which have recognized the potential of digital technologies to advance the Sustainable Development Goals (SDGs), and particularly to support health systems in all countries in health promotion and disease prevention. The eIDSR is, hence, developed to reflect the following recently adopted overarching frameworks:

- (a) Integrated Disease Surveillance and Response ((AFR/RC/48.8)
- (b) IHR (2005)_(WHA58.3)
- (c) Regional Strategy for Health Security and emergencies strategy (AFRO/RC66/6)
- (d) eHealth resolution and decision (WHA58.28)
- (e) Digital health (WHA71.7)

9.4 Benefits of eIDSR

The eIDSR provides real-time information for immediate action. Potential benefits of eIDSR include:

(a) Early alert and detection

With eIDSR, the speed of outbreak detection can be improved, as information may be more rapidly captured, and in some cases, the time and place of an outbreak can be predicted with varying degrees of accuracy, thus enabling opportunities for prevention and control (*Refer to a study done by CDC. 2008b. Potential effects of electronic laboratory reporting on improving timeliness of infectious disease notification—Florida, 2002–2006. Morbidity and Mortality Weekly Report 57(49):1325–1328.*
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5749a2.htm>)

(b) Timely reporting

eIDSR tools allow rapid and timely transmission of data from lower primary reporting units to subsequent higher levels to enable appropriate public health action

(c) Standardization of data

Standardization of tools in the eIDSR system enables data collection to be more consistent and complete for ease of data exchange and comparison across health facilities.

(d) Better data transmission and management including storage

- (i) A major challenge of paper-based data is a need to compile reports from various sources and provide reports to higher level offices at regular intervals and to different administrative levels. Moreover, data storage and transport can be difficult, and there is a risk of data damage and loss.
- (ii) With eIDSR there is faster data transmission, and moreover, data are also organized into a format that is more accessible for use and interpretation.

(e) Interoperability and sharing of data

eIDSR provides an opportunity for exchange and use of information across entities, especially if standards and workflow have been well developed for the eIDSR system to allow interoperability with other information systems.

(f) Automated transmission, analyses and improved quality data

- (i) Paper-based reporting runs the risk of omitting valuable information when reporting to higher administrative levels.
- (ii) eIDSR reduces the number of data entry errors and facilitates automated data analysis, thus saving considerable effort for health staff.

(g) Ultimate contribution towards good response, better monitoring and evaluation

eIDSR provides a platform for data storage and automatic analysis across health facilities for better monitoring and evaluation of various public health interventions.

(Studies done by Valenciano et al, 2003 and 2003; Pinto et al 2005 which demonstrated that the simple advance of a computerized reporting system using country-identified thresholds for priority diseases did show improvements in monitoring trends and predicting outbreaks in a matter of weeks post-implementation)

(h) Cost reduction

eIDSR makes for early detection of disease outbreaks, which in effect, can contribute to overall reduction of high costs associated with management of these outbreaks.

9.5 Key guiding principles in establishing eIDSR

The following are key guiding principles for establishing eIDSR:

- (a) Use of existing infrastructure:** As much as practicable, eIDSR should be built on existing framework and systems, such as paper-based IDSR, HMIS, DHIS2, etc. This enables easy adaptability by implementers, and promotes smooth transitions. In the event infrastructure already exists, eIDSR introduction may possibly not require major customization, which might be costly.
- (b) Standardization:** Standardization of data and electronic tools will promote uniformity in data collection and aggregation. Standardization promotes comparison between various levels of the health systems, and between countries.
- (c) Integration:** IDSR is built on the premise of integration, and so eIDSR should be implemented in the spirit of integration. This could entail integration of various data sources and information systems from other health programmes (e.g. malaria, EPI, cancer registry, noncommunicable diseases etc.) into a common platform or data warehouse.
- (d) Interoperability:** It is the ability of different health information systems to work together within and across organizational boundaries to exchange data and use information that has been exchanged. It is important for standards and workflow that eIDSR developers put together to be easily interoperable with other information systems.
- (e) Multisectoral collaboration:** It is essential to collaborate with stakeholders, such as telecom companies. Such collaboration could be in the form of waivers, corporate social responsibility, and partial tax holidays etc. Effective collaboration could accelerate eIDSR roll-out and coverage. Collaboration with other sectors like animal and environment is also key, as this will facilitate efficient utilization of scarce resources, effective and prompt leveraging of various sector capabilities for better disease prevention and control.

- (f) **Near real-time approach:** Every effort should be made to ensure provision of near real-time transfer of information about events incorporated into the design and implementation of eIDSR. This should be a long-term goal and countries will have to start slowly with planning and developing in phases.
- (g) **One Health:** The One Health approach offers an innovative approach where various disciplines work together to address health at the human-animal-environment interface. In view of the fact that majority of emerging and re-emerging infections are often zoonosis, and responsible for large outbreaks in recent times, maintaining a focus on diseases that affect both humans and animals is a worthwhile investment.
- (h) **Data security:** Protection of health information is essential in every health information system. Security of data will ensure that information is only accessible by authorized personnel, who need to take action. It also promotes ethical handling of data. Caution should be taken to ensure there are processes for patient privacy.
- (i) **User-friendly system:** The system should ideally be simple enough to be used by staff at all levels. It should be easy to log on, input and receive information. The system should also be flexible to adapt to change of disease and event profiles over time.

9.6 eIDSR development and implementation Process

Developing an eIDSR system should be planned carefully, with all relevant stakeholders getting involved. The system should fit capabilities and needs of the country, and a plan for securing resources should be developed prior to initiating eIDSR.

The most important considerations for the process of developing and implementing eIDSR are shown below. Depending on the country, more considerations may need to be made. Countries need also to ensure that they are ready to embark on eIDSR, by weighing the costs and benefits and also assessing eIDSR feasibility options in their country.

9.6.1 Process for establishing eIDSR

(a) Engage stakeholders and establish technical working group

- (i) The success of eIDSR requires an effective engagement of all relevant stakeholders.
- (ii) When initiating an eIDSR system, the surveillance group should engage with the department that handles the health information system. These two departments should bring together all relevant stakeholders in the country to develop a technical working group required for coordinating eIDSR implementation. Potential members of this technical working group (TWG) could include national telecommunications; ministries responsible for information, communication and technology; laboratory personnel; a clinician; representatives of other relevant ministries and institutions; national public health informatics experts; mobile

phone companies; internet companies, and partners. Composition of the TWG will depend on the context of a given country. This body should also assume the role of resource mobilization.

- (iii) eIDSR may need to leverage ICT capacity provided by other line ministries, especially ministries with oversight of ICT. Ministries of health should seek ways to engage with ministries in charge of ICT to ensure there is appropriate ICT coverage and governance of eHealth.

(b) Assess country IDSR functionality

IDSR functionality needs to be assessed at all levels, including political commitment to use ICT as a pivot of development and social transformation. The ministry of health needs to make electronic disease surveillance a priority, and establish an epidemics and infectious diseases (EID) division to follow up on implementation of disease surveillance activities. Appointing a disease surveillance focal point at district level is a key point in the success of eIDSR implementation.

(c) Determine country capabilities and needs

- (i) A crucial step in the development of an electronic system is to assess capabilities and infrastructure needs of the country. The eIDSR technical working group or a similar TWG, which oversees surveillance activities, should carefully consider capabilities and infrastructure and resources against country needs with regard to their surveillance system. WHO has developed a standardized eSurveillance assessment tool, which may also be used as a resource tool.
- (ii) Network coverage
 - Assessing network capability of a country is a critical step in determining the type of system that can be developed. Internet and mobile network coverage is a key component to consider.
 - Internet: number of providers; cost of subscription; internet speed; internet coverage in all areas of the country; national level connectivity; and district level connectivity.
 - Mobile: number of providers; cost of text messaging; cost of phone calls; provider coverage in all areas of the country; distribution of providers by customers; common operating systems (android/iOS).
 - Explore also alternative sophisticated models to extend connectivity, such as TV white space, and balloon-, drone-, or low-orbiting satellite-based Internet connectivity to extend coverage in remote or hard-to-reach areas. Some of these options can be done using public–private partnership.
- (iii) Power supply option
 - Availability of power supply is key to a successful eIDSR. Reliable power supply to suit the needs of the system must be available at the level of implementation.

- Countries should determine available and potential power supply options for each level of the health system, in all geographic areas. For example, connection to the power grid; consistent generator with fuel provision; consistent generator but no fuel provision; inconsistent generator or inconsistent fuel; power banks, or solar power.
 - Countries may, in addition, consider seeking alternative models to ensure reliable power. Solar panels, for example, could be outfitted to key government ministries, prioritizing those responsible for managing critical data sets in emergencies, and to district health facilities.
- (iv) Equipment – data capture, data management, data analysis
- Equipment is an essential component of eIDSR. It is important to assess the equipment available for eIDSR in a given country at each level of the health system. If equipment is not available, the feasibility of using options for each type of equipment should be considered.
 - You should also consider the lifecycle of all of your hardware, and ensure you develop a plan for replacing/renewing hardware as needed.
- (v) Hardware –
- Consider how to address housing of data on servers; will servers be cloud-based (easier maintenance but monthly/yearly payment)? Consider also where service will be housed i.e. physical structure (requires cool room with consistent power); potential costs, including initial/setup and ongoing, must be considered;
 - Consider types of computers and quantities required. Note that desktop computers are cheaper, but must have power; laptops are portable, but expensive; and tablets are portable and convenient;
 - Consider types of mobile devices required, including smart phones;
 - Consider availability of power and how you will ensure uninterrupted power supply.
- (vi) Software for surveillance or similar function
- Is any software already being used for other surveillance in the country that could be leveraged?
 - Is there a need to develop? Countries may consider open-source software that can be customized, or commercial off-the-shelf software.
 - Partnerships between system developers are key in developing software which could be flexible and easily adaptable;
 - Countries need to evaluate software that could be adopted or adapted to their particular surveillance needs;
 - There is need to have a good back-up system.
- (vii) Devices
- Are there already mobile devices in-country – smart phones and/or tablets?

- (viii) Human resource – technical capacity
 - Countries will need a pool of software development staff available to be able to support open-source systems. These would ideally be government staff.
 - Computer literacy of staff is key for those who will use the electronic system that is developed;
 - It might be necessary to train and retrain, as technology evolves (continued education).

(d) Availability of partnerships

- (i) Partnership frameworks for public–private partnerships with telecom operators to support eIDSR systems should be explored jointly with ministries responsible for ICTs and telecoms;
- (ii) Explore if required partnerships are available for implementing eIDSR.

(e) Determining appropriate scope of eIDSR implementation, including One Health approach

- (i) Based on the assessments above, countries should determine the scope of implementing eIDSR (alert notification, case-based reporting, routine weekly reporting, routine monthly reporting, and outbreak/emergency management). Countries may start with any approach that fits their needs and capacity at the time, and later add on other functions. Obtain estimates for initial investments and current costs;
- (ii) Countries should determine potential investors.

(f) Rolling out eIDSR plan

- (i) Develop and launch country-specific eIDSR implementation plan.
- (ii) Develop annual operational plan (timelines, costs, responsibilities) and long-term (5 years) national eSurveillance plan in the framework of existing integrated health plan(s).
- (iii) Consider a step-wise incremental process in implementing plan and training.
- (iv) Incorporate routine monitoring and regular evaluations, including an initial baseline assessment, prior to implementation.

9.6.2 Important considerations for a successful eIDSR

The following are deemed important considerations for successful implementation of eIDSR in a country.

(a) Laboratory integration

- (i) System should link with lab data or have the ability to link to lab data in the future.

(b) Data privacy and use of a unique identifier (ID number)

- (ii) Data collection with patient identifiable data must go to a server with protections.

- (iii) Access to data should be controlled through user-access rights.

(c) Data security and user-agreement policies

- (i) There should be clear guidelines on how to access data.
- (ii) There should be scheduled data backups (local and remote).
- (iii) Physical data storage devices should be secure and locked.

(d) IT System Maintenance

- (i) Software upgrades, hardware upkeep or replacement and server maintenance should be considered, if system is in-house.

(e) Sustainability

- (i) In order to ensure sustained support of the eIDSR programme, a sustained financial base will need to be established to account for routine and one-time costs such as hardware system maintenance, training of personnel, connectivity costs and end-user materials, such as those for information, education and communication (IEC).
- (ii) There should be local capacity to maintain software and hardware.
- (iii) There should be adequate resources to support operational infrastructure.
- (iv) There should be enough resources to support capital investments, such as mobile devices and computers, and associated operational costs.
- (v) Resources for continued capacity building, training, re-training, etc. should be established.
- (vi) eIDSR should be anchored within national eHealth policy and strategy.
- (vii) There should be, right from the beginning, stakeholder (including private companies and telecom companies) involvement in the design and implementation stage.
- (viii) There should be advocacy for domestic financial resource allocation as well as innovative financial solutions, including leveraging resources from the private sector, such as telecom providers.

(f) Interoperability

- (i) Ideally, data may be shared across systems (including with the surveillance system), from the animal and other relevant sectors.

9.6.3 Potential available tools for eIDSR

Several countries in the Region use open-source tools such as DHIS2 for data collection and aggregation. Some countries, such as South Africa and Lesotho, use commercial software such as some electronic medical record (EMR). In considering the use of commercial software, countries should ensure that there is a budget for licensing costs; negotiations should be done also to ensure that suppliers provide enhancements or adaptations. It is important to note that open source does not mean “free” as there are always implementation and customization costs to fit that country’s specific context and needs.

9.7 Using eIDSR in core surveillance functions

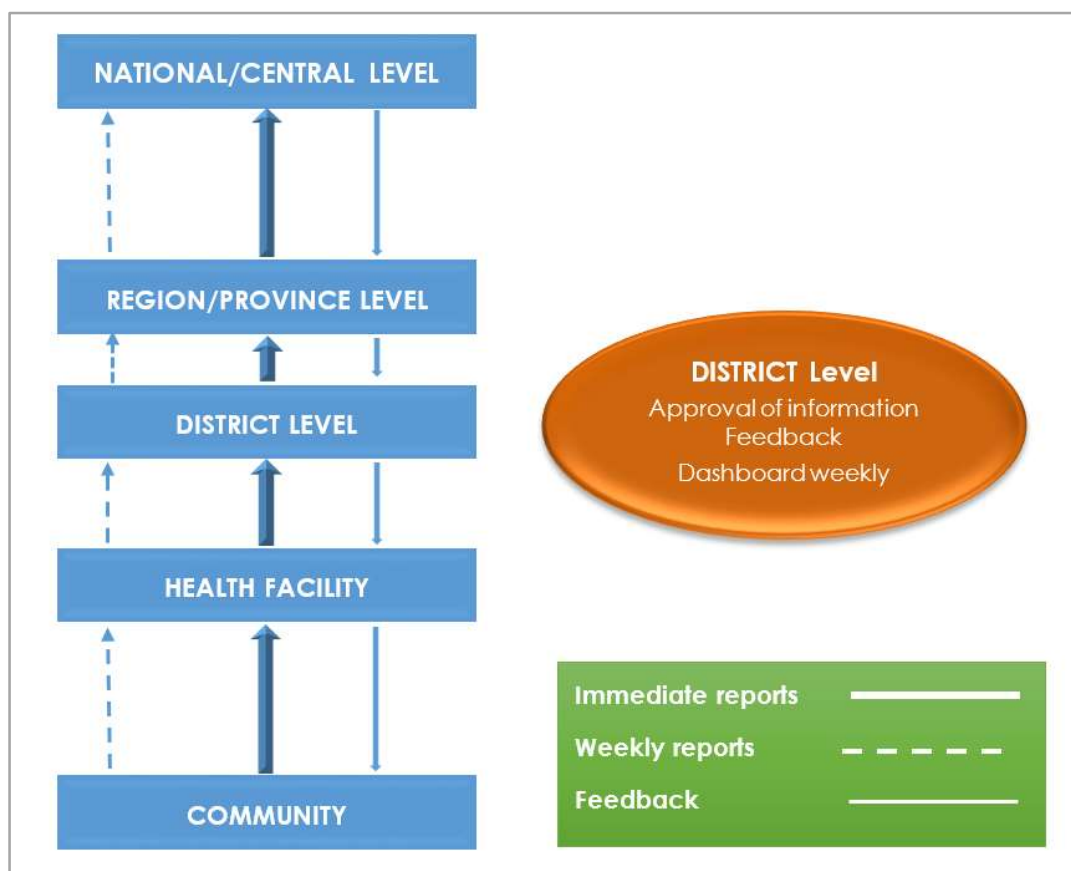
There are many components that will ensure successful implementation of eIDSR in the public health sector. These components include understanding the scope and operational environment, using the right tools, and building capabilities within the local context. The One Health approach also provides an opportunity for creating interoperable, interconnected electronic reporting systems between human and animal surveillance systems.

The use of e-tools for conduct of Data Quality Assessment/Assurance (DQA) is also part of a monitoring and evaluation strategy of IDSR functions, which may be used for continuing improvement of data quality. Such tools can identify errors, inconsistencies and other data anomalies which can affect reliable, accurate, precise and complete data.

Within a given country context, establishing an electronic platform can facilitate implementation of the following IDSR activities, as described in previous sections of the document:

- (a) real-time reporting (indicator and event-based surveillance); refer to Introduction Section;
- (b) alert notification (community and health facility reporting); refer to Section 2;
- (c) case-based reporting; refer to Section 2
- (d) routine reporting (weekly aggregates) and routine monthly reporting; refer to Section 2. Figure 9.1 below illustrates how information flows in eIDSR system;
- (e) outbreak/emergency management; refer to Sections 4 and 6; case investigation; refer to Section 6;
- (f) contact tracing; refer to Section 6;
- (g) logistics and supply chain management; refer to section 6;
- (h) real-time outbreak line-listing; refer to Sections 4 and 6;
- (i) event management (hazard description, characterization, risk assessment and outcomes); refer to Section 6;
- (j) information products i.e. situation reports (Sitreps), epidemiological bulletin etc. refer to Section 7; supportive supervision; refer to Section 8;
- (k) monitoring and Evaluation and Data Quality Assessment (DQA); refer to Section 8.

Figure 9.1: Information flow for eIDSR



9.8 Roles and responsibilities at different levels in the context of real-time reporting and outbreak/emergency management

The following are some roles and responsibilities with regard to eIDSR at various levels. These roles should be complemented by specific roles, as described in relevant sections. Countries may modify or add to the roles, depending on their context.

(a) Community level

- (i) Contributing information on events e.g. through toll-free helplines;
- (ii) Acting on alert message sent from health authorities;

(b) Health facility level

- (i) Depending on the eIDSR platform, reporting events requiring immediate action;
- (ii) Submitting weekly IDSR reports;
- (iii) Following up on events that are reported by community;
- (iv) Acting on notifications and respond, as recommended, for their area of jurisdiction;
- (v) Ensuring compatibility of their handset with eIDSR;
- (vi) Ensuring maintenance and ownership of handset and other tools.

- (c) District level
 - (i) Providing staff access to the eIDSR;
 - (ii) Verifying and approving onward transmission of reported events from lower health facilities;
 - (iii) Issuing alerts to other facilities and leaders, regarding events within the district;
 - (iv) Providing feedback to reporting health facilities regarding events;
 - (v) Updating health facilities and leaders on progress made regarding response;
 - (vi) Training, mentorship and supervision of health staff;
 - (vii) Mobilizing resources to support effective implementation of eIDSR;
 - (viii) Ensuring availability and compatibility of ICT equipment with eIDSR;
- (d) Provincial/regional level
 - (i) Training and supervision;
 - (ii) Collaborating with national level to develop and update electronic tools;
 - (iii) Issuing alerts to districts;
- (e) Central/ national level
 - (i) Maintaining the server;
 - (ii) Developing and updating electronic tools;
 - (iii) Managing the eIDSR system, including troubleshooting;
 - (iv) Maintaining system administration (registration of health staff using server)
 - (v) Training and supervision;
 - (vi) Providing feedback;
 - (vii) Issuing alerts to other facilities;
 - (viii) Coordination of partners and stakeholders;
 - (ix) Ensuring linkage with other platforms, to facilitate interoperability;
 - (x) Monitoring alerts;
 - (xi) Doing advocacy with policy-makers, and resource mobilization to sustain the system;
 - (xii) Ensuring data security;
 - (xiii) Overseeing development and implementation of national ehealth/digital health strategy;
 - (xiv) Aligning eIDSR investments, and working with national ehealth/digital health strategy;
 - (xv) Country ehealth/digital health architecture with consideration for re-usable components;
 - (xvi) System governance.
- (f) WHO and other regional bodies (AU, ECOWAS, Mano River Union, EAC, ECSA, SADC etc)
 - (i) Facilitating creation of formal platform for sharing information and data across countries;
 - (ii) Technical assistance to Member States;
 - (iii) Sharing best practices and facilitating exchange of expertise;

9.9 Supervision, Monitoring and Evaluation

eIDSR development and implementation requires constant monitoring. This is very important during the initial system development and implementation phase. System functionality can be evaluated by looking at issues such as:

- (a) acceptability or willingness to participate. i.e. number of people who are accessing and using the system correctly;
- (b) accessibility – Is the system accessible from the place where the reporting site is situated? In some areas, where mobile telephone is used for eIDSR, accessibility is an important aspect, and this can hamper prompt reporting of diseases;
- (c) data quality and completeness – Check for any data errors;
- (d) timeliness of data submission;
- (e) system flexibility, portability and stability; and
- (f) cost.

To improve data use at the service level, users should be encouraged to use the system with regular feedback of information to lower levels; information flow should not be one-way.

Other system performance indicators include core surveillance indicators for monitoring IDSR (refer to section 8). The IDSR support supervision checklist should be used during supervisory visits, while considering integrated needs from other teams, in terms of joint supervision. The supportive supervision checklist has to be updated to incorporate eIDSR, and uploaded as part of the eIDSR platform. Overall evaluation of the eIDSR system, and its interoperability with the HMIS and eHealth system, should be done periodically, using a blend of internal and external experts.

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