Public Health Reporting in Malawi – Preparedness Exercise

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Report on Public Health Event Reporting in Malawi – Preparedness exercise

Presentation

Title

Public health event reporting in Malawi – preparedness exercise

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Abstract

Background:

The International Health Regulations is a legal instrument, designed by the World Health Organization (WHO) to help take action on matters of public health. Malawi, as party to the IHR (2005), is required to maintain the capacities to control and assess a public health event. In 2017, WHO released a new framework to monitor and evaluate the status of IHR implementation. This framework uses simulation exercises, as a tool to document the preparedness, detection and response capabilities.

Methods:

Qualitative data was collected as part of a public health event reporting drill from 28 June to 4 July 2018. Interviews were conducted with 35 healthcare workers at the facility and district levels in four districts. The exercises featured scenarios presenting five key hazard areas.

Results:

The tabletop simulation exercise showed relatively high inclination to report (79,8 %) on all five scenarios, and showed a general consensus around what route of communication (telephone, 80,4 %) would be used in the first four of the five scenarios. It also showed an inclination to report immediately (78,6 %) in four of five scenarios, whereas in the fifth scenario, 78 % opted to report monthly. Generally, in all scenarios, the respondents chose to report in order to investigate the matter further, or because they would be in need of support to manage the patients.

Conclusions:

Malawi's already centralized focal points provides good foundations for an adequate reporting of outbreaks of public health concern. However, there is room for further training on detecting, assessing and reporting public health events, as some of the scenarios prompted unclear reporting lines. This could lower the threshold for reporting unusual events through the same focal points in every district.

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Abbreviations and Acronyms:

AEHO	Area Environmental Health Officer
CHAM	Christian Health Association of Malawi
CPHO	Chief Preventive Health Officer
DEHO	District Environmental Health Officer
DHO	District Health Office
DMO	District Medical Officer
EHO	Environmental Health Officer
EPI	Expanded Programme of Immunization
FSH	Food, Sanitation and Hygiene
HSA	Health Surveillance Officer
IDSR	Integrated Disease Surveillance and Response
IEC	Information and Education Communication
IHR	International Health Regulations
MA	Medical assistant
MoH	Ministry of Health
PHIM	Public Health Institute of Malawi
SHSA	Senior Health Surveillance Officer
USCDC	United States Centers for Disease Control and Prevention
VO	Veterinary office
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WHO-AFRO	World Health Organization African Regional Office

1 Summary of the protocol

1.1 Summary of the exercise

Exercise name	Public health event reporting in Malawi – preparedness exercise
Exercise date	26 June to 5 July 2018
Scope	This exercise was an operations-based type exercise that was designed to test Malawi's reporting structures using fictional scenarios relevant to the International Health Regulations (2005).
IHR core capacities	Surveillance; Coordination
Objectives	Overall objective: The purpose of this project was to determine the capacity for reporting of public health events of different types from the facility to national level in Malawi. Specific objectives Exercise the alert and response capabilities of public health authorities and partners - Determine the routes of communication for different types of public health event alerts (e.g. infectious diseases, food safety events, zoonotic events, chemical and radiological events) - Identify key stakeholders involved in the reporting of alerts of different origin within health structures in Malawi - Identify weaknesses and strengths in the public health event reporting system in Malawi - Inform key stakeholders of identified weaknesses in order to improve event-based surveillance
Public health event	Five alert scenarios was used: - An event with a small cluster of cases with watery diarrhoea (known event) - An event with a small cluster of cases with unusual symptoms (novel event) - An event involving suspected rabies cases (zoonotic event) - An event involving suspected poisoning from maize seed (chemical event/food safety event) - An cluster of suspected malaria cases (event that is not immediately notifiable)
Participating organisations	Public Health Institute of Malawi, Norwegian Institute of Public Health, Norwegian Church Aid, University of Oslo

Format	Structured interviews at facility and district levels
Source	The exercise was loosely based on scenarios developed by the World Health Organization.

2 Background and justification

2.1 The International Health Regulations (2005)

The International Health Regulations (2005), or IHR (2005), is a legal instrument which aims to "prevent, protect against, control, and provide a public health response to the international spread of disease" (1). The IHR (2005) are legally binding for the 194 Member States of the World Health Organization (WHO). The origins of the IHR can be traced back to 1851, where a series of sanitary conferences were conducted with the objective to forge an agreement and curb the spread of infectious diseases (like cholera) (2). However, it was not until the creation of WHO in 1948 that an international accord similar to the one we have today, was struck. The term International Health Regulation was not used before 1969, and at that time the treaty applied to only three diseases: yellow fever, cholera and plague (2). The creation of IHR as we know it began in 2002, with the emerging outbreak of severe acute respiratory syndrome, or SARS. The outbreak began in 2002, but China delayed reporting this to WHO until 2003 (2), prompting criticism from the WHO Director-General Gro Harlem Brundtland (3) and a global shift towards a norm of transparency .

The scope of WHO's International Health Regulations (2005) is, as mentioned previously, to prevent and protect, and respond to public health events of international concern. In its creation, the IHR have gone from having disease-specific models, to an "all-hazard" approach (4) and as an international, legally binding treaty, the 194 member states are obligated to report events of international health importance. The IHR (2005) require that all its member states have core capacities in place, which include; having laboratory systems and surveillance in place to detect events of public health concern; reporting specific diseases, including any potential public health emergencies; assessing the health concern and working together with the other countries to response to international events; and responding to public events (4).

An important and vital part of the IHR (2005) is that of recognizing the potentially debilitating effect to a country concerning travel, commerce and disease. The IHR (2005) contain a "balancing dynamic", which informs what health measures towards international arrivals and departures a State Party may take. It also states that state parties must have enough scientific evidence of the risk posed before implementing measures that affect travel

and trade, and that adopted measures are likely to ameliorate that risk (2). This to further prevent a State Party from not disclosing an emerging outbreak in order to avoid negative economic consequences.

2.2 IHR (2005) monitoring and evaluation:

The West African Ebola Virus Disease (EVD) epidemic of 2013 – 2016 was responsible for a major loss of life, with more than 11,300 deaths recorded, as well as major socioeconomic disruption in the region (5). This outbreak underscored the importance of having strong capacities, both at local and national levels, to detect, respond and take preventive measures to contain a threat to public health. During the Ebola Virus Disease outbreak in West Africa, WHO worked together with national public health authorities with the emphasis on exercises in neighbouring countries to try to ensure the containment of Ebola, and to ensure that systems that could manage the disease were in place in high-priority, high-risk countries (6).

The Ebola Virus Disease outbreak, while showing the importance of strong capacities, also showed that the IHR was not effective (7). This mainly due to the challenges in relation to the politically sensitive nature of a PHEIC, and the potential negative impact on trade, tourism, travel and economics, which culminated in the late reporting of EVD and fuelled the its rapid spread. Shortage of healthcare workers was also a major challenge in the EVD outbreak, and that lack of community control allowed the virus to spread (8). This showed that further research needed to be undertaken in order for the IHR to be more effective.

Because of the EVD epidemic, the WHO launched in 2017 a new framework for the monitoring and evaluation of the implementation of the IHR (2005) which includes four components: I) Annual reporting through the monitoring questionnaire, II) Joint External Evaluation, III) After Action Review, and IV) Simulation exercises (6). This mixed approach uses both qualitative and quantitative data to document the status of preparedness, detection and response capacities. Simulation exercises have been included in this framework as a critical training and quality assurance tool for assessing the functional capacities to respond to outbreaks and public health emergencies. As a training tool, they allow participants to learn and practice emergency response procedures in a safe and controlled environment. As a quality assurance tool, exercises test and evaluate emergency policies, plans and procedures. Different types of discussion-based exercises (including tabletop exercises) and operations-

based exercises (such as drills, functional exercises and full-scale exercises) can be used to test different capacities.

The US Centers for Disease Control and Preparedness has increasingly been using preparedness exercises for a wide range of topic (9). These exercises have already explored topics from toxoplasmosis outbreaks (10), to simulations of acute blood shortages (11) to outbreaks of severe acute respiratory syndrome (12). With the introduction of the new M&E framework for the IHR (2005), preparedness exercises have become increasingly common to test the functionality of public health systems (13). Examples of exercises conducted in low- and middle income countries include a remote tabletop exercise conducted to assess disaster preparedness before the 2010 FIFA World Cup in South Africa (14). A study in which 12 multi-sectorial exercises were developed and conducted with 558 participants from 14 countries (among them Burundi, Kenya, Rwanda, Tanzania and Uganda), suggested that "exercises can be a valuable, low-burden tool to improve emergency preparedness and response in countries around the world." The authors also concluded that exercises like these can be tool to assess performance, while improving collaborative planning for public health threats (15).

2.3 Implementation of the IHR (2005) in Malawi

Malawi, as party to the IHR (2005), is required to develop, strengthen and maintain the capacities to detect, assess, notify and respond to public health events. In 2015, the Public Health Institute of Malawi conducted the first national assessment of the status of implementation with technical assistance provided by the Norwegian Institute of Public Health. The objectives of the assessment were "to review the status of implementation of the IHR core capacities for Malawi" (16). The national assessment examined eight core capacities, as well as Points of Entry and four hazard areas (zoonotic events, food safety, chemical events and radiation emergencies). The findings of the assessment demonstrated that there were underlying structures in place that provided a strong foundation for Malawi's ability to detect and respond to public health events, like the Integrated Disease Surveillance and Response system, or IDSR. However, there were gaps in most core capacity areas, including laboratory and surveillance capacity (16). The assessment demonstrated that Malawi was not yet equipped with the core capacities to fulfil the IHR requirements, but has

structures, guidelines and protocols in place that provide a good foundation for improvement (17).

2.4 Existing healthcare in Malawi

Malawi has a three-tier healthcare system divided into primary, secondary and tertiary healthcare structures. The primary sector consists primarily of maternity wards or rural hospitals, while the secondary and tertiary can offer more enhanced services due to more comprehensive services, such as laboratories and blood banks (18). The healthcare system in Malawi has both public and private health components. Private healthcare providers plays an important role in the delivery of health care services in Malawi, particularly through the Christian Health Association of Malawi, or CHAM, which is the largest non-governmental provider (19). With over 175 health facilities, CHAM provides Malawi with approximately 37 % of its healthcare services and trains up to 80 % of Malawi's healthcare providers (19). CHAM's primary funder is the United States Centers for Disease Control and Prevention (19).

2.5 Existing surveillance and response structures in Malawi

Surveillance and response to infectious diseases in Malawi is guided by the Integrated Disease Surveillance and Response (IDSR) framework. IDSR is a system and a strategy developed by the World Health Organization in cooperation with the United States Centers for Disease Control (US CDC) to promote "rational use of resources by streamlining common surveillance activities" (20). This system was adopted in 1998 by the 46 Member States of the WHO African Regional Office (WHO-AFRO). Implementation of this strategy is considered to be the main means of fulfilling core capacity requirements for surveillance and response required by the IHR (2005), a process which has been promoted by among the Member States of the WHO-AFRO Region, including Malawi.

Malawi first adopted the IDSR system in 2002. In 2014, the national technical guidelines were updated reflect the requirements of the IHR (2005) and new public health needs (21). Despite the IDSR framework being in place for a long time in the WHO–AFRO region, few nationwide assessments of the framework exist in Africa, and even fewer in Malawi (22, 23).

In Malawi, disease surveillance information flows from the community level to the facility level, to the district level to the national level. From the community level, selected syndromes are reportable through a monthly village clinic report forms and patients meeting simplified case definitions should be referred to health facilities.

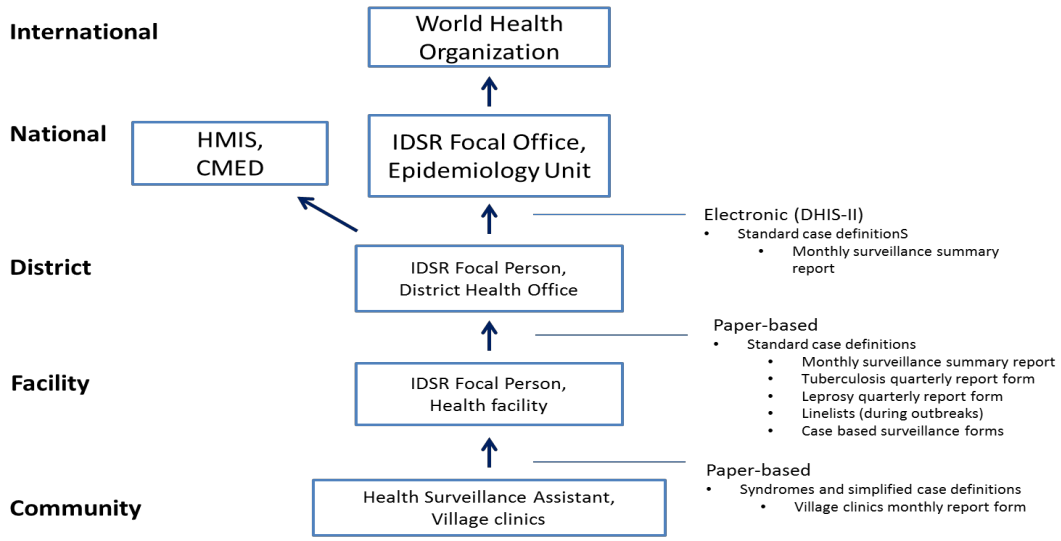

Fig 1. Flow of surveillance data IDSR priority diseases in Malawi, adapted from the 2005 guidelines

IDSR Focal Points at facility and district levels are responsible for compiling reports on the defined case definitions for IDSR conditions (Figure 1). Information flow from the facility to the district level for indicator-based surveillance is primarily paper-based. Paper forms with aggregate numbers of cases and deaths due to reportable conditions are sent from the facility to the district level. Although the IDSR guideline specify that certain conditions should be reported on a weekly basis, in practice only monthly forms are compiled at the facility and district levels. At the district level, the data for the IDSR conditions is entered into District Health Information System (DHIS-II) and sent to the central level. In addition, vertical programs for diseases like HIV/AIDS, tuberculosis and malaria also collect surveillance data through designated focal persons at the district level as part of their own program activities.

In a study by Tsung-Shu Joseph Wu, et al,(22) where they aimed to understand the current state of implementation and the differences between guideline and practice, they analysed raw data from the IDSR reporting system, DHIS-II, and did qualitative interviews with 29 key informants. This study revealed a relatively good rate of completeness in IDSR reporting, but poor timeliness, and that the differences between guidelines and practices were huge.

According to the article's qualitative findings, none of the informants on the community level was practicing case identification using IDSR guidelines. However, information technology infrastructure and the emerging mHealth technology (24), or the practice of medicine and public health supported by mobile phones, can be used to improve the timeliness for the outbreaks and unusual events detection.

2.6 Public health event reporting in Malawi

There is no formal event-based surveillance system in place. Alerts of possible outbreaks are reported from districts to the central level on an ad-hoc basis, but there are few, if any, defined thresholds for reporting outbreaks or increased incidence of notifiable diseases, and systems to report any events of non-biological origin are absent. However, the 2015 IHR (2005) assessment demonstrated that there is high level of awareness of the epidemic potential of cholera, which suggests that the threshold for reporting this condition may be relatively low (16).

3 Objectives and research questions

3.1 Objectives

The purpose of this exercise was to determine the capacity for reporting of public health events of different types from the facility to national level in Malawi through a preparedness exercise.

The specific objectives were to:

- Exercise the alert and response capabilities of public health authorities and partners
- Determine the routes of communication for different types of public health event alerts (e.g. infectious diseases, food safety events, zoonotic events, chemical and radiological events)
- Identify key stakeholders involved in the reporting of alerts of different origin within health structures in Malawi
- Identify weaknesses and strengths in the public health event reporting system in Malawi

4 Methods

4.1 Overview

In order to test the reporting of public health events within the IDSR structure in Malawi, a drill was conducted from 28 June to 4 July 2018. This exercise targeted healthcare workers at public and private healthcare facilities at the local, district and national levels.

4.2 Study sites

Malawi is a landlocked nation that borders Tanzania to the northeast, Mozambique to the southeast, south and southwest, and Zambia to the west, with a population of almost 19 million people (25, 26). The official language is English, while the national language is *Chewa*. Furthermore, local tribal languages are also used for communication in different district (25). Administratively, Malawi is divided into a northern, central and southern region, with a further division into 5 zones and 29 health districts. Four districts (Lilongwe, Dedza, Ntcheu and Zomba) were included in the exercise. From each district, between four and seven facilities were purposively selected to participate. In each district, the health authorities were consulted to select with sampling in order to select facilities which were accessible within the timeframe of the exercises and to ensure inclusion both rural and urban facilities. In addition, at least one selected facility in each district was run by the Christian Health Association of Malawi (CHAM). Where possible, private facilities were also included in the selected facilities.

4.3 Data collection

In each district, a team of three to four interviewers conducted structured interviews with key informants at the facility and district levels. At each selected facility, we asked to interview both clinical staff, who are responsible for patient management, and environmental health staff, who are responsible for surveillance and outbreak response. We initially targeted the facility In-Charge and the IDSR Focal Person. If the In-Charge was not available, an alternate clinician or nurse was asked to participate in the interview. If the IDSR Focal Point was not available, we asked to interview an Assistant Environmental Health Office (AEHO), Environmental Health Officer (EHO) or Senior Health Surveillance Assistant (SHSA). In some facilities, group interviews were conducted, while in others the participants were

interviewed separately. At each district, the IDSR Focal Person or District Environmental Health Officer (DEHO) were asked to participate.

In each interview, we presented the participants with five predefined scenarios presenting a potential public health event. The participants was then asked a fixed set of questions on whether the event should be reported, to whom it should be reporting, how it should be reported and when it should be reported (Annex I). All participants were informed that the exercise was designed to test preparedness capacities and did not reflect true events, and that individual responses would remain anonymous.

Responses to the questionnaire were recorded on paper questionnaires. The collected data was then entered manually into an Excel database for analysis.

4.4 Data analysis

We conducted a descriptive analysis of:

- Reporting pathways for different types of events and to whom events are reported
- Different routes of reporting used
- Reasons for reporting the different scenarios, including the most common to least common reasons for reporting or not report

Respondents were categorized into two groups, clinical staff (referred to in the results as clinicians) and environmental health staff.

4.5 Validity and expectations

The scenarios used were based on fictitious events and did not reflect any ongoing threats. The scenarios were designed to demonstrate how information passes within the healthcare sector, and to other sectors when relevant, as if they were real-life scenarios. Participants were encouraged to ty to describe how they *would* actually react if the given scenarios were to occur, rather than how they *should* react according to existing guidelines.

5 Results

In total, 22 facilities from the participating districts were included in the exercise (Table 1.1). The number of facilities included per district varied from four (in Lilongwe), to six (in Dedza and Ntcheu) and seven (Zomba). There were thirteen public facilities, seven CHAM facilities, and two private facilities included. In total, 35 healthcare workers were interviewed. Of these, 45 % (n=14) were clinical staff (including five facility In-Charges), while 54 % (n=19) were environmental health staff (including five IDSR Focal Points).

Dedza	Ntcheu	Zomba	Lilongwe
9	10	12	4

Table 1.1.
Distribution of respondents by districts

The results from the five scenarios are presented below.

5.1 Suspected cholera event

1. Cholera (Known event)	*A 34-year-old man presents at the facility with acute watery diarrhea and vomiting for the last 12 hours. He is severely dehydrated and has sunken eyes.*

In the first scenario, 86 % of respondents (n=30) indicated that this event should be reported. Almost all respondents recognized this scenario to be a potential cholera case. The most commonly stated reasons for reporting included:

- To initiate an investigation,
- To implement control measures,
- To acquire additional supplies, and
- To arrange for specimen collection and analysis.

Some of the respondents also mentioned that they would need to report this so that neighbouring villages and other areas in the district could initiate preventive measures.

Of the 30 respondents who indicated that they would report, 23 said that they would report immediately. The remaining seven respondents indicated that they would report following initial treatment of the case, or following an initial investigation. The most common means of reporting was telephone (n=28).

When asked to whom this event would be reported, the most common responses were the facility In-Charge (n=10), or someone responsible for environmental health at the facility level, including EHOs (n=3), AEHOs (n=5), and HSA/SHSAs (n= 6). Sixteen respondents indicated that they would report this event to the district level, of whom five specified that they would report to the IDSR coordinator, three would reporting to the DEHO and two would report to the District Medical Officer (DMO). Twelve respondents indicated that they would inform more than one person.

Only five respondents said that they would not report the health incident to anyone. Two respondents indicated that they would initiate an investigation before reporting. Two respondents indicated that the case would be referred to another facility, where reporting would take place. One respondent chose not to report due to the lack of "rice water" in the case.

5.2 Suspected viral haemorrhagic fever-event

2. VHF (Novel event)	*Five people from the same village have presented at the health care facility within a week with sudden high fever, severe headaches, severe joint and muscle pain, vomiting and skin rash. One of the cases has also been coughing up blood and has extensive bruising.*

In the second scenario, almost all respondents (n=34) indicated that this event should be reported. Only one indicated that this might be cases with viral haemorrhagic fever (Ebola). Almost all of the participants recognized that the severity of the clinical presentation of the described symptoms required further investigation. The primary reasons for reporting stated by the respondents were:

- To request support given the severity of the symptoms
- To assist with investigation

Measles, tuberculosis, chicken pox were also stated as reasons for reporting, and 9 of the respondents gave one of these diagnoses as a possible explanation, with measles being the most common (n=5). However, many of the respondents stated that as this was a highly severe presentation of symptoms, they would report this in order to acquire support. The latter reason was the most common (n=19).

When asked to whom this event would be reported, the most common answer was to the IDSR focal person (n=11), or another environmental health officer like an AEHO (n=2) or HSA/SHSA (n=5). Some would report to a clinician, or a clinician and another person (n=7). Seven of the respondents would report to more than one person.

Out of the 34 who chose to report, 25 would do so immediately, while the remainder indicated that further assessment should be conducted before the event is reported. The main method of reporting was through telephone (n=29).

For the single respondent who did not want to report this health incident, the person said he would rather refer the patient to another hospital, due to lack of resources to treat the patients.

5.3 Suspected zoonotic event

3. Dog bites (Zoonotic event)	*Three children from the same area have presented at the facility with bites from an aggressive stray dog. The location of the dog is unknown.*

In the third scenario, most of the respondents would report this event (n=31). Almost all respondents indicated that rabies would be the primary concern related to this event. The main reasons for reporting was:

- To get vaccines for the affected people or the affected dogs.
- To acquire support for managing the patients
- To alerting others about the possible risk of rabies
- To inform the animal health authorities of suspected rabies in animals in order to trace the location of the infected dog, either to treat the dog, or to put it down.

For people who have been bitten by dogs to receive the rabies vaccine as post-exposure prophylaxis, they are required to visit the animal health office to receive a letter indicating that rabies is suspected. This letter can then be presented at a healthcare facility pharmacy in order to receive the vaccine. While many respondents that this information would be reported to the animal health office, in many cases it was later explained that the patient would need to visit the veterinary office in order to acquire the letter. For several respondents, this was considered to be a report, and no further information would be provided directly from the healthcare facility to the animal health office.

Some of the interviewees said they would report this to the veterinary office and to the DMO/DHO (n=7), while some reported to only the veterinary office (n=4). Aside from the veterinary office, many stated that this would be reported to the IDSR coordinator only (n=7), or another environment health staff like HSA (n=2). Five stated they would report this to a clinical staff, and out of those five, three would report only to the clinician, the other two stating that they would report to the EHO and the DHO. Two stated they would refer these patients another health facility. Out of all the respondents in total, ten stated that they would report this to multiple others.

Out of the 35 people asked and of those who would report (n=31), the most common timeframe for reporting was immediately (n=26). The main method of reporting was telephone (n=16). Other notable routes of reporting was in person (n=3), on paper/through a referral (n=8).

Of the people stating they would not report (n=2) one stated that it was "more of a tradition" to report, and the other stated that this would be referred to the veterinary office, and that the patient would be sent with a cooler box for the vaccine.

5.4 Suspected food poisoning event

4. Poisoning from maize seed (Chemical/ food safety event)	*Two patients died shortly after presenting to the health facility with vomiting, diarrhea and confusion. A family member suspects that they became ill after eating treated maize seed.*

In the fourth scenario, a large number of the respondents stated that they would report (n=31). Several respondents stated that the event was likely food poisoning, potentially deliberate, and that one should instigate a contact tracing or perform an autopsy to identify the toxin. The main reasons for reporting were:

- To request assistance with investigation of the incident.
- To request support for an investigation, or for management of the affected.
- To confirm the suspicion of food poisoning.
- To inform regarding a general public health concern
- To perform an autopsy.

The respondents wanting to perform an autopsy (n=3) wanted to so because of different reasons. One wanted to perform autopsies so the community could be informed of the cause of death, while another wanted to identify the toxins as mentioned previously. The third respondent wanted the police to exhume bodies.

When asked to whom they would report this to, a number of people stated that they would report this to a clinician (n=8). Of the people who stated they would report this to an environmental officer, most stated either the IDSR coordinator (n=5) or AEHO (n=5). Environmental health officers at different levels were also mentioned as someone the respondents would report to, these being DHO (n=1), DEHO (n=2), EHO (n=2) or DMO (n=2) Others stated that they would report this to the police (n=6). Fifteen of the respondents stated that they would report to multiple, while 16 would only report to one. Three chose not to report.

Out of the 35 people asked, 27 stated that it would be reported immediately, while another person stated that it would be reported as soon as possible. The main method of reporting was by telephone, either through a phone call (n=27) or with WhatsApp (n=2) or both (n=3).

Out of the people who chose not to report (n=3), one said it was due to the lack of treatment options at the facility, and another stated that this could just be managed locally, while the third stated that this would be reported later if more affected patients came in.

5.5 Malaria event

5. Malaria (Non-reportable event)	*Three people from the same family present at the healthcare facility with headache, fever and joint pain. They test positive by RDT for malaria.*

For the last scenario, 12 of 35 respondents, stated that they would report this event, while 21 said that they would not report this. However, when asked how this would be reported, 25 out of 33 said that this would be written in a monthly report to the District Health Office, five people stated that they would report this immediately or weekly, and only one person stated that this would not be reported at all. The main reason for those 25 who said it would just be reported monthly, was that this was a normal occurrence that could be treated at the local facility. Seventy-six percent of the respondents (n=25) indicated that this was a routinely notifiable condition that should be reported on a monthly basis. The route of reporting was almost exclusively through paper-based report.

Scenario	*I*	*II*	*III*	*IV*	*V*
% who would report	*86 %*	*97 %*	*89 %*	*91 %*	*36 %*
Primary method of reporting	*Phone call (93,3 %)*	*Phone call (85,3 %)*	*Phone call (58 %)*	*Phone call (85 %)*	-
Timeframe of reporting	*Immediately (76,7 %)*	*Immediately (73,6 %)*	*Immediately (77 %)*	*Immediately (87 %)*	*Monthly (76 %)*

Table 1.2. Summarized findings

6 Discussion

The purpose of this exercise was to determine the capacity for reporting of public health events of different types from the facility to district level in Malawi. With the five selected scenarios for this exercise, we assessed the reporting capabilities for i) cholera, representing a known event, ii) suspected viral haemorrhagic fever, representing an usual event, iii) dog bite with suspected rabies exposure, representing a zoonotic event, iv) poisoning from maize seed, representing a food or chemical safety event and iv) malaria, representing an event that does not require immediate reporting.

For the cholera scenario, most respondents would report this event (86 %) although only 77 % would report this event immediately. Reasons given for reporting were largely related to implementation of infection control measures and initiation of investigation. In Malawi, cholera is endemic, with multiple small and large outbreaks reported in recent years, most recently in 2018 (27). Consequently, cholera should be a known and familiar event for healthcare workers in Malawi. Therefore, we expected that the threshold for reporting a suspected cholera case would be low, and the reasons and reporting lines would be clear. Surprisingly 34 % of the respondents would not immediately report this event, giving reasons that included reporting after treatment of case and referral of case to other facilities with better resources, indicating that the importance of immediate reporting was still not clear at some facilities. For the respondents choosing to report this event, it was clear that telephone was the medium of choice with reporting lines going through the responsible environmental health officer at the facility level, although the responsible health officer differed between the facilities from EHOs, AEHOs, HSAs to SHSAs. Almost half of the respondents (53 %) indicated that they would also report this event to the district level through the DEHO or DMO.

For the viral haemorrhagic fever scenario, we observed the highest proportion of respondents indicating that they would report (97 %) among the five scenarios. Reasons given for reporting included needing assistance in investigation and needing additional information. Urgency in reporting this event was also higher than for the other events, but still only 74 % would report this event immediately. With the severity of symptoms presented in this scenario and the recent memory of the West Africa Ebola -epidemic (2014) (28), we expected awareness for symptoms of Ebola-like diseases to be high. Conversely, the unusualness of the condition may lead to difficulties in identification of the disease and uncertainties concerning

reporting practices. This might have been the reason why almost all would report this event, but only 75 % said they would report it immediately. This assumption was substantiated by the fact that health care workers that were able to perform a differential diagnosis (measles, tuberculosis, chicken pox, Ebola) from the presented scenario were more inclined to immediately reporting than health care workers that were unable to do so.

In the third scenario relating to dog bites, 89 % responded that they would report this event, with the main reasons being need of vaccines or the need to alert other people. However, it was apparent that the route of reporting was unclear. Many of the respondents said they would call the veterinary office to get vaccines, while others would send the patient to the veterinary office with a referral. In addition, it seemed unclear what was to be considered reporting of this event. Many of the respondents said they would report this event, although it seemed like "reporting" meant "referral" to the veterinary office in many cases. In addition, some respondents stated reporting this event to the PHC coordinator and the Agriculture Extension Development Coordinator, stating the reason being "for follow up" and to trace the location of the dogs respectively. It was evident from the diversity of answers that the importance of reporting this event, as well as the expected reporting lines and procedures, was unclear.

In the scenario of poisoning from maize seeds, the reporting rate was 91 %. The main reasons mentioned were for support and further investigation. In addition to reporting the event to an environmental health officer or a clinical staff member, some respondents also would report this incident to the police. There is no food safety authority in Malawi. Generally, reporting of chemical events may not be well understood as routines are not in place for informing the environmental affairs and agricultural authorities of such events.

In the fifth scenario of Malaria, the total reporting rate was 36 %. Malaria is endemic in Malawi, and most respondents were aware that this condition did not require immediate reporting. For those who responded that they would report this event, the majority (58 %) said they would only report it in the monthly form. However, 16 % (or four respondents) said they would report this event immediately. This may be an artefact of the nature of this simulated exercise, as respondents may have felt encouraged to indicated that they reported all events, even if there was not a public health justification for doing so.

Overall, the respondents were inclined to report in all the presented scenarios, with an average reporting percentage of 91 %. The fifth scenario was the only event that differed from the other scenarios in reported responses. The high reporting rate for some events might be due to an increased awareness for the specific symptoms and conditions (cholera-like, haemorrhagic, rabies-like, food poisoning-suspicious symptoms). However, due to the nature of the exercise it is highly probable that reporting percentages overestimate the reporting in real life, as partially exemplified in the malaria scenario. Given the differences in reporting practices, there does not seem to be a consensus between and within the districts on the reporting lines or responsible persons, especially at the facility levels, although there seems to be a clear understanding of the hierarchy of reporting lines from the facility to the national level. Naturally, this presents a great challenge in collecting and collating notified and reported incidents from the different facilities within a district, and from the different districts to the national level.

Furthermore, we found that all immediate reporting was through telephonic means, either via WhatsApp, phone call or text message. Reporting through phone calls gives a huge advantage for reporting, as it is both speedy and gives a direct line. However, phone calls leave no "paper-trails", so it is impossible to review information handed over by phone calls. At times the phone call reporting that was used by the respondents seemed disorganized, as phone calls were made to selected individuals on private numbers, many of the respondents didn't have the numbers for the person they should report to, or any back up in case they were unable to reach the individual that should be contacted. It seems plausible that even with a supposed high percentage of initial reporting, the quality of information reported may suffer from these ad hoc systems and may get lost as a result.

In general, there was a lot of "wait-and-see"-approach or respondents indicating that they would report after investigation. This was particularly evident in the second scenario with suspected viral haemorrhagic fever and the fourth scenario with poisoned maize seeds. This could be due to the unknown nature of these scenarios, where our respondents felt more comfortable reporting this when they had more information. In general, a low threshold for reporting should be encouraged, particularly for public health events which may ultimately have severe public health consequences.

7 Limitations

Although the results of the exercise provides some insight on the reporting of public health events in Malawi, there are some limitations that must be taken into consideration. Our study population consisted of only of 35 people, who were from only four districts in Malawi. As the sample size is small, this group does not represent all healthcare workers in Malawi. However, the results of the exercise suggest some weaknesses, which may also be present in other districts. This can potentially be elucidated through further exercises in a wider selection of districts.

A major limitation of the exercise is that responses from participants indicating that they would report is not necessarily equivalent to reporting. Participants may feel inclined to report in more situations than they actually would outside the artificiality of the exercise, as they may feel pressured to perform. Furthermore, it is also reasonable to think that when respondents are asked if they would report or not by representatives of the Public Health Institute of Malawi, they may be encouraged to respond positively in order not to look bad. As we did not test the practical reporting routines, it was not possible to determine if reporting could be conducted as described. However, we include a fifth scenario in which immediate reporting was not required as a control. In this scenario, many fewer participants indicated that they would report suggesting that the responses provided for the previous scenarios may be accurate. Nevertheless, five of respondents indicated that they would report malaria cases immediately or weekly, which may suggest over-reporting.

A general finding was that our interviewees often did know to whom they should report, but when probed, they would not be clear on who actually did the reporting. This was a limitation of the questionnaire, which did not ask our respondents to provide further details on who actually did the reporting at the facility level.

8 Conclusions and recommendations

In general, the Malawian surveillance system lacks a centralized streamlined reporting system for public health events from the facility to the district level. If public health events are not reported promptly, this can lead to late detection as it did with SARS in 2003 and EVD in 2014. Part of the reason that these two events became so large was that it took such a long time to report (4, 7), which in turn lead to increased mortality and morbidity. According to our results, Malawi will have less trouble reporting a serious event such as viral haemorrhagic fever from the facility level, but it is still unclear how well this reporting works as our results also showed that our respondents generally lacked knowledge about certain central diseases.

Malawi is equipped with district IDSR focal points, who could handle reporting of public health event better given an adequate education program on what should be reported. Our study showed that in manasy scenarios, the reporting lines were more unclear for events that were not only related to human health, and events that were chemical, and not biological in origin. Thus, if there is a lack of a common understanding on what type of events should be reported, it calls for further training on detecting, assessing and reporting public health events. This could lower a threshold for reporting even unusual events through the same focal point.

There are several approaches that may improve public health event reporting, using both formal and informal reporting tools. It would be plausible to implement a streamlined system through WhatsApp relatively quick to handle this until a more sophisticated system is in place, particularly as it is already being used by healthcare workers to report events informally. Alternatively, it may be useful to investigate the opportunity to use the mobile phone application built in the District Health Information System database, which is quick, reliable and cost effective. This has been tried in Tanzania for routine reporting of diseases (29), where over a period of five months, both data completeness and data timeliness improved from 50 % to 89 %, and as Malawi's rate of cell phone users is growing quickly (30), this can be a good investment.

Improvements to reporting infrastructure could be combined with educational programs for healthcare facilities on what they should do when confronted with specific scenarios. Given the variation in reporting practices with different types of events, multi-sectorial

collaboration for event surveillance at both the facility and district levels should be strengthened.

9 Annex

9.1 Data collection tool

Date: _____
Name of interviewer: _____

Name of respondent: _____
Position: _____
Facility: _____
District: _____

Instructions for respondent – to be developed

1. Cholera (Known event)	**A 34-year-old man presents at the facility with acute watery diarrhea and vomiting for the last 12 hours. He is severely dehydrated and has sunken eyes.**

1. Would you report this incident to anyone? □ Yes □ No □ Don't know
If yes:

- To whom would you report?
  Name(s) and position(s):
  _____
  _____
  _____

- What type(s) of communication would you use to report?
  □ Phone call Number: _____
  □ Text message Number: _____
  □ Whatsapp Number: _____
  □ Paper report Specify: _____
  □ Email Email address: _____
  □ Electronic report (DHIS-II, eIDSR, Argus) Specify: _____
  □ Other (specify): _____

- When would you report this incident?
  □ Immediately
  □ End of shift
  □ Other (specify)

- Why would you report this event? (Expected response, support, information, etc)

_____
_____
_____
_

2. What questions would you ask the patient(s)? (Additional information needed to alert?)

_____
_____
_____

3. What follow up activities would you do in the following 5 hours after you received this information?

_____
_____
_____

2. VHF (Novel event)	**Five people from the same village have presented at the health care facility within a week with sudden high fever, severe headaches, severe joint and muscle pain, vomiting and skin rash. One of the cases has also been coughing up blood and has extensive bruising.**

3. Dog bites (Zoonotic event)	**Three children from the same area have presented at the facility with bites from an aggressive stray dog. The location of the dog is unknown.**

4. Poisoning from maize seed (Chemical/ food safety event)	**Two patients died shortly after presenting to the health facility with vomiting, diarrhea and confusion. A family member suspects that they became ill after eating treated maize seed.**

5. Malaria (Non-reportable event)	**Three people from the same family present at the healthcare facility with headache, fever and joint pain. They test positive by RDT for malaria.**

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