Public Health Emergency Guidelines

Health & Family Welfare Department
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Acronyms

AFP	Acute flaccid paralysis
AR	Attack rate
BOD	Burden of disease
BPR	Business process reengineering
CFR	Case fatality ratio/rate
CHW	Community health worker
ELISA	Enzyme linked immunosorbant assay
EPRP	Epidemic preparedness and response plan
EWARS	Early warning and response system
GIS	Geographic information system
HeRAMS	Health resource availability mapping system
HEW	Health extension worker
HMIS	Health management information system
ICT	Information communication technology
IDS	Integrated disease surveillance
IHR	International health regulation
MOH	Ministry of Health
MOU	Memorandum of understanding
NGO	Non-governmental organizations
NNT	Neonatal tetanus
OR	Odds ratio
PEA	Post emergency / event assessment
PF	Post recovery framework
PHE	Public health emergency
PHEIC	Public health emergency of international concern
PHEM	Public health emergency management
PHEMTTF	Public health emergency management technical task force

PHI	Public health intelligence
PPE	Personal protection equipment
RR	Relative risk
RRT	Rapid response team
SARS	Severe acute respiratory syndrome
TOR	Terms of reference
TWG	Technical working group
UNICEF	United Nations Childrens' Fund
VARM	Vulnerability assessment and risk mapping
VHF	Viral hemorrhagic fever
WHO	World Health Organization
WIR	Weekly incidence rate

Section 1. INTRODUCTION

The public health system is continually challenged by recurrent and unexpected disease outbreaks and is facing the challenge of managing health consequences of natural and human made disasters, emergencies, crisis, and conflicts. These problems continue to disrupt the health care system, while successful detection and response to these challenges is becoming increasingly complicated.

The rapidly expanding global economy, the convergence of people in large urban areas, the ease with which people and goods travel around the world, emergence of new infectious agents, the wide distribution of manufactured foods, and the changing nature of our environment are some of the factors challenging the public health system to quickly recognize and respond to widely dispersed public health events.

Investigations of diseases are now more complex in nature than they were in the past because of a variety of new pathogens, risk factors and outbreaks, which cross jurisdictions and national boundaries—often raising political and economic concerns.

Emergency management follows some basic principles. Emergency management must be:

- *Comprehensive*- emergency managers consider and take into account all hazards, all phases, all stakeholders, and all impacts relevant to emergencies.
- *Progressive*- emergency managers anticipate future emergencies and take preventive and preparatory measures to build disaster-resistant and disaster-resilient communities.
- *Risk-driven* -emergency managers use sound risk management principles (hazard identification, risk analysis, and impact analysis) in assigning priorities and resources.
- *Integrated*- emergency managers ensure unity of effort among all levels of government and all elements of a community.
- *Collaborative*- emergency managers create and sustain broad and sincere relationships among individuals and organizations to encourage trust, advocate a team atmosphere, build consensus, and facilitate communication.
- *Coordinated*- emergency managers synchronize the activities of all relevant stakeholders to achieve a common purpose.
- *Flexible*- emergency managers use creative and innovative approaches in solving emergencies challenges.
- *Professional*- emergency managers value a science and knowledge-based approach; based on education, training, experience, ethical practice, public stewardship, and continuous improvement.

Periodic infectious disease outbreaks and recurrent natural disasters serve to remind the importance of the public health system which encompasses the government and private sector, academia, NGOs, associations and development partners as a whole. However, there is tremendous task to be addressed in order to narrow the gaps between these actors in order to maintain adequate responses to emerging diseases and health consequences of

natural and human made disasters.

1.1 Reengineering the Process

In order to combat with the challenges that are ever growing, the way working processes are organized and its capacities should also be changed. Based on this fact the health sector has identified Public Health Emergency Management (PHEM) as one of the core processes to be reengineered.

PHEM is designed to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration, and prompt response to and recovery from various public health emergencies. PHEM is the process of anticipating, preventing, preparing for, detecting, responding to, controlling and recovering from consequences of public health threats in order that health and economic impacts are minimized.

The process is fully integrated, adaptable, all-hazards and all health approach national preparedness and response system. This core process is comprised of four sub processes which are: Public Health Emergency Preparedness, Early Warning, Response, and Recovery.

Every public health emergency management processes have a starting and ending point. As indicated in Figure 1-1below, the process starts with early warning and ends with recovery. However, in real situation the steps move forwards and backwards. For example, early warning system is a continuous activity to be carried out throughout the whole process, and it is not something you do once and then go to another process. The same way each step repeats itself based on health risks identified.

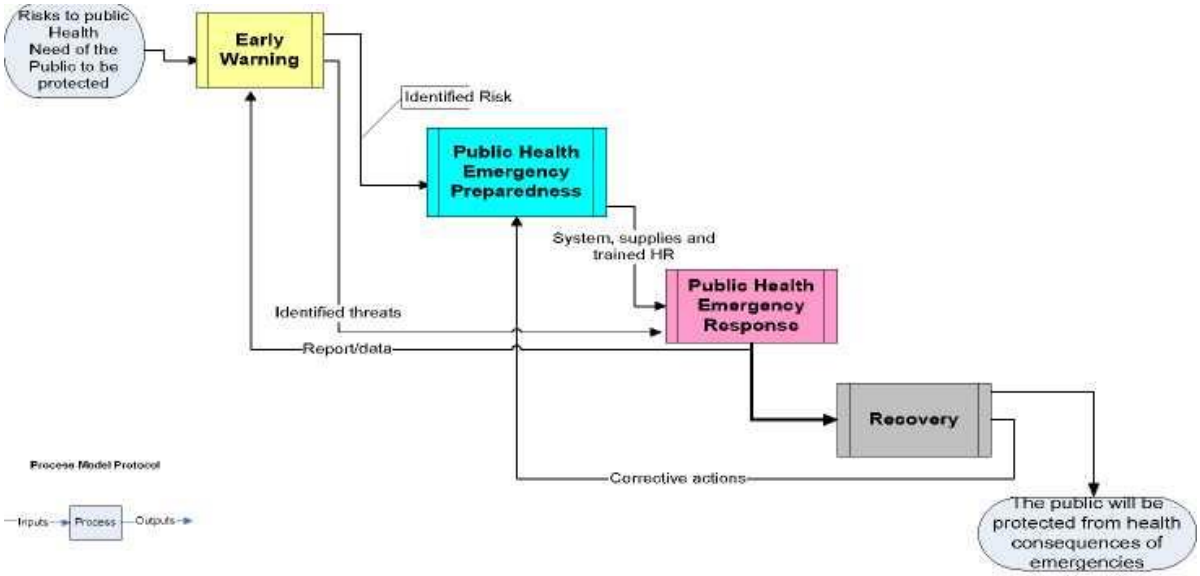

Figure 1-1 Public Health Emergency Management Core process Sub-processes

The major public health risks identified in the state are listed below. Note that the lists are in order of priority - from high priority to low priority.

- Epidemics of communicable disease
- Food contamination
- Landslide
- Pandemic Influenza

- Flood
- Diseases that affect people during conflicts and in displaced populations
- Accidents including chemical spills, industrial & construction activities
- Earthquake, volcanic eruptions
- Bioterrorism

It is believed that the PHEM core process will provide the health sector with a system that is effective and efficient; and its implementation shall be in an accountability basis.

1.2 Guiding principles

1.2.1 Multi-hazard approach

The core process evolved from a traditional communicable disease orientation to a more modern multi-hazard approach. The attention dedicated by the core process to every hazard will be determined by the potential importance of the risk identified; epidemics due to communicable disease and nutritional emergencies being the first two priorities. Any health hazard, irrespective of their origin or source, including those caused by biological (both of an infectious and non-infectious nature), chemical agents or radio-nuclear materials are considered by this approach.

1.2.2 From risk assessment to recovery

The manual will cover the entire cycle of an emergency or disaster; from prevention and detection to response and recovery. The extent of the activities in the process will vary according to the type of Public Health Emergency (PHE). The guiding principle will be complementarity: avoid duplicating work already done by other directorates within the Ministry of Health or by sectors outside the health sector.

1.2.3 Risk assessment and mitigation

One of the major changes in emergency management is change from the old concept of disease management to a new approach of risk management. Therefore, systematic analysis of the vulnerability to health hazards and assessment of the risk is an innovative area of focus. Each and every level in health system is required to understand the health hazards and risks posed on their population and map this using technology such as Geographic Positioning System (GIS). Based on the prevailing hazards and risks, mitigation measures need to be taken.

One of the best shifting mechanisms is to be well prepared to effectively manage risks in a manner that helps to reduce the peak burden on health care infrastructure and ultimately, to diminish the overall caseload and health impacts. This is contrasted to reactive approaches that are fire-fighting for an already significant problem.

1.2.4 International Health Regulations (IHR2005)

The IHR 2005 is a legally binding document that entered into force on 15 June 2007.

The purpose of the IHR 2005 is to prevent, protect against, control and provide public health response to the international spread of disease in ways that are relevant and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade. The scope of the regulation embraces all the public health emergencies of international concern (PHEIC), which includes those caused by infectious diseases, chemical agents, radioactive materials, and contaminated food.

In order to implement the IHR successfully, it is important that building the core capacities such as coordination, surveillance, response, preparedness, risk communication, human resource development, and laboratory capacity are be emphasized. These functions are also the main components of this manual. Therefore, building a strong PHEM process and strengthening its capacity will ensure the proper implementation of IHR 2005.

The three main categories of events that require to be notified under the IHR 2005 are:

- Four conditions that must be notified to WHO: smallpox, poliomyelitis due to wild-type poliovirus, human influenza caused by a new subtype, and severe acute respiratory syndrome.

- Other diseases and events may require notification if they are considered to be events of potential international public health concern. This assessment will normally be conducted at district level or above by using the IHR decision instrument in Annex 1. The diseases referred to in this category by the IHR include the following: cholera, plague, yellow fever, viral haemorrhagic fever, other diseases that are of special national concern.

- Any event of potential international public health concern including those of unknown cause or source, and those involving other events or diseases than those listed in the above two bullet points.

The definitions of event and disease in the IHR(2005) are the building blocks of the expanded surveillance and notification obligations. The term "event" is defined as a manifestation of disease or an occurrence that creates a potential for disease. "Disease" means an illness or medical condition, irrespective of origin or source that presents or could present significant harm to humans.

Accordingly, notification may be required for:

- Events, irrespective of their origin or source, including those caused by biological, (both of an infectious and non-infectious nature) chemical agents or radio-nuclear materials;
- Events where the underlying agent, disease or mode of transmission is new, newly-discovered or as yet unknown at the time of notification;
- Events involving transmission or potential transmission through persons, vectors, cargo or goods (including food products) and environmental dispersion;
- Events that carry potential future impact on public health and require immediate action to reduce the consequences;
- Events arising outside of their established patterns of occurrence.

As mentioned above, such potentially notifiable events extend beyond communicable diseases and address such concerns as contaminated food or other products, and the

environmental spread of toxic, infectious material or other contaminants. The nonspecific scope of the IHR (2005) does not require that the event under assessment involve a particular disease or kind of agent or even a known agent, nor does it exclude events based upon whether they may be accidental, natural, or intentional in nature.

1.3 Purpose of this guideline

The main aim of the PHEM guideline is to provide guidance on how to implement the designed sub processes in the PHEM. It has been produced as a general guide to assist all public health officers, stakeholders and development partners, who take part in public health emergency management, in the implementation of the new approach in a standardized way throughout the country.

1.4 Scope and applicability of the guideline

The activities, in the PHEM guideline, are to be implemented state-wide with full involvement of all stakeholders. As the name implies PHEM deals with the management of all public health emergency issues, including diseases outbreaks, nutritional emergencies and health consequences of natural and human made disasters. Practices that will be covered in this guideline include preparedness, early warning, response and recovery. Hence this guideline addresses all public health emergencies related issues and will be implemented at all levels throughout the country.

The information and activities in this guideline are intended for use by health managers and health staff at all levels of the health system (State, Districts and health facilities). These include;

- Public health /Health management teams
- PHEM staff
- Surveillance officers/focal points
- Health facilities

It is planned to update the guideline continuously based on changes in disease patterns and new issues that will emerge during the implementation phase. Hence, it is a live document that will be updated regularly.

Section 2. PUBLIC HEALTH EMERGENCY PREPAREDNESS

Preparedness is defined as "the range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from incidents". Preparedness activities and tasks are those things that should be done prior to the occurrence of emergency. Development of plans, procedures, protocols, and systems; establishment of mutual aid agreements; provision of training; and the conduct of exercises are among other preparedness tasks.

The public health emergency preparedness capabilities include:

- Putting in place the necessary logistics and funding,
- Building the essential systems specific to protection, prevention and response;
- Equipping public health personnel and respondents with the necessary knowledge and tools, and
- Educating the public on related measures to be taken to prevent and control the event.

The aim of preparedness is to strengthen capacity in recognizing and responding to public health emergencies through conducting regular risk identification and analysis, establishing partnership and collaboration, enhancing community participation and implementing community-based interventions and strategic communication during the pre-emergency phase and ensuring their monitoring and evaluation.

The main objectives of health emergency preparedness include:

- Preventing avoidable crisis and catastrophes;
- Reducing morbidity and mortality effects;
- Availing resources;
- Minimizing disruption to health services;
- Maintaining business continuity as far as possible;
- Reducing disruption to society as much as possible.

In the public health context, the preparedness sub process is comprised of the following broad activities:

- Coordination and collaboration;
- Vulnerability assessment and risk mapping;
- Planning for identified risks and hazards;
- Capacity building;

- Monitoring and rehearsal or simulation.

Preparedness involves a range of players and partners engaging in initiatives that promote health, prevent and control diseases and conditions and protect people from the consequences of health emergencies due to man-made and natural causes. Therefore, preparedness is a responsibility shared by all levels of government, private sector, not-for- profit sector, institutes, and professionals' associations.

The way forward to implement sound preparedness measures is to accomplish first and foremost a paradigm shift from managing emergencies to managing risks. Hence, a big educational drive is needed to install the distinctive concepts of hazards, vulnerability, risks and the value of managing risks. High-level advocacy and influential public champions are needed to promote risk reduction in their societies.

2.1 Coordination and collaboration

A coordinated disaster preparedness and response system is an essential condition for effective management of public health emergencies.

- *Horizontal coordination* addresses links among different directorates, sectors and institutions at state, districts, PHC/CHCs and Health Sub-centres levels. Horizontal coordination also includes cross-border coordination with neighbouring countries and inter-state, between districts, PHC/CHCs and Health Sub-centres within the state.
- *Vertical coordination* addresses the hierarchy from the state level to the health sub-centre level.

Coordination will be better managed if a committee or task force of all the stakeholders is established. Creating new committee for emergency preparedness may be required, if not, work within established structures and systems. This committee should be, as much as possible, led by the correspondent administrative authority at different levels and will include representatives from relevant sectors and institutions such as water, agriculture, health facilities, universities, etc and partners to ensure comprehensive preparedness.

Activities and steps required for effective coordination and collaboration are:

- Identify all sectors, collaborators and partners, their areas of intervention and capacity for public health emergency management;
- Develop a list and keep a register of all experts, institutions and organization and update the list yearly;
- Communicate with all partners and establish a coordination/collaboration forum;
- Develop a term of reference (TOR), memorandum of understanding (MOU) to guide the framework;
- Monitor and evaluate participation and implementation of public health emergency activities as per the TOR or MOU;
- Report the level of preparedness to the next higher level and share with all stakeholders on monthly basis or as required;
- Organize a Rapid Response Team (RRT) to initiate activities at the time of response;
- Review membership, TOR or MOU as per the findings.

At State level, the PHEM coordinates preparedness activities using three major mechanisms:

- Multi-sectoral PHEM Taskforce, a decision-making body at State levelled by the Health Minister or the Secretary (Health & Family Welfare);
- PHEM Technical Taskforce (PHEMTTF), led by the Principal Director;
- Technical Working Groups (TWG), which is a technical advisory body of the PHEMTTF that encompasses experts, from different institutions and partners to give advice on specific health risks e.g. Acute watery diarrhoea TWG, vaccine preventable TWG, etc.

It is advisable that the districts, PHC/CHCs, health sub-centres and lower structures also follow and adapt similar functional groups for the purpose of coordinating activities at their respective level. In addition to this, districts, PHC/CHCs, health sub-centres PHEM structures should identify members of the RRT that is expected to take a timely preparedness and response action when an emergency occurs.

The rapid response team needs to follow the combination below for the purpose of effective coordination and action initiation where needed.

2.2 Vulnerability assessment and risk mapping

Definition of terms:

Vulnerability: The susceptibility of a community, service, or infrastructure to damage or harm by a realized hazard or threat.

Hazard: An accidental or naturally occurring event or situation with the potential to cause physical or psychological harm (including loss of life) to members of the community, damage or losses to property, and/or disruption to the environment or to structures (economic, social, political) upon which a community's way of life depends e.g. Presence of outbreaks, flood, storm, chemical release.

Threat: The intent and capacity to cause loss of life or create adverse consequences to human welfare (including property and the supply of essential services and commodities), the environment or security.

Risk: The probability of harmful consequences or expected loss (of lives, people injured, economic activity disrupted or environment damaged) resulting from interactions between natural or human induced hazards conditions. For example:

- Measles epidemic (hazard) in a community - The potential impact (and risk) will depend on vulnerability based on the immunization level, nutrition status etc.
- Earthquake (hazard) - type of house (tent, tukul, poorly designed high-rise building etc.)
- Floods (hazard) - the lower in altitude and closer to a river, the more susceptible to flooding.

Risk is a function of many factors and not only exposure to hazard. Risk is defined as a product of the likelihood of the occurrence of a given hazard (epidemic disease, drought, flood, etc.) and the vulnerability to the impact. Improving coping capacity reduces the risk by reducing the vulnerability to the impact or by reducing the likelihood of the hazard.

A vulnerability assessment is a continuing, dynamic process of assessing hazards and risks that threaten the population and the health system and determining what can be done about it. Vulnerability assessments also include a method of structured data collection geared towards understanding the levels of potential threats, population likely to be affected, coping capacity, relief needs and available resources to address them.

A vulnerability assessment provides:

- A means to inform decision-makers about the needs of preparedness at different levels;
- A starting point to construct an overall plan that corresponds to the dimensions of identified risks. This can also help to measure the levels of preparedness or unpreparedness;
- A tool to initiate the public health emergency preparedness planning;
- The basis for monitoring trends of risks in emergency prone areas. In that sense, the initial effort of developing a data base through vulnerability assessments should become the basis for maintaining and updating an essential informational tool for development planning purposes.

The steps you are required to follow in conducting a Vulnerability Assessment and Risk Mapping (VARM) are listed below.

Step 1. Contextualization

Contextualization is a matter of looking at the impact severity of hazards in the sector's area of concern. An organization should begin by defining the scope of the risk management activity in the context of its roles and responsibilities. It needs to define the physical, social, environmental and statutory environment within which the risk exists. It should take into account all the stakeholders relevant to the risk management.

It also requires describing the relevant characteristics of the area for which the risk assessment is being completed as this will influence the likelihood and the impact of an emergency on the community. The MoH may need to consider some or all of the following aspects of its area, identifying emerging trends and possible future events, in addition to recording the current situation:

Health: What is the current health status of the community? Does it have any particular vulnerability in health terms (e.g. high level of chronic malnutrition, large population of elderly people)? What health facilities are available in the area, and would they be able to cope with the scale of event envisaged?

Social: What is the demographic, ethnic and socio-economic composition of the community? Are there any particularly vulnerable groups in the community (for instance young children, pregnant mothers, nomads, pastoralists, displaced persons or refugees)? How the various communities and vulnerable groups are geographically distributed within the area? How experienced is the community at coping with different types of emergencies? Coping capacity of local may vary and is often underestimated.

Environment: Is there any particular vulnerability (e.g. susceptibility to flooding, sensitive environments)? Is the area to be assessed urbanized, rural or mixed?

Infrastructure and economy: How is the infrastructure configured in the area (transport, utilities, business, etc.)? What are the critical supply networks in the area? Are there any sites in the area that are particularly critical for local, sub-regional, regional and national essential services (e.g. telecommunications hubs, regional medical facilities, head offices of large businesses etc.).What type of economy does it have?

Hazardous sites: What potentially hazardous sites exist in the area? Examples are settlements in flood prone areas or near industrial center with hazardous substances). Where are they in relation to communities or sensitive environmental sites?

Much of this information will already be in the public domain or available from other ministries, for example census results, local and national surveys, yearbooks and maps.

Step 2. Hazard identification

Each health facilities should identify any hazards in each own functional areas, present significant risk which could rise to an emergency.

Step. 3. Risk analysis – assessing the likelihood of hazards

The likelihood of any hazard in different geographical or functional areas varies. An example is the likelihood of an infectious diseases epidemic in human varies from place to place. A functional or geographical areas has likelihood of different hazard, so, each level of the health system needs to carry out their own assessment.

An assessment of likelihood of the hazards occurring within at least one year should be done. When assessing the likelihood of a hazard it is necessary to refer to the description of an outcome of an incident. For example, it is difficult to assess the likelihood of flooding in the next 5 years without defining the size of the flood incident to be assessed (small-scale floods are more likely than larger-scale floods). The outcome can be defined in various ways. For flooding, it may be appropriate to talk in terms of the area flooded. For many incidents it may be necessary to use numbers of fatalities or population affected. Although both measures - area flooded and fatalities - are consequences of the hazards, they are immediate or primary consequences that can be used as proxy measures to describe the outcome of the hazard.

Where there is a considerable range in the foreseeable outcomes of a potential hazard, it may be necessary to assess the likelihood (and subsequently impact) of the hazard at multiple outcomes. For example, it may be necessary to make separate risk assessments for different scales of flooding, different duration and severity of a drought, different fatality rate from an emerging pandemic influenza strain, different sizes of toxic chemical release.

2.2.1 Assessing the impact of hazards

Any hazards will have impact in four different categories – health, social, economic and environment. The health sector will be primarily directly impact and other sector may have indirect impact (loss of wages due to infectious diseases endemics). The measures of impact can be only partly objective (e.g. total numbers of people injured or displaced, total amount of chemical released) as the impact depends not only on absolute numbers but also on the nature of the society or environment experiencing the hazard (Coping capacity).

Rating the severity of health impacts should make every effort to back up what is a subjective judgment with evidence (for example measures from a previous similar incident) and to record what assumptions have been made.

Table 2-1 Impacts each category and measures of impacts

Level	Descriptor	Categories of Impact (see below)	Description of Impact
1	Insignificant (likelihood over 2 years >0.005%)	Health	Insignificant number of injuries or impact on health
		Social	Insignificant number of persons displaced and insignificant personal support required. Insignificant disruption to community services, including transport services and infrastructure.
		Economic	Insignificant impact on local economy.
		Environment	Insignificant impact on environment
2	Minor (likelihood over 2 years >0.05%)	Health	Small number of people affected, no fatalities, and small number of minor injuries with first aid treatment.
		Social	Minor damage to property. Minor displacement of a small number of people for < 24 hours and minor personal support required. Minor localized disruption to community services or infrastructure <24hours
		Economic	Negligible impact on local economy and cost easily
		Environment	Minor impact on environment with no lasting effects.
3	Moderate (likelihood over 2 years >0.5%)	Health	Sufficient number of fatalities with some casualties requiring hospitalization and medical treatment. Activation of major incident procedures in one or more hospitals.
		Social	Damage that is confined to a specific location or a small number of locations, but requires additional resources. Localized displacement of >100 people for 1-3 days.
		Economic	Limited impact on local economy with some short-term loss of production, with possible additional clean-up costs.
		Environment	Limited impact on environment with short-term or long-term effects.
4	Significant (likelihood over 2 years >5%)	Health	Significant number of people in the affected area impacted with multiple fatalities, multiple serious or extensive injuries. Significant hospitalization and activation of major incident procedures across a number of hospitals

		Social	Significant damage that requires support for local responders with external resources. 100 to 5,000 people in danger and displaced for longer than one week.Local responders require external resources to deliver support.
		Economic	Significant impact on the local economy with medium-term loss of production.
		Environment	Significant impact on environment with medium-to long-term effects.
5	Catastrophic (likelihood over 2 years >50%)	Health	Very large numbers of people in affected area(s) impacted with significant numbers of fatalities, large numbers of people requiring hospitalization with serious injuries with longer-term effects.
		Social	Extensive damage to property and built environment in affected area requiring major demolition. General and widespread displacement of more than 500 people for prolonged duration and extensive personal support required. Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support.
		Economic	Serious impact on local and regional economy with some long-term, potentially permanent, loss of production with some structural change. Extensive clean-up and recovery costs.
		Environment	Serious long-term impact on environment and/or permanent damage.

The health department will lead the impact assessment but other sector should be consulted and should fully participate in the assessment as any hazard will impact not only the health sector but others as well.

Step 4. Risk Evaluation

Plotting risk matrix after assessment and impact score of hazards or threat is a essential steps in evaluating the risk.

Each sector should have its own risk matrix for which it has lead responsibility. The formula used to combine likelihood and impact scores varies from one risk assessment approach to another.

- Very High Risk – these are classified as primary or critical risk which requires immediate attention. They may have a high or low likelihood of occurrence, but their potential consequences are such that they must be treated as a high priority. This means that strategies should be developed to reduce or eliminate the risks, but also that mitigation in the form of (multi-agency) planning, exercising and training for these hazards should be put in place and the risk monitored on a regular frequency. Consideration should be given to specific planning to the risk rather than generic.
- High Risk – these are classified as significant. They may have high or low likelihood of occurrence, but their potential consequences are sufficiently serious to warrant appropriate consideration after those risks classed as 'very high'. Consideration should be given to the development of strategies to reduce or eliminate the risks, but also that mitigation in the form of at least (multi-agency) generic planning, exercising and training should be put in place and the risk monitored regularly.
- Medium Risk - these risks are less significant, but may cause upset and inconvenience in the short-term. These risks should be monitored to ensure that they are being appropriately managed and consideration given to their being managed under generic emergency planning arrangements.
- Low Risk - these risks are both unlikely to occur and in their impact. They should be managed using normal or generic planning arrangements and require minimal monitoring and control unless subsequent risk assessments show a substantial change, prompting a move to another risk category.

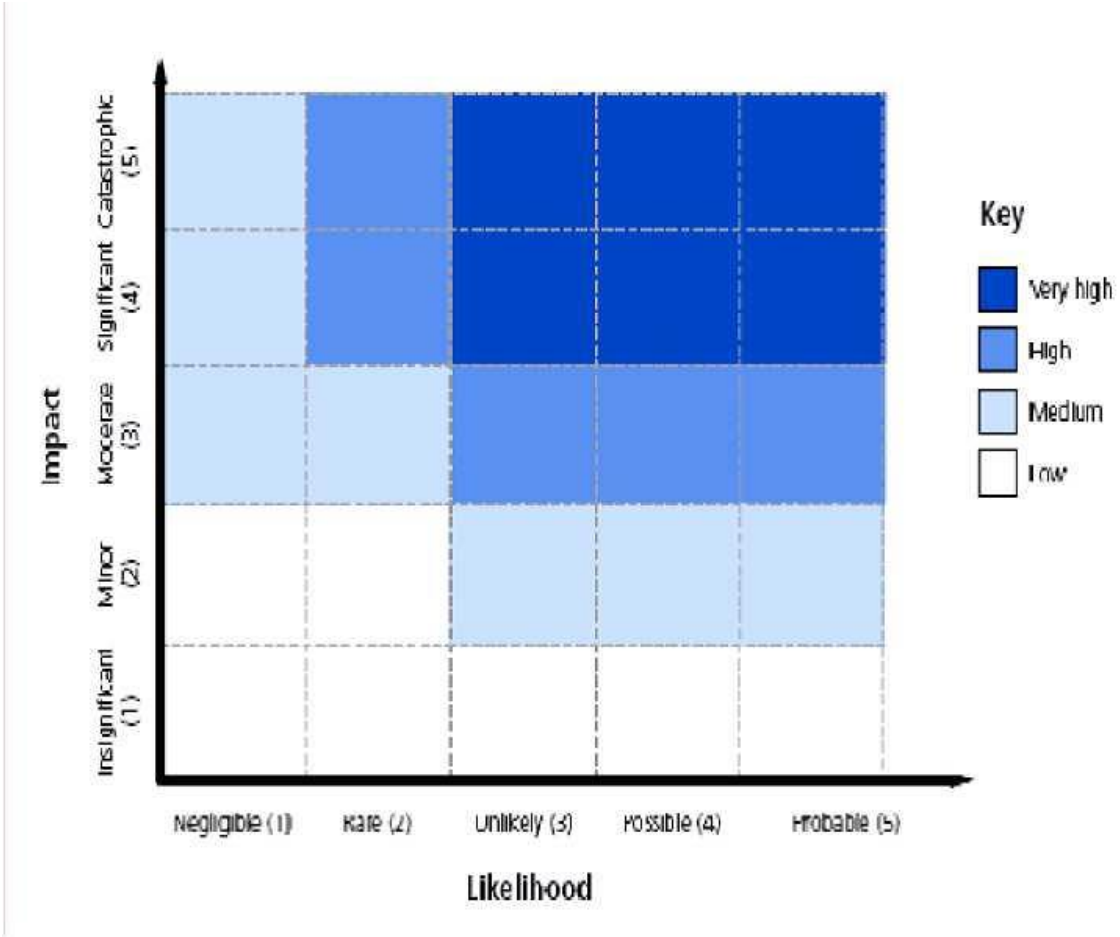

Figure 2-1 Risk Matrix

Step 5: Risk Reduction

Risk assessments are not an end in themselves. Assessments allow organizations to prioritize their contingencies activities on an objective basis and to measure the effectiveness of their actions in reducing risk or making response plans. Therefore, at the risk reduction stage of the process, sectors should prioritize their own risk reduction measures in accordance with the size of the risks and the gaps in the capabilities required to respond to those risks. Risk priority will be expressed on a 1-5 scale with 1 as the lowest priority and 5 as the highest risk priority.

Once priorities have been agreed, the next step is to identify and evaluate reduction options for each risk. The process of risk reduction has a number of stages that are described below:

- Assess the type and extent of the capabilities (equipment, trained staff, facilities, plans) required for managing and responding to the hazards.
- Identify the capabilities that are already in place.

- Identify the additional resources needed with a priority order keeping in mind the economic reality of the region.
- Identify what other organizations may contribute.
- Align actions with what is available at hand and other organizations' contributions to minimize or fill gaps.

Step 6: Monitoring, reviewing and publishing

Regular review of Risks and risk treatment programme should be done as the hazards and risk of hazard may change overtime, seasonal and due to other reasons. Experience from other places may be a good opportunity. Questions like "Could it happen here?" "Are our assumptions still valid?" and "Were there any impacts which were not taken into account in our risk assessment?" may be asked and review of the process may be based upon tha findings. The risk assessment should be seen as a living document and should be referred to regularly and updated when required.

2.3 Preparedness Planning

Planning is the theme of the whole emergency preparedness exercise. Plans should be updated regularly especially following major incidents and mock exercises to include lessons learned. The plans should form the basis of estimation of required resources for predictable emergencies including training. It should be exercised periodically to ensure that partners are familiar with the plan and able to execute their assigned role. Thus, it is essential that plans reflect the preparedness cycle of plan, train, exercise, and incorporation of after-action reviews and lessons learned.

The purpose of planning at this stage is to have agreed upon, implementable and/or operable plans in place, for which commitment and resources are relatively assured. Readiness planning includes working out agreements between people and/or agencies as to who will provide services in an emergency to ensure an effective, coordinated response. The written plan is a product, but not the main goal, of the planning process and needs to be operationalized.

The activities and steps in the process of planning include:

- Identify and convene preparedness planning team(s)/experts from different sectors including partners,
- Coordinate and integrate all response and recovery agencies/organizations in the planning process,
- Identify needs required to respond to potential emergencies,
- Discuss with partners to endorse and agree on their roles and responsibilities,
- Develop plans, to prevent, protect against, respond to, and recover from natural and man-made disasters,
- Prepare monitoring mechanisms and tools to ensure preparedness plan is operationalized,
- Ensure the integration of the plan in the sector regular plan.

2.4 Logistics and Capacity Building

Based on the risk assessment findings, capacity building activities shall be carried out in order to effectively mitigate, prepare for identified risks, and respond to any occurrence of PHE events.

The capacity building activity could focus on establishing and/or strengthening system and human resource needs related to PHEM: surveillance system, communication, laboratory, and logistics.

The logistic part focuses on stockpiling drugs, vaccines (buffer stocks), personal protection equipment (PPE), emergency health kits, medical supplies required for prevention and control of epidemics, and nutritional supplements. This has to be augmented with securing funds for related operational activities.

The public health emergency management unit shall ensure adequate supplies for the management of different hazards and identified risks are available, as part of the preparedness plan. While doing preparedness, estimate needs based on different assumptions. The table below gives a general approach on how to estimate of the amount of supplies needed according to the number of people in area at risk. Construct a simple excel spreadsheet to calculate the supplies that are required for your level.

System development:

- Identify an efficient surveillance strategy and establish/strengthen the inflow of gathered information from all sources in a timely fashion,
- Develop/strengthen communication procedures, and systems that support required communications with all levels,
- Provide ICT support to early warning sub process,
- Coordinate procurement and placement of communication systems based on a gap analysis of requirements versus existing capabilities.

Table 2.2 Sample 'excel worksheet to estimate required supplies for management of diarrhoeal disease

Level (eg. District, PHC/CHC/SC)	Population ofthe locality	Expected number of cholera cases	# of people with severe dehydration	ORS in sachets	Ringer's Lactate of 1000ml bag	others
(A)	(B)	(C)	(D)			
XXX	0	(B) x attack rate	(C) x severe rate	(C) x 6.5	(D) x 6	
YYY	0	(B)x attack rate	(C) x severe rate	(C) x 6.5	(D) x 6	
ZZZ	0	(B) x attack rate	(C) x severe rate	(C) x 6.5	(D) x 6	
TOTAL	Sum above	Sum above	Sum above	Sum above	Sum above	

2.5 Medical and Public health Surge

- Cases are investigated by public health professionals to reasonably minimize morbidity and mortality rates, even when the numbers of casualties exceed the limits of the normal medical infrastructure for an affected community.
- Improve tracking of cases, reducing exposure, adverse events, and patient disposition,
- Have or have access to a system that provides these capabilities,
- Decrease the time needed to execute medical and public health functions,
- Improve coordination public health and medical services,
- Ensure epidemiology response capacity consistent with hospital preparedness guidelines for surge capacity,
- Participate in the development of plans, procedures, and protocols to identify and manage local and regional public health and hospital surge capacity,
- Increase the proficiency of volunteers and staff performing collateral duties in performing epidemiology investigation and mass prophylaxis support tasks,
- Increase the number of physicians and other providers with experience and/or skills in the diagnosis and treatment of infectious, chemical, or radiological diseases or conditions possibly resulting from a terrorism-associated event who may serve as consultants during a public health emergency.

2.6 Monitoring and Simulation

Monitoring: This activity focuses on monitoring the implementation of identified activities indicated in the sub-process and reporting the status to respective process owners and concerned bodies based on the frequency set in the PHEM core process design. Operationalizing developed plans through exercising, training, and real-world events, and use after-action reports to support validation and revision of operational and Epidemic Preparedness and Response Plan (EPRP) is also a major activity that contributes to identifying flaws in our plan. The findings of the rehearsal guide the refinement of the consecutive plans that will be used at different phases.

Conduct performance review every year (Use various methods such as workshop, review meetings, questionnaire etc.). Document findings, lessons learnt and share with all members.

Monitoring indicators: Monitoring indicators found in this guideline are expected to be used as a starting point to conduct monitoring of programs at all levels. Therefore, these are expected to be refined and qualified according to the contexts with which preparedness activities are to be carried out.

Simulation: Once it is assumed that preparedness has reached to an acceptable level the next action is simulation where by the team at all level tests efficiency and reliability of preparedness activities in an ideal setting.

This exercise is a focused practice activity that places participants in a simulated situation and requires them to function in the capacity that would be expected of them in a real event. It can involve all partners that are expected to take part in each type of emergency management and are parts of the planning process. Conducting an exercise evaluates a system's ability to execute the plan. It allows the system to identify and correct problems in the plan prior to a real event.

Below are major activities that should be under taken to conduct a rehearsal under ideal settings:

Establish ideal contexts to simulate exercise

This is the step where you need to set objectives and methodologies for the risk assessment exercise. Always begin by defining the scope of the risk management activity in the context of its roles and responsibilities. Also define the physical, social, environmental and statutory environment within which the risk exists. Doing so will help you to exercise your simulation in a real-world setting. It should take into account all the stakeholders relevant to the risk management.

Identify a setting where you evaluate your preparedness taking the worst scenario for the selected risk. E.g. take a known flood prone area to simulate your preparedness in relation to malaria epidemic response.

Choose appropriate mechanism

It is possible to conduct simulation in different ways. Face to face, online etc You will need

to choose one which is appropriate for your purpose. There are many different types of exercises. Depending on time, money, resources and what you'd like to evaluate you can choose the type of exercise that is most appropriate.

- Orientation Seminar: An overview or introduction designed to familiarize participants with roles, plans, procedures or equipment.
- Drills: A coordinated and supervised activity normally used to test a single specific operation or function.
- Tabletop Exercise: A facilitated analysis of an emergency situation in an informal stress-free environment.
- Functional exercise: - A fully simulated active exercise that tests the capability of an organization to respond to a simulated event.
- Full-scale exercise: - simulates a real event as closely as possible.

Identify and orient team

Communicate all relevant stake holders on the purpose of the simulation exercise. This is a stage where you invite your partners that participate in the simulation exercise.

It is important always to brief participants on the purpose of the audit exercise so that everyone will be aware of its role and responsibility in action.

Conduct rehearsal

Remember to notify your staff if the simulation is in house and to notify public if the simulation is in real situation.

Identify strengths and limitations

The overall purpose of the rehearsal exercise is to identify systems and capacity strengths and weaknesses prior to and event. The process has to identify strengths and weaknesses in relation to:

- Coordination and collaboration that is expected to be in place,
- Vulnerability assessment and risk mapping outcomes used in the decision-making process,
- The quality of planning process, preparedness and response details in it,
- Capacity building measures taken prior to an event

Review/update the plan

Once the exercise is over the last step is to review and update plans according to findings. Make sure that the updated plan is circulated to all members participated in the planning and rehearsal exercise.

Section 3. Early Warning and Surveillance

Early warning is the identification of a public health threat by closely and frequently monitoring identified indicators and predicting the risk it poses on the health of the public and the health system.

The purpose of early warning is to enable the provision of timely and effective information to the public and to responders, through identified institutions that allow preparing for effective response or taking action to avoid or reduce risk.

Public health early warning indicators are conditions which, when they occur or change, signal an increase in the risk of occurrence of a particular threat to public health. These indicators are regularly monitored to identify situations for which a public health action may be needed. Major indicators of early warning include:

- An increase in the number of cases beyond expected /occurrence of outbreaks,
- Unexplained morbidity and mortality,
- Malnutrition,
- Evidence of increase in zoonotic disease and/or related vectors,
- Environmental changes such as air pollution, water quality changes, contamination,
- Drought, flood, severe weather (metrological information),
- Agricultural events such as reduced harvest, occurrence of pests or diseases,
- Refugees, internally displaced people, disruption of health services and infrastructure,

- Important industrial accidents; chemical spills etc.

An early warning system uses an event-based surveillance and indicator-based surveillance, as depicted in Figure 3-1 to monitor threats, risks and priority diseases respectively. As a basic principle of public health intelligence, both components are given equal attention and processed in the same way, since a signal leading to a public health alert can originate from either one

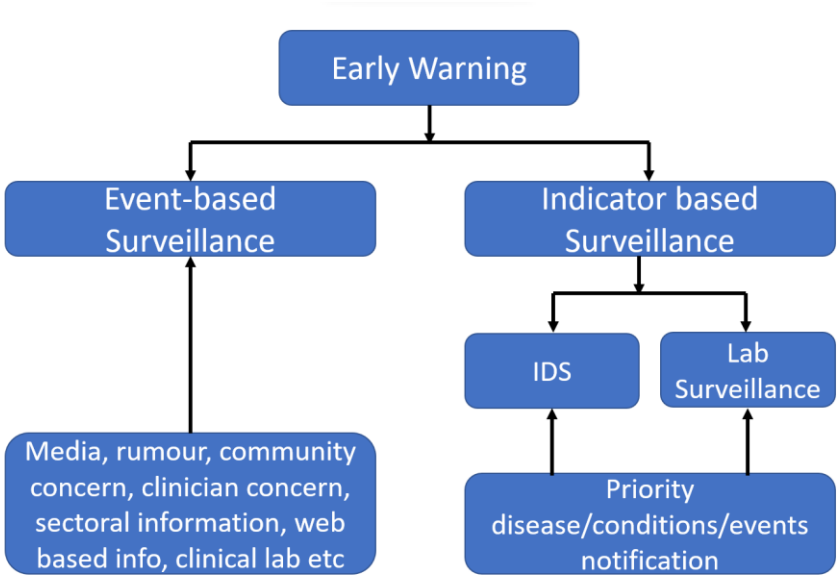

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Figure 3-1. Components of early warning system

The occurrence of outbreaks is the most common public health emergency of concern. Therefore, to ensure identification of risks and timely detection of an outbreak a system with an early warning mechanism agreed by all operational agencies is essential.

Reporting forms, case definitions and reporting mechanisms are developed to facilitate this. Health workers at the primary and secondary care levels are the key component of this early warning system. They must be trained to report any event of public health concern and suspected case of a disease with epidemic potential immediately to the PHEM coordinator, using direct communication and/or the outbreak alert form.

The analysis of these reports by the PHEM coordinator will allow for the identification of risks and clusters. It is vital that all events of public health concern and suspected cases are followed up and verified.

In camps established after large population displacements, an immediate response is necessary because of potentially high attack rates and high mortality rates. Effective monitoring of events can contribute greatly in preventing occurrences of PHEs while the early detection of outbreaks can have a major impact in reducing the numbers of cases and deaths. The impact of early detection and response in reducing the disease burden caused by an outbreak in an emergency situation is shown in Figure 3-2and Figure 3-3 below.

The Integrated Disease Surveillance (IDS) system will ideally detect an outbreak in the early stages. Once an outbreak occurs, investigation will be required to:

- Confirm the outbreak,
- Identify all cases and contacts,
- Detect patterns of epidemic spread,
- Estimate potential for further spread,
- Determine whether control measures are working effectively.

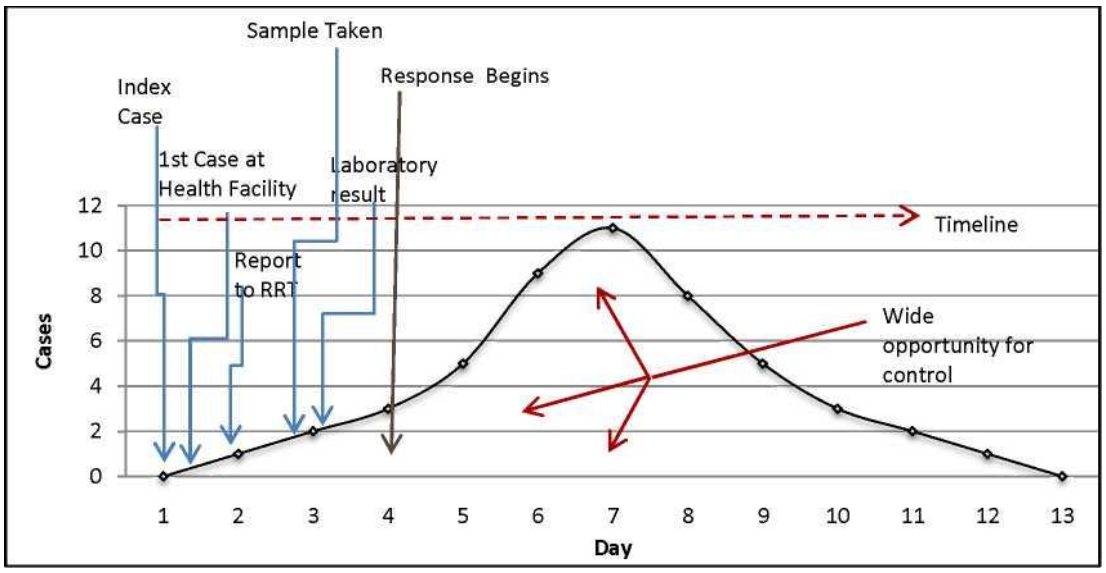


Figure 3-2. Impact of early detection of an outbreak

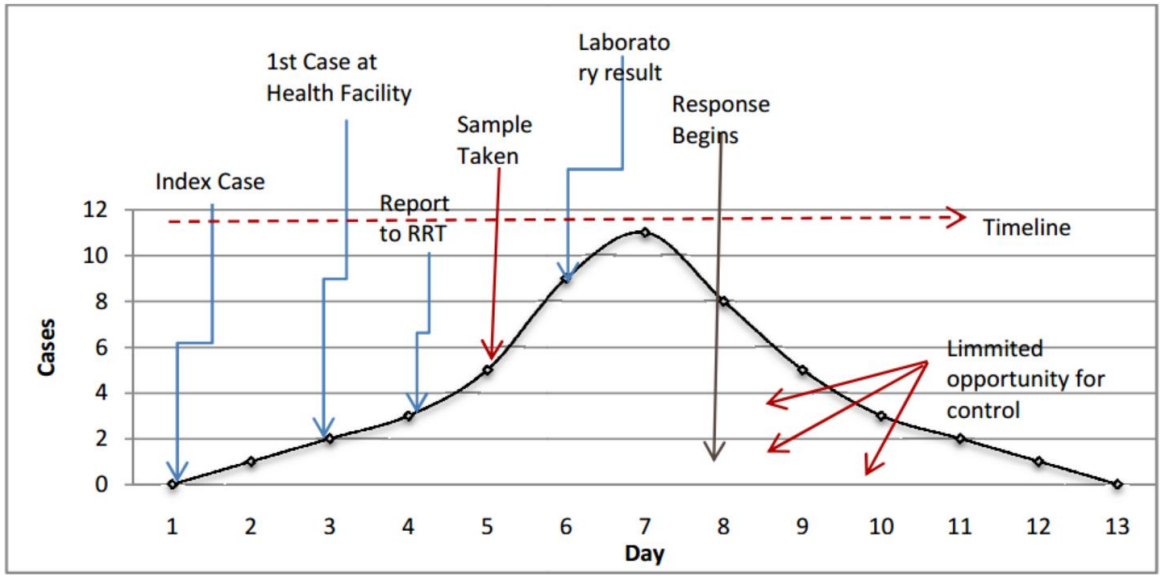


Figure 3-3 Impact of late detection of an outbreak

3.1 Indicator Based Surveillance

Indicator-based surveillance refers to structured data collected through routine integrated disease surveillance, nutritional and laboratory surveillance.

3.2 Integrated Disease Surveillance

In integrated disease surveillance, the various surveillance activities become integrated into one system within the broader national health system. It also emphasizes all functions of surveillance activities to be carried out using similar structures, processes and personnel.

Surveillance is the process of gathering, analyzing, and dissemination of information for the purpose of proper planning, implementation, and evaluation of health services/interventions. It is also defined as "Information for Action". A functional disease surveillance system is essential for defining problems and taking action. Proper understanding and use of this essential epidemiological tool (public health surveillance) helps health workers at the district and health units to set priorities, plan interventions, mobilize and allocate resources, detect epidemics early, initiate prompt response to epidemics, and evaluate and monitor health interventions. It also helps to assess long term disease trends.

Objectives of surveillance:

- To detect epidemics/outbreaks so that they can be controlled in a timely manner,
- To predict epidemics so that health services can plan to respond, prevent where possible, treat and control priority diseases,
- To monitor trends of priority diseases in order that changing trends inform policy decision,
- To evaluate an intervention so that effective and efficient actions/policies are identified and supported.

3.2.1 identifying Priority Diseases and Conditions for Surveillance

Surveillance could not be established for all disease. So, disease should be prioritise based on the data already available from all sector. These diseases and conditions are selected based on one or more of the following criteria:

- Diseases which have high epidemic potential (anthrax, avian human influenza, cholera, measles, meningococcal meningitis, pandemic influenza, smallpox, severe acute respiratory syndrome (SARS), viral haemorrhagic fever (VHF), and yellow fever),
- Required internationally under IHR2005 (smallpox, poliomyelitis due to wild-type poliovirus, human influenza caused by a new subtype, SARS),
- Diseases targeted for eradication or elimination (poliomyelitis due to wild-type poliovirus, Measles, Rubella, Tuberculosis, neonatal tetanus (NNT),
- Diseases which have a significant public health importance (rabies, dysentery, malaria, dengue, relapsing fever, typhoid fever, typhus and severe malnutrition);
- Diseases that have available effective control and prevention measures for addressing the public health problem they pose.
- Notifiable diseases identified by the state.

Table 3-1 List of reportable diseases/ conditions in Mizoram

Diseases	**Syndromes**
1. Acute Flaccid Paralysis (AFP)/Polio 2. Measles	1. Fever 2. Fever with rash

3. Rubella 4. Avian Human Influenza 5. Cholera 6. Dracunculiasis/Guinea worm 7. Maternal and Neonatal Tetanus 8. Dysentery 9. Malaria 10. Meningococcal Meningitis 11. Relapsing Fever 12. Severe Malnutrition 13. Typhoid fever 14. Typhus – Scrub Typhus 15. Anthrax 16. Chickenpox 17. Chikungunya 18. Congo Crimean Haemorrhagic Fever 19. Dengue 20. Diphtheria 21. Human rabies 22. Japanese Encephalitis 23. Kyasunur Forest Disease 24. Leptospirosis 25. Mumps 26. Non typhoidal salmonellosis 27. Pertussis 28. Shigellosis 29. Viral Hepatitis A 30. Viral Hepatitis B 31. Tuberculosis in children 32. Neonatal Tetanus 33. Plaque	3. Fever with Bleeding 4. Fever with altered sensorium 5. Cough with fever 6. Cough without fever 7. Loose watery stool with blood 8. Loose watery stool without blood 9. Jaundice 10. Animal bite 11. Snake bite 12. Acute Encephalitic syndrome 13. Acute Hepatitis 14. ARI/ Severe acute respiratory infection (SARI) 15. ARI/ Influenza like Illness (ILI)

*The list may be review and update from time to time as required

In addition to the above reportable diseases and conditions, it is required to report the following emergency illnesses or health conditions that are of concern to the public which need early response.

- Clusters of respiratory illness (including upper or lower respiratory tract infections, difficulty breathing and Adult Respiratory Distress Syndrome),
- Clusters of gastrointestinal illness (including vomiting, diarrhoea, abdominal pain, or any other gastrointestinal distress),
- Influenza-like constitutional symptoms and signs,
- Clusters neurologic symptoms or signs indicating the possibility of meningitis, encephalitis, or unexplained acute encephalopathy or delirium,
- Cluster of rash illness,
- Haemorrhagic illness,
- Botulism-like syndrome,
- Sepsis or unexplained shock,
- Febrile illness (illness with fever, chills or rigors),

- Disease caused by antimicrobial resistant organism,
- Non-traumatic coma or sudden death,

Note: Region specific disease or events that are public health importance and which warrant surveillance can be added to their surveillance system.

3.2.2 Standard Case Definition

Case definition: is a set of criteria used to decide if a person has a particular disease, or if the case can be considered for reporting and investigation.

Standard case definition: is a case definition that is agreed upon to be used by everyone within the country/State. Standard case definition can be classified as confirmed, probable, and possible or suspected.

A standard case definition of suspected and confirmed cases of the reportable diseases and conditions listed above is indicated in Table 3-2. These definitions must be used at all levels including the community, health professionals working at health sub-centres, PHC/CHCs, hospitals, health offices at different levels, private health facilities, other government health facilities and NGO clinics.

Table 3-2 Standard case definition of reportable disease/conditions to be used at health centres and above

Diseases/condition	Suspected	Confirmed
Acute flaccid paralysis (AFP)/ Polio	Acute flaccid paralysis is defined as sudden onset of weakness and floppiness in any part of the body in a child <15 years of age, or paralysis in a person of any age in whom polio is suspected. (WHO)	Laboratory confirmed
Diphtheria	An illness of upper respiratory tract characterized by the following: a) Laryngitis or pharyngitis or nasopharyngitis or tonsilitis AND b) adherent membranes of tonsils, pharynx and/or nose (WHO)	Laboratory confirmed
Pertussis	Person of any age with cough lasting ≥2 weeks or any duration in an infant with: - Paroxysms (fits of coughing) - Inspiratory whooping - Post-tussive vomiting (vomiting immediately after coughing) - Without other apparent causes. (WHO)	Laboratory confirmed

Tuberculosis	Suspected case: Any patient having cough more than 2 weeks duration Probable case: Patient with symptoms suggestive of pulmonary TB (cough more than 2 weeks with or without fever) diagnosed by MO as TB with or without radiological signs consistent with pulmonary TB. (IDSP)	Laboratory confirmed
Neonatal Tetanus	Any neonate with a normal ability to suck and cry during the first 2 days of life and who thereafter cannot suck normally between 3 and 28 days of age and becomes stiff or has convulsions/spasms (jerking of muscles), or both. (WHO)	No Laboratory confirmation required
Measles	Any person in whom a clinician suspects measles infection, OR Any person with fever and maculopapular rash, i.e. non-vesicular AND Cough or Coryza (runny nose) or conjunctivitis (red eyes) or Lymphadenopathy or Arthralgia. (WHO)	<u>Laboratory-confirmed measles case:</u> A suspected case of measles that has been confirmed positive by testing in a proficient laboratory, and vaccine-associated illness has been ruled out <u>Epidemiologically linked measles case:</u> A clinical case of measles that has not been confirmed by a laboratory, but was geographically and temporally related, with dates of rash onset occurring 7–21 days apart from a laboratory-confirmed case or another epidemiologically linked measles case. <u>Clinically compatible measles case:</u> A clinical case of measles, but no adequate clinical specimen was taken and the case has not been linked epidemiologically to a laboratory-confirmed or epidemiologically linked case of measles or other communicable disease.
Chikungunya	Any person With or without history of travel to or	Laboratory confirmed

	having left a known endemic area 15 days of symptoms AND Meeting the following clinical criteria Acute onset of fever Arthralgia/arthritis With or without skin rash (NVBDCP)	
Rubella	Any person in whom a clinician suspects measles infection, OR Any person with fever and maculopapular rash, i.e. non-vesicular AND Cough or Coryza (runny nose) or conjunctivitis (red eyes) or Lymphadenopathy or Arthralgia. (WHO)	Laboratory confirmed
Japanese Encephalitis	Person of any age, at anytime of the year with acute onset of fever and change in mental status (including symptoms such as confusion, disorientation, coma or inability to talk) And/or New onset of seizures (excluding simple febrile seizures) Other early clinical findings may include an increase in irritability, somnolence or abnormal behaviour greater than that seen with usual febrile illness. (IDSP)	Laboratory confirmed
Hepatitis B	An acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue and right upper quadrant tenderness. - Biological signs include increased urine urobolinogen and >2.5 times the upper limit of serum alanine aminotransferase. Note: Most infections occur during early childhood. A variable proportion of adult infections are asymptomatic (IDSP)	Laboratory confirmed
Dengue fever	**Probable case:** An acute febrile illness of 2-7 days duration with two or more of the following manifestations: Headache, retro-orbital pain, myalgia, arthralgia, rash, haemorrhagic manifestations OR Non-ELISA based NS1 antigen/IgM positive	**Confirmed case:** A clinical description of Dengue fever with at least one of the following: Demonstration of Dengue virus antigen in serum samples by NS1-ELISA. Demostration of IgM antibody titre by ELISA

		positive in single serum sample. Detection of viral nucleic acid by polymerase chain reaction(PCR). Isolation od Dengue virus (Virus culture +ve) from serum, plasma, leucocytes. IgG seroconversion in paired sera after 2 weeks with Four fold increase of IgG titre.
Malaria	A patient with fever in endemic area during transmission season, or who has recently visited an endemic area during transmission season, or who has recently visited and endemic area, without any other obvious cause of fever like: • Cough and other signs of respiratory infection • Running nose and other signs of cold • Diarrhoea • Pelvic inflammation indicated by severe low back ache, with or without vaginal discharge and urinary symptoms • Skin rash suggestive of eruptive illness • Burning micturition • Skin infection e.g. boils, abscess, infected wounds • Painful swelling of the joints • Ear discharge However, none of these symptoms exclude malaria with certainty. Only an experienced health functionary can exclude other 'obvious causes of fever" (NVBDCP)	**Clinical Malaria:** A patient with fever in endemic area during transmission season, or who has recently visited an endemic area without any other obvious cause of fever will be considered as a case of clinical malaria if the diagnosis cannot be established within 24 hours and treated accordingly. For ruling out other causes of fever, the following should be looked for. 1. Cough and other signs of respiratory infection 2. Running nose and other signs of cold 3. Diarrhoea 4. Pelvic inflammation indicated by severe low back ache, with or without vaginal discharge and urinary symptoms 5. Skin rash suggestive of eruptive illness 6. Burning micturition 7. Skin infection e.g. boils, abscess, infected wounds 8. Painful swelling of the joints 9. Ear discharge However, none of these symptoms exclude malaria with certainty. Only an

		experienced health functionary can exclude other 'obvious causes of fever" **Uncomplicated malaria (confirmed):** A patient with fever without any other obvious cause and diagnosis confirmed by microscopy showing asexual malaria parasites in the blood and/or positive rapid diagnostic test(RDT) and not having complications. These cases are recorded as Pf or Pv, a case of mixed infection is recorded as Pf in the programme. Severe malaria: A patient, who presents with symptoms and/or signs of severe malaria with laboratory confirmation of diagnosis. Severe malaria is clinically characterized by confusion or drowsiness with extreme weakness (prostration). In addition, the following may develop: cerebral malaria; generalised convulsion, pulmonary edema, severe anaemia, renal failure, hypoglycaemia, metabolic acidosis, circulatory collapse/shock; spontaneous bleeding; laboratory evidence of DIC; macroscopic haemoglobinuria; hyperthermia and hyperparasitemia (NVBDCP)
Cholera	Severe dehydration or death from acute watery diarrhea in a patient aged 5 years	Laboratory confirmed

	or more (Severe dehydration- lethargy, altered consciousness, decreased urine)	
Typhoid Fever	Any Patient with fever for more than one week and with any 2 of the following. • Toxic look • Coated tongue • Relative bradycardia • Splenomegaly	Laboratory confirmed
Acute Viral Hepatitis	Suspected case: Acute illness typically including the following: • Acute jaundice (Yellow sclera/skin) • Dark urine • Anorexia, malaise • Extreme fatigue • Right upper quadrant tenderness	Laboratory confirmed
Plaque	Disease characterized by rapid onset of fever, chills, headache, severe malaise, prostration with • Bubonic form: extreme painful swelling of lymph nodes at axilla, groin and • neck.(buboes) • Pneumonic form: cough with blood-stained sputum, chest pain, difficult breathing • Septicemia form: toxic changes in the patient.	Laboratory confirmed

Note:Any unusual occurrences, outbreaks, clusters of illnesses that may indicate public health hazards should also be reported immediately.

3.2.3 Reporting diseases and conditions under surveillance

Ensuring reliable reporting of surveillance data throughout the state is important so that program managers, surveillance officers and other health care staff can use the information for action.

The routine flow of surveillance data is usually from reporting sites to the next level up to the state level as indicated in figure 3.4 below. The community and health facilities especially health sub-centres and CHC/PHCs are the main source of information. The information collected from this site is compiled in standard forms, analyzed and then forwarded, to the Medical Officer at the CHC/PHCs. CHC/PHC uses standard formats to compile aggregate, and send the data to the Chief Medical Officer at the district, from which the state level receives. Feedback and information sharing will follow the same route.

Electronic Reporting: The state has electronic reporting system for Integrated Disease Surveillance (IDS) – Integrated Health Information Platform (IHIP) and Health Management Information System (HMIS) both developed by MoHFW, Government of India . Most of the current system uses web-based software which can be utilized at different levels, the lowest being at health sub-center level. It is envisaged that all the health centres will be utilizing information technology opportunities to send and share their reports electronically. Where ever possible, any reporting centre is expected to utilized the electronic reporting system in place, if not possible, paper-based reporting system may be utilized for the same.

Reporting Periodicity

The identified diseases and conditions are classified in to two reporting periods depending on their epidemic potential, diseases targeted for elimination and eradication as indicated in Table 3.1 above; immediately reportable and weekly reportable.

Immediate reporting: For the immediately reportable diseases, a single suspected case is considered as a suspected outbreak.

Therefore, suspected outbreak of these diseases should be notified from level to level within 30 minutes of identification as follows:

- From community or health Sub-center to PHC/CHC within 30 minutes,
- From PHC/CHC to District Health Officer (CMO Office) within another 30 minutes,
- From District Health Officer (CMO Office) to State (IDSP/Director of Health Services) within another 30 minutes,
- State to MoHFW within 24 hours of detection, if required.

You can report the information verbally or by telephone, radiophone or use an electronic method such as email, fax, mobile short message service.

Weekly reporting: Currently IDSP reporting system (Integrated Health Information Platform) is currently in place for weekly reporting. Apart from IHIP, Vaccine preventable diseases surveillance reporting follows separate reporting channels. Reporting of the total number of cases and deaths seen within a week (Monday to Sunday) and should be reported to the next level as follows:

- Health facilities report data from Monday to Sunday to district every Monday till midday;
- Districts report to State every Tuesday till midday.

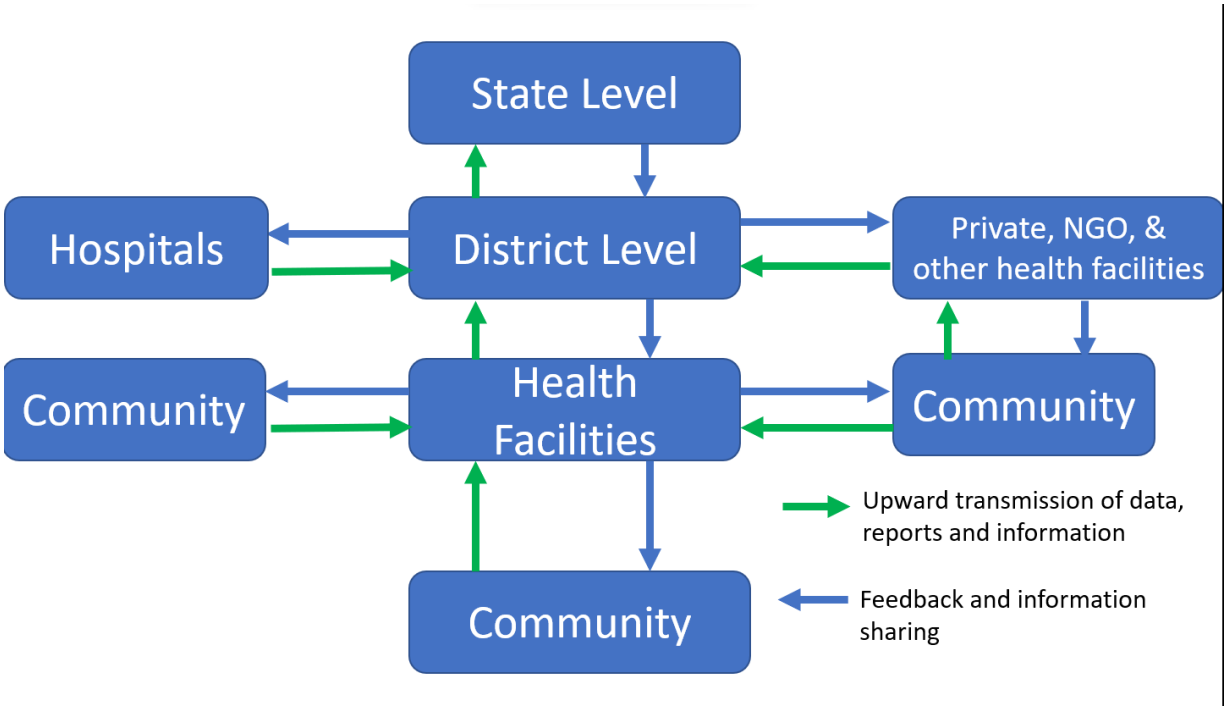


Table 3-4 Diagram illustrating the formal and informal flow of surveillance data and information

Reporting Tools

Different reporting tools are developed to facilitate the reporting of the identified diseases and conditions to be utilized at different levels of the health system. Most of the disease under surveillance are included in the IHIP platform and the platform is expanding to include most of the reportable diseases. These include:

- Weekly reporting form for Health Facilities
- Weekly reporting format for other levels

Table 3-4 List of formats to be used and the periodicity of reporting in different levels

Level	Formats to be used	Periodicity
Health Sub-centre	'S' form	Weekly
PHC/CHC	'P' form * 'L' form	Weekly
District Hospital	'P' form * 'L' form	Weekly
District	'P' form * 'L' form	Weekly

Reporting procedures

Reporting of the identified disease is either immediately or on weekly bases using their own reporting formats. Most of the disease under surveillance are included in the IHIP platform and the platform is expanding to include most of the reportable diseases. During epidemics

the reporting procedures varies from the routine reporting. The table below shows the reporting procedures and the formats to be used.

Table 3-5 List of identified diseases and their level of reporting procedures and formats to be used

Name of diseases	**Reporting Procedures and formats to be used**
All diseases included in the IDSP - IHIP	Form – 'S', 'P' & 'L' in IHIP
All Vaccine preventable diseases	VPD format
Heat related Illness	Heat related illness reporting format in IHIP
Air pollution related diseases	Air pollution related illness reporting format in IHIP & NOADS app for mobile devices
Vector Borne Diseases – Malaria, Dengue, etc.	M forms and IHIP

List of reporting format will require update and most of the disease under surveillance are being included in IHIP platform.

3.3 Laboratory-based Surveillance

Laboratory-based surveillance is the key part of the overall surveillance as the detection and control of outbreaks requires rapid identification of the pathogens and their source of infection. Starting from the state level to the health sub-centre level, suspected outbreaks should be confirmed by laboratory investigation.

With the existing Laboratory at the CHC/PHCs and District Hospitals and the upcoming establishment of Public Health Laboratory, these may be utilized in any Public health emergency as and when required. The purpose of the public health laboratory network is to improve the performance of laboratories in support of disease surveillance and response. The laboratories will establish communication channels for routine communication, exchange of information and interaction in specified ways with each other and with PHEM at every level.

Some of the functions of a public health laboratory include provision of the following:

- Timely laboratory confirmation of disease pathogens for surveillance, including epidemic alert and response,
- Training and continuing education for laboratory personnel on laboratory techniques, use of equipment, and appropriate and safe collection, storage and transportation of specimens,
- Strengthened rapid response to outbreaks investigation,
- Enhanced coordination and promotion of quality assurance programs for clinical and environmental laboratories, certification and proficiency testing.

3.3.1 Designated Laboratories for Surveillance

At the state and district levels, identify laboratories that can:

- Ensure safe collection, handling, transportation and processing of specimens,

- Examine of the samples for diseases under surveillance and other environmental samples as per their capacity, for example malaria laboratory surveillance should be done at health post level.
- Identify samples which require transportation to the national laboratory or abroad,
- Ensure that the laboratories have all the necessary reagents, equipment, and supplies required.
- Provide information to all health facilities about the methods for transporting specimens including how to prepare, handle, ship, and store the specimens. Make sure to disseminate information about packing and shipping infectious material as directed by national policy.

The laboratory confirmation for most of diseases under surveillance can be performed at state levels. However, samples of a few diseases should be sent to the national laboratory to be examined,the list of which needs to be updated as the state progress in establishing Public Health Laboratory.

The local surveillance focal person should establish or strengthen routine communication with identified laboratories that receive specimens from fields. The surveillance focal person at each level of the health system should maintain an up-to-date list of the laboratories that have the capacity to perform required laboratory testing.

Table 3-6 Diseases under surveillance and the lowest level where laboratory diagnosis can be done

Name of disease	Sample type	Where to send samples

3.3.2 Improve Local Laboratory Capacity for Surveillance and Response

Once the laboratories are identified, support the laboratories to build their capacity to collect and analyze samples. Also make sure that the following are fulfilled:

- Ensure that specimen collection and transport media are pre-positioned in all identified laboratories. Rapid laboratory diagnostic tests or serological tests available for detection of priority diseases and hazards (for example chemicals) should be available for timely use in certain levels such as national and regional laboratories.
- Support the health facility in collecting the appropriate specimen for confirming the suspected case.
- Coordinate with the laboratory, as needed, to identify the correct specimen for collection and any special concerns or procedures.
- Collect and package the specimen safely or assist the health facility in collecting the specimen.
- Ensure the safe and reliable transport of the specimen from the health facility to the designated laboratory.
- Receive the laboratory results from the laboratory and report them promptly to the health facility and state levels. Also report results to the clinician for patient care.
- Take action with the health facility based on the laboratory report.

3.3.3 Specimen Storage and Transportation

Before storage or transportation of specimens, make sure that all the samples are labelled appropriately. Adhesive labels should be used whenever possible. The label should be permanently affixed to the specimen container. It should contain:

- the patient's name,
- a unique identification number,
- the specimen type and date and place of collection,
- the name or initials of the specimen collector.

To preserve bacterial or viral viability in specimens for microbiological culture or inoculation, specimens should be placed in appropriate media and stored at recommended temperatures. These conditions must be preserved throughout transport to the laboratory and will vary according to transportation time. Procedures will differ for different specimens and pathogens, depending on their sensitivity to desiccation, temperature, nutrient and pH level.

Many specimens taken for viral isolation are viable for two days if maintained in type-specific media at 4-8 ℃. These specimens must be frozen only as directed by expert advice, as infectivity may be altered.

Specimens for bacterial culture should be kept in appropriate transport media at the recommended temperature. This ensures bacterial viability while minimizing overgrowth of other microorganisms. With the exception of cerebrospinal fluid, urine and sputum, most specimens may be kept at ambient temperature if they will be processed within 24 hours. For periods over 24 hours, storage at 4-8 °C is advisable except for particularly cold-sensitive organisms such as Shigella species, meningococcus, and pneumococcus. These exceptions must be kept at ambient temperature. Longer delays are not advisable, as the yield of bacteria may fall significantly.

Specimens for antigen or antibody detection may be stored at 4-8 °C for 24-48 hours, or at minus 20 ℃ for longer periods. Sera for antibody detection may be stored at 4-8 °C for up to 10 days. Although not ideal, room temperature may still be useful for storing serum samples for antibody testing, even for prolonged periods (weeks). Thus, samples that have been collected should not be discarded simply because there are no refrigeration facilities available.

Transport of specimens requires appropriate safety boxes, cold boxes and ice packs and may require a suitable cold chain.

3.4 Event-based Surveillance

An event means a manifestation of disease or an occurrence that creates a potential for disease.Event-based surveillance is the organized and rapid capture of information about events that are potential risk to public health. This information can be rumours and other ad-hoc reports transmitted through normal channels (i.e. established routine reporting systems) and informal channels (i.e., media, health workers and nongovernmental organizations reports, etc.) Event-based surveillance encompasses the following two areas:

- Events related to the occurrence of disease in humans, such as a cluster of cases of a disease or syndromes, unusual disease patterns, or unexpected deaths as recognized by health workers and other key informants in the country,
- Events related to potential risks for humans' health, such as events related to diseases and deaths in animals, contaminated food products or water, environmental hazards including chemical and radio-nuclear events, extreme weather forecasts including flood and drought.

Event-based surveillance complements indicator-based surveillance. Both systems should be seen as essential components of the national surveillance system. Event-based surveillance systems rely on the immediate reporting of events and help to detect:

- Rare and new events not specifically included in indicator-based surveillance.
- Events that occur in populations which do not access health care through formal channels.

Sources of information for event-based surveillance include:

- Media, in most developed and developing countries the media are the most important informal source of information on public health events. Therefore, media are very important sources in event-based surveillance.
- Health care workers can be involved in event-based surveillance as primary reporting sources, such as during patient consultations, or as secondary sources passing on rumours picked up through patient consultations.
- Community members can be also used as sources of information for event-based surveillance.
- Scientific findings related to new organisms, drug resistance, etc., may trigger public health action.
- Agriculture, environment, meteorology and others may collect information on health-related risks and exposures.
- International watch; through report and websites etc. as a country can be affected secondarily by a health event emerging abroad.

Events that are reported through these channels should be verified by the PHEM system. Event verification is the systematic process by which an officer verifies the reality of events, their etiology, potential for spread, and the need for assistance in affected regions. The verification process relies on the source of the event report. Some sources are always reporting verified event. However, reports from media and unofficial sources are not verified; such information must be cross-checked against independent sources and may require active searching for additional information.

Additionally, reported or identified events needs to be evaluated for their relevance to see if the 'event is within the scope of public health?' which is usually straightforward; and their reality if it really did happen?This may require a few phone calls to verify.

3.5 Data Analysis and Interpretation

Surveillance data analysis and interpretation is a crucial part that guides responses to public health emergencies. The analysis provides key information for taking prompt public health actions.

Data analysis provides the following important outcomes:

- Frequency count by reporting units help in identifying outbreaks or potential outbreaks.
- Analysis of routine data provides information for predicting changes of disease rates over time and enables appropriate action.
- Disease rates change over time. Some of these changes occur regularly and can be predicted such as an increase of malaria cases following the rainy season. Analysis and use of the trends in summary data over time provides information for improving prevention activities.
- Identifies problems in the health system; so that gaps can be effectively implemented. For example, an outbreak of malaria should alert the public health manager about the possibility of poor vector control, migration of infected people, etc. in that area.
- During an outbreak, analysis of the data identifies the most appropriate and timely control measures. Analysis in terms of person, time, and place will be help focus the intervention.
- During an acute epidemic of a disease or condition the information that is generated from data analysis leads to the identification of the most appropriate and timely control actions. The actions are taken immediately to limit the epidemic and prevent further cases from occurring.

Data analysis and interpretation should be done daily and weekly at each level where data are collected (starting from health facility level to state level).

3.5.1 Surveillance Data Analysis and Interpretation

The major steps in data analysis are: creating database or filed paper data, data cleaning and data analyzing and interpretation (information generation).

Organize the Data

Create an electronic database or file paper data: The reports that are being received daily and weekly have to be entered on daily basis into an electronic database or kept on file using a paper format at each level of the health system. In order to avoid loss of electronically saved data always make a backup and save it on different computer or save it on a server.

Data cleaning: before starting analysis check if the data is complete. If reports are missing or part of the data is incomplete try to get the data before starting analysis.

For routine weekly surveillance data calculate the completeness of the reports. All districts and levels above should calculate the completeness of the reports received on weekly basis. A report is said to be complete if all the reporting units within its catchments area has submitted the reports on time. E.g. if 9 out of 10 health facilities have submitted, then the report is said to be incomplete (or 90% complete).

$$\text{Completeness} = \frac{\text{The number of health facilities reported in that week}}{\text{Total number of health facilities expected to report}} \text{ X } 100$$

Note that the number of health facilities that are expected to report for a particular level (e.g. for a district) are government hospitals plus health centers plus other health facilities such as NGO health facilities and other government health facilities.

A report (from a reporting unit) is said to be on time, if it reaches the designated level within the prescribed time period. If it reaches later, then the report is considered to be late. The timeliness of a reporting unit can be calculated by assessing how many of its expected reports have come on time.

Perform Data Analysis

Simple data analysis is done to find information related to person, place, and time. The minimum data analysis practice that has to be generated includes:

- Trends over time (line graph, bar graph or histogram),
- Geographic distribution of the disease or the outbreak (dot map),
- Frequency of cases, deaths (table),
- Case fatality rate (CFR),
- Attack rate (AR).

All the analysis can be disaggregated by age, sex, place, at risk groups, etc. File or store the information generated through data analysis in an "analysis book". Additionally, some of the graphs, tables and maps can be posted on the wall. Update the graphs tables and maps every week.

Analyze data by time: Time includes the variables such as day, week, month, and year. The purpose of "time" analysis is to detect changes in the number of cases and deaths over time. It also helps to compare the current disease trend with previous trends. It enables you to see if thresholds are reached or not.

Data about time is usually shown on a graph. Graphs are made with bars (a bar graph) or lines (a line graph) to measure the number of cases over time. The number or rate of cases or deaths is placed on the vertical or y-axis. The time period being evaluated is placed along the horizontal or x-axis.

Example: The line graph below shows the trend of meningococcal meningitis cases in a village of population of 27,000. Here the time period is a week. The trend of the disease over weeks is increasing. Also it indicates that the alert threshold is crossed at week 5.

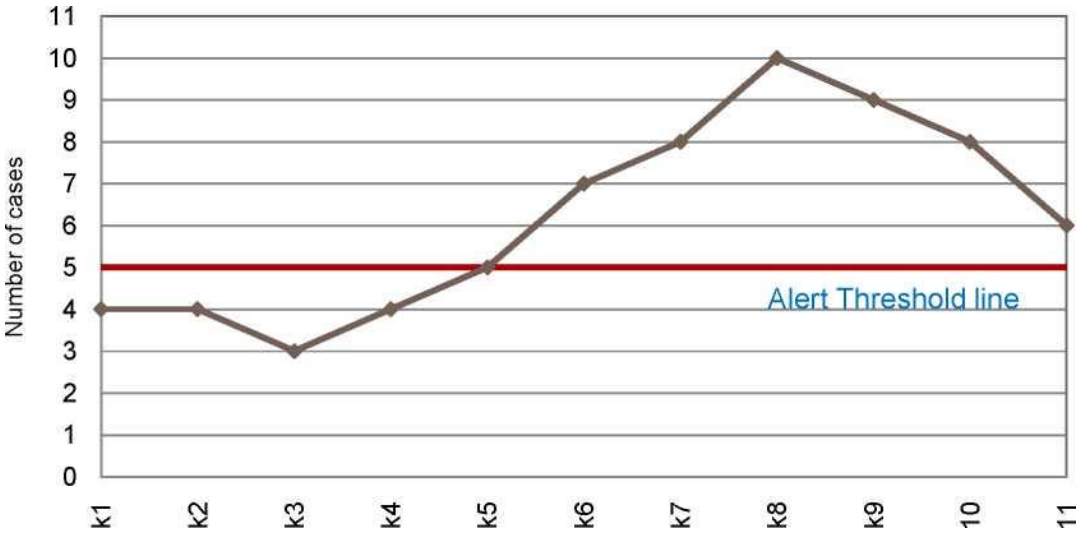


Figure 3-5 An example of data analysed using time factor

Analyse data by place: Analysing data according to place gives information about where a disease is occurring such as district, block, town, village etc. Establishing and regularly updating a spot map of cases for selected diseases can give ideas as to where, how, and why the disease is spreading. An analysis of place provides information on:

- Clusters of cases occurring in a particular area,
- Spot locations of cases and identify populations at highest risk for transmission of the disease,
- Travel patterns that relate to the method of transmission for this disease,
- Common sources of infection for the cases,
- The population distribution and population density of the area,
- The variety of populations in an area (farming area, high-density urban area, refugee settlement, and so on),
- Environmental factors such as rivers, lakes, pumps, and so on,
- Show distances between health units and villages (by travel time or distance in kilometers).

Use manual methods or geographic information system (GIS) software to create a map to use as part of routine analysis of surveillance of disease. On a map of the area where cases occurred, mark the following:

- Roads, water sources, location of specific communities and other factors related to the transmission risk for the disease or condition under investigation. For example, a map for neonatal tetanus includes locations of traditional birth attendants and health facilities where mothers deliver infants.
- Location of the patients' residences or most relevant geographical characteristic for this disease or condition (for example, by village, neighbourhood, work camp, or refugee settlement. Another example is when mapping young patients during a meningitis outbreak remember to locate the school that the patients attend.)
- Other locations appropriate to the disease or condition being investigated.

Analyze data by person: Analysis by person includes the variables such as age, sex, ethnicity and other occupational risk factors such health workers, food handlers, miners, etc. A simple count of cases does not provide all of the information needed to understand the impact of a disease on the community, health facility, or district, but simple percentages and rates are useful for comparing information reported.

Make a distribution of the cases by each of the person variables in the reporting formats. For example, compare the total number and proportion of suspected and confirmed cases of measles by:

- Age group
- Sex
- Occupation
- Urban versus rural residence
- Vaccination status
- Risk factors
- Outcomes
- Final classification

For each priority disease or condition under surveillance, use a table to analyze characteristics of the patients who are becoming ill. For surveillance and monitoring, use a table to show the number of cases and deaths from a given disease that occurred in a given place and time.

To make a table:

- Decide what information you want to show on the table. For example, consider analysis of measles cases and deaths by age group,
- Decide how many columns and rows you will need. Add an extra row at the bottom and an extra column at the right to show totals if needed.
- Label all the rows and columns.
- Record the total number of cases or deaths or both as needed.

Table 3-7 Example of table showing measles cases and deaths

Age group	Number of reported cases	Number of deaths	% of reported cases
0 - 4 years	40	4	40/50*100 = 80%
5-14 years	9	1	9/50*100 = 18%
15-30 years	0	0	0/50*100 = 0%
31 years and older	1	0	1/50*100 = 2%
Total	50	5	50/50*100 = 100%

To calculate the percentage of cases occurring within a given age group from the example given above;

- Identify the number of cases reported within each age group from the data for which time or person characteristics are known. (For example, there are 40 cases in children 0 - 4 years age group)
- Divide the number of cases within each age group by the total number of reported cases. (For example, for children age 0 - 4 years age group, divide 40 by 50 which is equal to 0.8.)
- Multiply the answer with 100 to calculate the percentage. (0.8 x 100 = 80 %)

Case Fatality Rate (CFR): The case fatality rate helps to

- Indicate whether an outbreak is identified timely,
- Indicate whether the case-management is performed properly,
- Identify the level of response to treatment (virulent, new or drug-resistant pathogen),
- Indicate poor quality of care or no medical care,
- Compare the quality of case management between different catchment areas, cities, and district.

Public health programs can reduce the case fatality rate by ensuring that cases are timely detected and good quality case management takes place. Some disease control recommendations for specific diseases include reducing the case fatality rate as a target for measuring whether the epidemic response has been effective.

To calculate CFR, use the following formula:

$$\text{CFR} = \frac{\text{Number of death from specific disease}}{\text{Total number of cases from that specific disease}} \times 100$$

- Divide the number of deaths by the number of reported cases for each age group.(For example, the number of reported cases for age group 0 - 4 years is 40 and death is 4.So divide 4 by 40 = 0.1)
- In the same way divide the total number of deaths by the total number of reported cases.(For example, the total number of reported cases is 50 and the number of total deaths is 5.So divide 5 by 50 = 0.1)
- Multiply the answer by 100 to get the rate (0.1 x100 = 10%)

Table 3-8 Example of table showing measles cases and deaths in district X in a year

Age group	**Number of reported cases**	**Number of deaths**	**Case fatality rate**
0-4 years	40	4	4/40*100 = 10%
5-14 years	9	1	1/9*100 = 11%
15-30 years	0	0	0/0*100 = -
31 years and older	1	0	4/40*100 = 0%
Total	50	5	5/50*100 = 10%

Attack Rate (AR): Calculate AR on weekly basis during an epidemic. Calculating AR helps to:

- calculate the resources needed to respond to the epidemics,
- evaluate if the threshold is reached,
- to know the speed of dissemination of the disease

AR is a variant of an incidence rate, applied to a narrowly defined population observed for a limited period of time, such as during an epidemic.

$$\text{Attack Rate} = \frac{\text{Number of new cases during specified period}}{\text{Number of susceptible persons}} \text{ X } 100$$

Example- from the above table the number of new measles cases reported during the year is 50. If we consider the total at risk population of district X is 4500, then the AR is 50 divided by 4500 multiplied by 100 which is 1.1%(50/4500 x 100 = 1.1%).

Interpret the Analyzed Data

Compare the current situation with previous week/months/quarter, seasons and years:

- Observe the trends on the line graphs and look to see whether the number of cases and deaths for the given disease is stable, decreasing or increasing.
- If case fatality rates have been calculated, is the rate the same, higher, or lower than it was in the previous months.
- Determine if thresholds for action have been reached or crossed.

Thresholds are markers that indicate when something should happen or change. They help surveillance and program managers answer the question, "When will you take action, and what will that action be?"

Thresholds are based on information from two different sources:

- A local situation analysis for the specific disease or condition describing who is at risk for the disease, what are the risks, when is action needed to prevent a wider epidemic, and where do the diseases usually occur (example - a specific facility/district level malaria epidemic threshold should be determined based on the 5 years average data);
- International recommendations from technical and disease control program experts.

These guidelines recommend two types of thresholds: an alert threshold and an action threshold for the diseases under surveillance (See table 3.9 below).

- An alert threshold suggests to health staff that further investigation is needed and preparedness activities should be initiated. Health staffs respond to an alert threshold by:
    - Reporting the suspected problem to the next level,
    - Reviewing data from the past,
    - Requesting laboratory confirmation,

  - Being more alert to new data and the resulting trends in the disease or condition,
  - Investigating the case or condition,
  - Prepositioning of drugs and supplies,
  - Mobilization of the needed resources,
  - Alerting the appropriate disease-specific program manager and district epidemic response team to a potential problem.
- An action threshold triggers a definite response. It marks that the findings from either the routine surveillance or special investigation signal the need for action beyond confirming or clarifying the problem.Possible actions include communicating laboratory confirmation results to concerned health centers, implementing an emergency response such as immunization, community awareness campaign, or improved infection control practices in the health care setting etc.

Table 3-9 Example of threshold levels for declaring an epidemic for diseases under surveillance

Name of disease	**Action threshold level**
Polio	A single laboratory confirmed wild polio virus case
Japanese Encephalitis	A single laboratory confirmed case JE Case

Summarize the analysis results

Consider the analysis results with the following factors in mind:

- Trends for inpatient cases describe the most severe cases of a particular disease; this is because generally only severe cases are hospitalized. Deaths are most likely to be detected for cases that are hospitalized.
- Increases and decreases may be due to factors other than a true increase or decrease in the number of cases and deaths being observed. For example large population movements or changes in health services can affect disease pattern.
- If no decrease is occurring while undertaking appropriate health intervention, the number of cases is remaining the same or increasing, consider whether any of the following factors are affecting reporting:
  - Has there been a change in the number of health facilities reporting information? o Has there been any change in the case definition that is being used to report the disease or condition?
  - Is the increase or decrease a seasonal variation?
  - In community outreach or health education activities that would result in more people seeking care?
  - Has there been a recent immigration or emigration to the area or increase in refugee populations?
  - Has there been any change in the quality of services being offered at the facility? For example, lines/waiting times are shorter, health staffs are more helpful, drugs are available, and clinic fees are changed.

Table 3-10 Summary of types of analysis, objectives, tools and methods

	Objective	**Tools**	**Method**
Time	Detect abrupt or long-term changes in disease or unusual event occurrence, how many occurred, and the period of time from exposure to onset of symptoms.	Record summary totals in a table or on a line graph or histogram.	Compare the number of case reports received for the current period with the number received in a previous period (weeks, months, seasons or years)
Place	Determine where cases are occurring (for example, to identify high risk area or locations of populations at risk for the disease)	Plot cases on a spot map of the district or area affected during an outbreak.	Plot cases on a map and look for clusters or relationships between the location of the cases and the health event being investigated.
Person	Describe reasons for changes in disease occurrence, how it occurred, who is at greatest risk for the disease, and potential risk factors	Extract specific data about the population affected and summarize in a table.	Depending on the disease, characterize cases according to the data reported for case-based surveillance such as age, sex, place of work, immunization status, school attendance, and other known risk factors for the diseases.

Communicate the Information

The main objective of outbreak communication is to communicate with the public in ways that build, maintain or restore trust, and encourage participate in the early warning activities. Mechanisms of accountability, involvement, and transparency are important to establish and maintain trust. Elements of communication include risk communication, alert/ warning and provision of feedback.

Risk communication: refers to activities for sharing information and ideas about risks and actions to deal with real and potential dangers that could lead to an indiscriminate demand that is impossible to meet.

Effective communication and warnings have to be short, concise, understandable, and actionable, answering the questions of "what?", "where?", "when?", "why?", and "how to respond?". The use of plain language in simple, short sentences or phrases enhances the user's understanding of the warning. Effective warnings should also include detailed information about the threat with recognizable or localized geographical references. Therefore, proper communications keep the public informed to calm fear and to encourage cooperation with the epidemic response. Develop community education messages to provide the community with information about recognizing the illness, how to prevent transmission and when to seek treatment. Begin communication activities with the community as soon as an epidemic or public health problem is identified.

- Decide what to communicate by referring to disease specific recommendations. Make sure to include:
    - The standard case definition of the disease,
    - When to report and where to report,
    - Signs and symptoms of the disease,
    - How to treat the disease at home, if home treatment is recommended,
    - Prevention measures that are feasible and that have a high likelihood of preventing disease transmission,
    - When to come to the health facility for evaluation and treatment,
- Decide how to state the message. Make sure that the messages:
    - Use local terminology
    - Are culturally sensitive
    - Are clear and concise
    - Address beliefs about the disease
- Use appropriate communication methods that are present in the district/locality
    - Radio
    - Television
    - Newspapers
    - Meetings with health personnel, community, religious and political leaders
    - Posters
    - Flyers
    - Presentations at markets, health centers, schools, women's and other community groups, service organizations, religious centers
    - Meetings with health personnel, community, religious and political leaders
    - Other (stickers, banners, brochures, etc.)
    - Give health education messages to community groups and service organizations and ask that they disseminate them during their meetings.

On a regular basis, meet with the community spokesperson to give:

- Frequent, up-to-date information on the epidemic and response,
- Clear and simple health messages that the media should use without editing,
- Clear instructions to communicate to the media only the information and health education messages from the PHEM guideline.

Provide feed-back: Often, health sub-centres, PHCs, CHCs, DHs/districts reliably report surveillance data to the next level as required. If the facility does not receive information back about how the data were used or what the data meant, health staff may think that their reporting is not important. As a result, future reporting may not be as reliable because health staff will not know if the information, they sent to other levels was useful or necessary. They will have a good understanding of the health situation at their own level, but they will not know or understand the situation at a district/state or national level.

When the district receive data, they should respond to the health facilities that reported it. And all the levels have to give feedback to the level that sends those reports.

The purpose of the feedback is to reinforce efforts of the health staff to participate in the surveillance system. Another purpose is to raise awareness about certain diseases and any achievements of disease control and prevention activities in the area.

Feedback may be written, such as a weekly or monthly newsletter, or it may be given orally, for example, during a monthly staff meeting, reaching them electronically or written reports

Section 4. Public Health Emergency Response

The public health emergency response section of the guideline focuses on topics such as rapid assessment of outbreaks, outbreak investigations, implementing control and prevention measures, and monitoring of the interventions.

The benefits of a rapid and effective response are numerous. Rapid response limits the number of cases and geographical spread, shortens the duration of the outbreak and reduces fatalities. These benefits not only help save resources that would be necessary to tackle public health emergencies, but also reduce the associated morbidity and mortality. It is therefore important to strengthen epidemic response, particularly at PHC/CHClevel and community levels. Attention needs to be focused on response strategies and continuous monitoring and evaluation of these activities.

Upon receipt of an alert, rumour, or detection of a deviation the disease or condition from the expected trend while performing weekly surveillance data analysis, communicate the respective level immediately for verification. For some communicable diseases, a single suspect case is the trigger for taking action, reporting the case to a higher level, and conducting an investigation. For other diseases, the trigger is when a case threshold is reached.

Some outbreaks or public health emergencies occur suddenly while others occur gradually giving you time to think. The size of the public health emergency can be smaller or large. Principal activities that are required during each phase of a public health emergency response are indicated below.

Table 4-1 Activities that need to be carried out at all administrative levels

Phase	**Activities**
Phase I Sudden onset crisis: First 24-72 hours Slow onset: First 1-2 weeks	Activation of the function of Emergency Operation Center at the state level Activation of the contingency plan or emergency plan Preliminary enquiries and consolidation of information PHEM Task Force Meeting – State and District level Preliminary working scenarios (anticipated health needs and risk) Inventory of "Who-Where-When-What' and gap analysis Preparation and dissemination of PHEM Task Force minutes and reports Conduct of regular task force meeting, planning Collection of baseline information Planning the initial rapid assessment Intensify the surveillance system
Phase II Sudden onset crisis: First 4-10 days Slow onset: First month	Health Resource Availability and Mapping System (HeRAMS) Conduct the initial rapid assessment Intensify the surveillance system Establish disease surveillance at the temporary site (if there is any) Review and distribution of standards and protocols Regular health coordination meeting – State/District/…. Update working scenarios, resource inventory and gap analysis Review/update health sector plan Review/update the sectoral humanitarian requirement Preparation and distribution ofregular bulletin /feedback
Phase III Sudden onset crisis: 4-6 weeks (disaster) to up to 3 months (conflict) Slow onset: 2-3 months	Operating based on the HeRAMS information Fully operational Early Warning and Response System (EWARS) andregular exchange of surveillance data and response operations Continuation of regular meeting Finalization of the response strategy Planning scenarios (identified health problems and risks) Communicate objectives, strategies and action plan with all concerned Implementation of response strategies and monitoring Preparation/update of multi-sectoral response appeal Resource mobilization Frequent updating of resource inventory and gap analysis

	Establishment of technical working groups as /when needed Organization and conduct of integrated training as/when needed Coordination of logistic support Monitoring implementation of PHE response strategies and the plan andtask force activities
Phase III Continuing humanitarian response and progressive recovery	Continuation of regular coordination meeting (e.g. bi weekly) Periodic updating of planning scenario and HeRAMS Establishment and /or suspension of technical working groups Maintenance of enhanced surveillance Real time or interim/mid-term evaluation of the sector response status Comprehensive assessment as needed Updating of strategic plan with increasing focus on recovery Contingency planning for possible changes in the situation
Phase out	Phase out plan for emergency programs as recovery activities increase Final evaluation and lessons learned exercise

Activation of EOC

The EOC is the physical location at which the coordination of information and resources to support incident management (on-scene operations) activities normally takes place.

EOC shall be activated:

- When more than one jurisdiction of District/PHC/CHC becomes involved in the response,
- When a Unified Command or Area Command is established,
- When the Incident Commander indicates that the incident could expand rapidly or involve cascading events,
- If similar incidents in the past required EOC activation,
- When the Regional President or Jurisdiction Leader directs that the EOC should be activated,
- When an emergency is imminent such as slow river flooding,
- Predictions of hazardous weather, elevated threat levels,
- As required by jurisdiction policy,
- When threshold events described in the Emergency Operation Plan occurs,
- The EOC remains activated to facilitate recovery needs long after the Incident Command completes its on-scene mission.

To deactivate EOC communicate with the Incident Commander or Unified Command.

The EOC be deactivated when:

- There is no need of additional resources,
- The epidemic/emergency is stabilized,
- The response objectives are met.

Investigation

District/CHC/PHC should aim begin an investigation of suspected epidemics within 3 hours of notification. Conduct an investigation when:

- A report of a suspected epidemic of an immediately notifiable disease is received,
- An unusual increase is seen in the number of deaths during routine analysis of data,
- Alert or action thresholds have been reached for specific priority diseases,
- Communities report rumours of deaths or a large number of cases that are not being seen at a health facility,
- A cluster of deaths occurs for which the cause is not explained or is unusual (for example, an adult death due to bloody diarrhea).

An epidemic or other public health investigation is a method for identifying and evaluating people who have been exposed to an infectious disease or affected by an unusual health event. The investigation provides relevant information for taking immediate action and improving long-term disease prevention activities.

The purpose of an outbreak investigation is to:

- Establish the existence of an outbreak;
- Verify the existence of the suspected epidemic or the public health problem;
- Collect information and laboratory specimens for confirming the diagnosis;
- Identify and treat additional cases that have not been reported or recognized;
- Identify the source of infection or cause of the epidemic;
- Describe how the disease is transmitted and the populations at risk;
- Select appropriate response activities to control the epidemic.

In investigating an outbreak both speed of the investigation and getting the right answer are essential. To satisfy both requirements follow the following 10 steps:

1. Prepare for field work
2. Establish the existence of an outbreak
3. Verify the diagnosis
4. Define and identify cases
5. Analyze data collected in terms of time, place and person
6. Develop hypotheses
7. Evaluate hypotheses
8. Refine hypotheses and carry out additional studies
9. Implement control and prevention measures
10. Communicate findings

4.1 Prepare for Field work

Decide to Investigate the Suspected Outbreak

For some communicable diseases, a single suspect case is the trigger for taking action, reporting the case to a higher level, and conducting an investigation. For other diseases, the trigger is when a certain threshold is reached. Health staff should promptly investigate the problem and respond to the immediate cases. Some health events require investigation to start

as soon as possible. CHC/PHC should aim to investigate suspected epidemics within 3 hours of notification.

Conduct an investigation when:

- A report of a suspected epidemic of an immediately notifiable disease is received,
- An unusual increase is seen in the number of deaths during routine analysis of data,
- Alert or action thresholds have been reached for specific priority diseases,
- Communities report rumours of deaths or about a large number of cases that are not being seen in the health facility,
- A cluster of deaths occurs for which the cause is not explained or is unusual (for example, an adult death due to bloody diarrhea).

Assemble Team

If epidemic preparedness activities have taken place in the PHC/CHC or health facility, staff who might be able to take part in the investigation should already be identified and trained. This team is termed as the Rapid Response Team (RRT).

The RRT should ideally involve the following experts but might be expanded depending on the disease suspected and the control measures required. The RRT should include:

- An epidemiologist
- A clinician
- A laboratory technician
- Environmental health specialist
- Public health officer
- A representative of the local health authority
- More professionals based on the type of the PHE

At the same time, reactivate the epidemic response committee. Arrange a meeting as soon as an epidemic is suspected or recognized. Then meet as often as needed to plan, implement, monitor and report on the epidemic response.

Identify and Assign Roles and Responsibilities

Identify the roles and responsibilities to be taken by different bodies within the RRT. Assign coordination roles at different levels including within the RRT. Make sure that the investigation team understands the link between the investigation and the selection of response activities for preventing additional cases and saving lives.

Also identify and assign the roles and responsibilities of other sectors and partners in the investigation.

Brief the RRT and Deploy to Field

Bring all the members of the RRT and brief them on the situation, the roles and responsibilities they are expected to play, means, time, and frequency of communication etc. Assign a clear leadership role to one of the team members.

In addition, review information already known about the suspected illness, including its transmission method and risk factors. Use this information to define the geographic boundaries and target population for conducting the investigation. Begin the investigation in the most affected places.

Avail relevant resources that are required during the field activity such as:

- Different formats (case-based formats, line list, outbreak reporting formats)
- This guideline and other relevant guidelines and reading materials
- Supplies for collecting lab specimens
- Drugs and other supplies that might be required for response
- Infection prevention equipment such as personal protective equipment (PPE)
- Laptop and wireless network for report writing and communicating reports
- Mobile phone with communication cost if necessary

Table 4-2 Principal steps in organizing and undertaking a rapid assessment

Steps	Activities
Initial decision	Agreement among health-related agencies and the government that an assessment is needed
Planning the assessment Day 1	Half day planning meeting and follow up work by individuals and sub groups to: • Compile available (secondary) data and agree on a working scenario, • Agree on objectives, scope of work and timeframe(dates) for the assessment and its relationship to other assessment activities, • Agree on information requirements, data collection methods, and criteria for deciding where to go (site selection procedures) and with whom to talk, • Design a rapid assessment tool, interview guides, identify any additional questions/observation that need to be added, • Identify personnel for field work, • Prepare maps, supplies, equipment and background information kits for field teams, • Assemble and train field team, • Arrange transport and communication for the field team, • Inform key persons (Council, MoH and partners) in areas to be visited, • Plan (arrange for) the processing and analysis of data during and after the field work.
Field work 5-6 days	Visits by teams to purposively-selected areas /sites. Interview and collect data from officials and other key informants at administrative and health facility levels. Interview community groups and households.
Analysis and reporting	Processing and analysis of data (primary and secondary data). Identification of priority problems, needs, risks and gaps.

3-4 days	Analysis of possible strategies and development of recommendations. Preparation of the report. Dissemination of the report.

4.2 Establish the Existence of an Outbreak

Once the surveillance system detects an outbreak, or alerts have been received, the lead health Authority must set up RRT to investigate.

In the event of a suspected outbreak, the RRT must:

- Meet daily to update the team on outbreak developments; to review the latest data on suspected cases/deaths and follow up any rumors;
- Oversee the investigation of reported cases to assess pathogen, source and transmission;
- Coordinate with the local health authorities, nongovernmental organizations and United Nations agencies.
- Implement the outbreak response plan set in the preparedness section for the disease covering the resources, skills and activities required;
- Review the human, logistic (stores, stocks, etc.) and financial resources available to manage the outbreak;
- Identify sources of additional human and material resources for managing the outbreak, e.g. treatment sites in a cholera outbreak;
- Define the tasks of each member in managing the outbreak, e.g. surveillance, vaccination;
- Ensure the use of standard treatment protocols for the disease by all agencies and train clinical workers if necessary;
- Ensure that clinical workers report suspected cases to the team immediately;
- Ensure that clinical workers are using standard treatment protocols;
- Ensure that cases are quantified by time and place;
- Produce spot maps and epidemic curves;
- Oversee the implementation of control measures.

The District Health authority/Chief Medial Officer has the overall responsibility for coordinating and undertaking epidemic investigations in their respective areas. In some regions, health facilities with appropriately trained health staff may undertake some or all aspects of investigating epidemics for some diseases or conditions.

In order to establish the existence of an outbreak:

- Review trends in cases and deaths due to the disease over the last 1-5 years (if available),
- Determine a baseline number to describe the current extent of the disease in the catchment area,
- Know the epidemic threshold for that particular disease,
- Compare the reported case versus the baseline and the threshold per month or week under that particular catchment area,

- Take into account factors influencing disease occurrences such as seasonal variations in some of the diseases such as malaria and meningitis,
- Based on the finding, decide whether the outbreak exists or not.

4.3 Verify the Diagnosis

Reports and alerts of outbreaks are frequent in emergency situations and must always be followed-up. It is important to be aware that in some languages one word may be used for more than one disease. Diagnosis must be confirmed either on a clinical basis by senior clinical workers or by laboratory tests, in which case specimens must be sent to a laboratory for testing.

The goals in verifying the diagnosis are:

- Ensure that the problem has been properly diagnosed and
- Rule out laboratory error as the basis for the increase in diagnosed cases.

When verifying the existence of an outbreak early in the investigation, you must also identify as accurately as possible the specific nature of the disease. Examine patients at the health facility and review records to confirm that the signs and symptoms meet the standard case definitions. Review laboratory results for the people who are affected. If you are at all uncertain about the laboratory findings, you should have a laboratory technician review the techniques being used. Collect samples to isolate the organism or identify the evidence for infection.

An assessment of current clinical and epidemiological information is the starting point for dealing with the problem of an outbreak of unknown origin. The historical knowledge of regional endemic and epidemic diseases, as well as their seasonality, further defines the possible causes. Since a variety of infectious agents can cause a similar clinical picture, the initial steps of the outbreak investigation (case definitions, questionnaires, etc.) should generally elaborate on known syndromes.

One or more specimen types may be required to define the cause of the outbreak. Laboratory confirmation of initial cases is necessary for most diseases when an outbreak is suspected. Specimens obtained in the acute phase of the disease, preferably before administration of antimicrobial drugs, are more likely to yield laboratory identification of the cause.

During the outbreak investigation, the information contained in the case investigation and laboratory request forms is collected along with the specimen. Assign each patient a unique identification number. It is the link between the laboratory results on the line listing form, the specimens, and the patient, which guides further investigation and response to the outbreak. This unique identification number should be present and used as a common reference together with the patient's name on all specimens, epidemiological databases, and forms for case investigation or laboratory request.

4.4 Define and Identify Additional Cases

Once the initial cases have been confirmed and treatment has begun, actively search for additional cases. The next task for investigator is to establish a case definition, or a standard

set of criteria for deciding whether, in this investigation, a person should be classified as having the disease or health condition under investigation.

In the health facilities where cases have been reported, search for additional suspected cases and deaths in the registers. Look for other patients who may have presented with the same or similar signs and symptoms as the disease or condition being investigated. Do the search in neighbouring health facilities too.

Also do the search for suspected cases, deaths and contacts in the community by identifying areas of likely risk where the patients have lived, worked, or travelled. Talk to other informants in the community such as ASHA, health workers, pharmacists, school teachers, veterinarians, farmers and community leaders etc. Collect information that will help to describe the magnitude and geographic extent of the outbreak. Refer newly identified cases to an appropriate health facility for treatment.

Record information about additional cases on a case-based reporting forms for at least the first five patients. Also, record information on a case-based form for all those patients from which laboratory specimens will be taken.

When more than five to ten cases have been identified, and the required number of laboratory specimens have been collected, record any additional cases on a line list. Use the line list as a laboratory transmittal form if 10 or more cases need laboratory specimens collected on the same day and specimens will be transported to the lab in a batch.

4.5 Analyze Data Collected in terms of Time, Person and Place

The methods for analyzing outbreak data are similar to the analysis of routine surveillance data described in section 2 above. Once the data had been collected, outbreak can becharacterized by time, place, and person. Characterizing an outbreak by these variables is called descriptive epidemiology. In fact, this step should be performed throughout the course of an outbreak.

During the initial analysis, summarize the epidemic data and look for clues about where the epidemic is occurring, where it is moving, the source of the epidemic (from a single source, for example, a common water well or a common source of food), and the persons at risk of becoming ill (for example, young children, refugees, persons living in rural areas, and so on).

Data analysis at this step will help to:

- Learn what information is reliable and informative (e.g. the same unusual exposure reported by many of the people affected) and what may not be as reliable (e.g. many missing or "don't know" responses to a particular question).
- Provide a comprehensive description of an outbreak by showing its trend over time, its geographic extent (place), and the populations (people) affected by the disease. This description allows to assess the outbreak in light of what is known about the disease (e.g., the usual source, mode(s) of transmission, risk factors, and populations affected) and to develop causal hypothesis.

- Make tables of the most relevant characteristics for cases (for example, comparing age group with vaccination status).

During an epidemic, these data will need to be updated frequently (often daily) to see if the information being received changes the ideas regarding the causes of the outbreak.

Analyze Data by Time

Prepare a histogram using data from the case-based reporting forms and line lists. Plot each case on the histogram according to the date of onset. As the histogram develops, it will illustrate an epidemic curve. Draw the epidemic curve for each of the localities separately. For example, decide if the curve should describe the entire CHC/PHC or the health facility catchment area where the case occurred.

An epidemic curve can provide information on the following characteristics of an outbreak:

- Pattern of the spread of the disease
- Magnitude
- The trend of the disease over time
- Exposure period and/or the disease incubation period

The overall shape of the epidemic curve can reveal the type (pattern) of outbreak which are:

- Common source
- Point source
- Propagated

A *common source* outbreak is one in which people are exposed continuously or intermittently to a common harmful source. The period of exposure may be brief or long. A continuous exposure will often cause cases to rise gradually (and possibly to plateau, rather than peak) (Figure 4.1).An intermittent exposure in a common source outbreak often results in an epidemic curve with irregular peaks that reflect the timing and extent of the exposure (Figure 4.2).

A *point source* outbreak is a common source outbreak in which the exposure period is relatively brief, and all cases occur within one incubation period. It has a sharp upward slope and a gradual downward slope typically describes a point source outbreak(Figure 4.3).

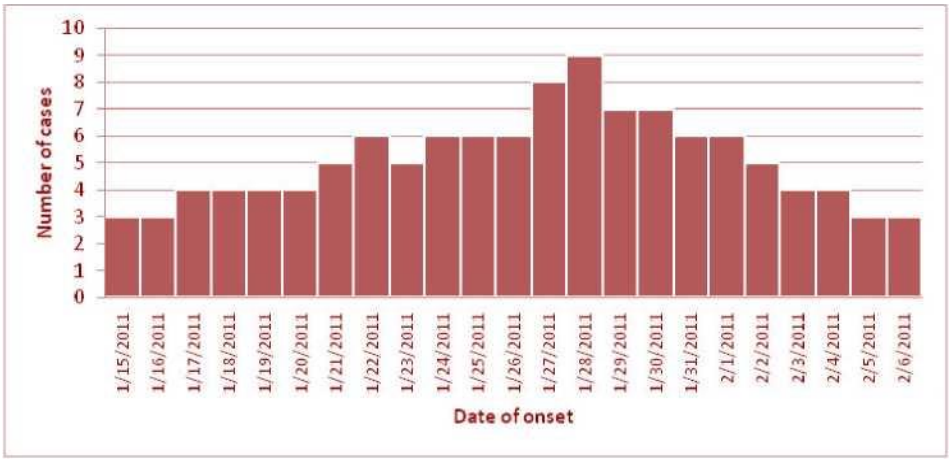


Figure 4-1 Epidemic curve of common source outbreak with continuous exposure

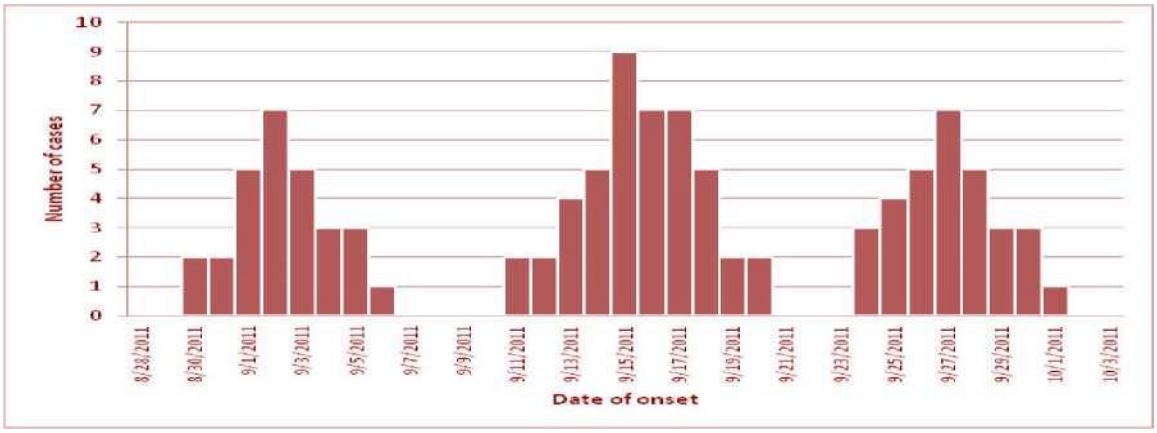


Figure 4-2 Epidemic curve of common source outbreak with intermittent exposure

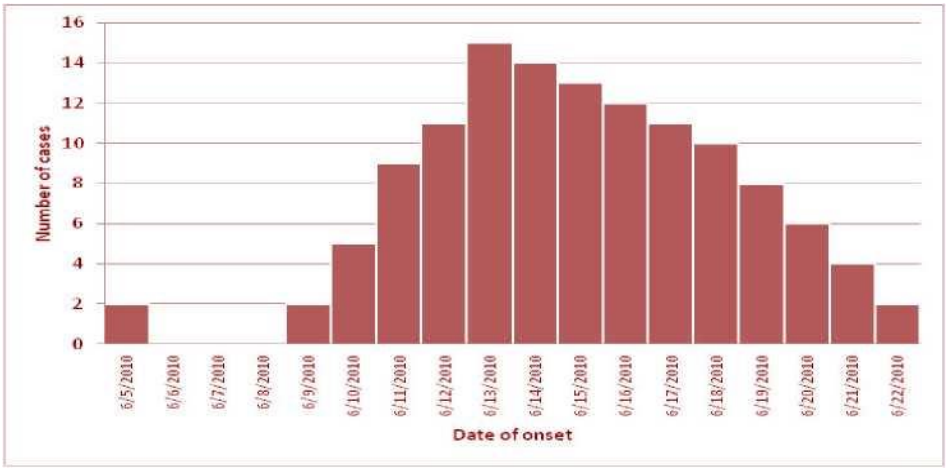


Figure 4-3 Epidemic curve of common source which is a point source outbreak

A *propagated* outbreak is one that is spread from person to person, as seen in Figure 4.4 below. Because of this, propagated epidemics can last longer than common source epidemics, and may lead to multiple waves of infection if secondary and tertiary cases occur. The classic propagated epidemic curve has a series of progressively taller peaks, each an incubation period apart, but in reality, the epidemic curve may look somewhat different.

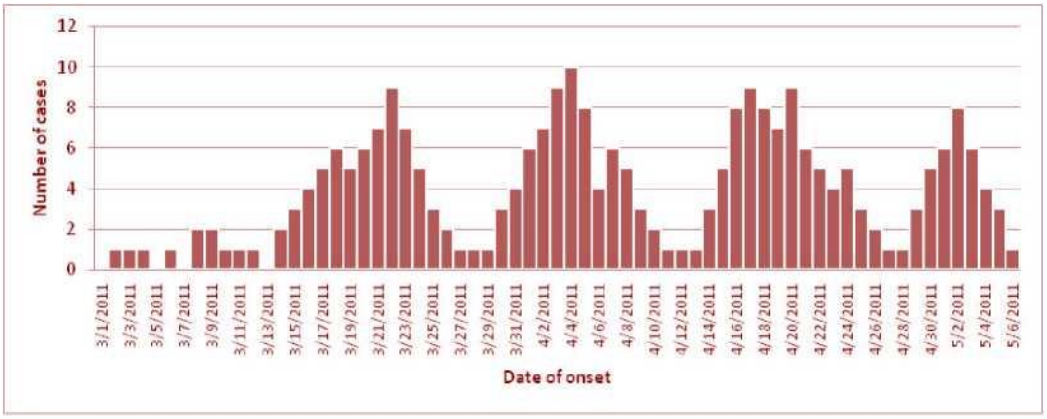


Figure 4-4 Epidemic curve for a propagated outbreak

Determination of incubation period and period of exposure are another use of epidemic curve. In common source outbreaks involving diseases with known incubation periods, epidemic

curves can help determine the probable period of exposure This can be done by looking up the average incubation period for the organism and counting back from the peak (median) case the amount of time of the average incubation period.

Highlight significant events on the histogram with arrows. For example:

- Date of onset of the first (or index) case
- Date the first case was seen at the health facility
- When the health facility notified the district
- When the district began the case investigation
- A concrete response began
- When the district notified the state level etc.

The purpose for highlighting these events with arrows is to evaluate whether detection, investigation, and response to the epidemic was timely. For example, monitoring the interval between the onset of the first known case and when the first case was seen in the health facility is an indicator of the community's awareness of the disease's signs and symptoms and the need to refer cases to the health facility.

Analyze Data by Person

Review the case-based forms and line lists and compare the variables for each person suspected or confirmed with the disease or condition. For example, depending on the factors that must be considered in planning a specific response, compare the total number and proportion of the suspected and confirmed cases according to one or more of the variables listed below:

- Age or date of birth, sex, occupation
- Urban and rural residences
- Immunization status
- Inpatient and outpatient status
- Risk factors
- Outcome of the episode such as whether the patient survived, died or the status is not known.
- Laboratory results
- Final classification of the cases
- Other variables relevant to the disease (for example death by age group).

Please see the disease specific guidelines for recommendations about the essential variables to compare for each disease.

Analyze Data by Place

Construct a spot map to using the place of residence on the case reporting forms or line lists. Then see what the map looks like and:

- Describe the geographic extent of the problem.
- Identify and describe any clusters or patterns of transmission or exposure.

- Depending on the organism that has contributed to this epidemic, specify the proximity of the cases to likely sources of infection.

Calculating place/location specific attack rates in addition to examining the number of cases in each locality allows comparison on the rate of transmission in different population sizes.

4.6 Develop a Hypothesis

In real life, hypotheses usually begin to generate as to explain why and how the outbreak occurred when it was notified. But at this point in an investigation, after some affected people were interviewed, spoken with other health officials in the community, and characterized the outbreak by time, place, and person, the hypothesis will be sharpened and more accurately focused. The hypothesis should address the source of the agent, the exposures that caused the disease, etc. For example when there is measles outbreak, the first hypothesis could be failure of vaccination or vaccine failure.

While developing hypotheses consider what was known about the suspected disease outbreak and look at the issues such as: What is the agent's usual reservoir? How it is usually transmitted? What vectors are commonly implicated? What are the known risk factors?

Descriptive epidemiology often provides some hypotheses. If the epidemic curve points to a narrow period of exposure, ask what events occurred around that time. If people living in a particular area have the highest attack rates, or if some groups with particular age, sex, or other personal characteristics are at greatest risk, ask why. Such questions about the data should lead to a hypothesis that can be tested.

4.7 Evaluate Hypotheses

The next step is to evaluate the credibility of the hypotheses. There are two approaches, depending on the nature of your data:

- Comparison of the hypotheses with the established facts and
- Analytic epidemiology, which allows to test your hypotheses.

Use the first method when the evidence is so strong that the hypothesis does not need to be tested. Use the second method when the cause is less clear. With this method, test the hypothesis by using a comparison group to quantify relationships between various exposures and the disease. There are two types of analytic studies: cohort studies and case- control studies. Cohort studies compare groups of people who have been exposed to suspected risk factors with groups who have not been exposed. Case-control studies compare people with a disease (case-patients) with a group of people without the disease (controls). The nature of the outbreak determines which of these studies to be used.

A cohort study is the best technique for analyzing an outbreak in a small, well-defined population. For example, a cohort study can be used if an outbreak of gastroenteritis occurred among people who attended ceremonies such as a wedding and getting a complete list of wedding guests is possible. In this situation, each attendee should be asked the same set of

questions about potential exposures (e.g., what foods and beverages he or she had consumed at the wedding) and whether he or she had become ill with gastroenteritis.

After collecting this information from each guest, an attack rate can be calculated for people who ate a particular item (were exposed) and an attack rate for those who did not eat that item (were not exposed). For the exposed group, the attack rate is found by dividing the numberof people who ate the item and became ill by the total number of people who ate that item. For those who were not exposed, the attack rate is found by dividing the number of people who did not eat the item but still became ill by the total number of people who did not eat thatitem.

To identify the source of the outbreak from this information, look for an item with:

- A high attack rate among those exposed and
- A low attack rate among those not exposed (so the difference or ratio between attack rates for the two exposure groups is high); in addition
- Most of the people who became ill should have consumed the item, so that the exposure could explain most, if not all, of the cases.

Usually, the mathematical association between exposure (consuming the food or beverage item) and illness for each food and beverage can be calculated. This is called the relative risk (RR) and is produced by dividing the attack rate for people who were exposed to the item by the attack rate for those who were not exposed.

Table 4-3 Food borne outbreak in a small town X after attending a wedding ceremony

Exposed to	People Who Ate				People Who Did not Eat				RR (d/h)
	Ill (a)	Not Ill (b)	Total (c = a+b)	AR (%) (d = a/c)	Ill (e)	Not Ill (f)	Total (g = e+f)	AR (%) (h = e/g)	
Doro wat	**4**	**32**	**36**	**11.1**	**3**	**20**	**23**	**13**	**0.9**
Kitfo	**8**	**23**	**31**	**25.8**	**6**	**24**	**30**	**20**	**1.3**
Kurt (Beef)	**5**	**33**	**38**	**13.2**	**3**	**18**	**21**	**14.3**	**0.9**
Tibs	**2**	**42**	**44**	**4.5**	**1**	**15**	**16**	**6.3**	**0.7**
Rice	**5**	**30**	**35**	**14.3**	**4**	**20**	**24**	**16.7**	**0.9**
Fruits cocktail	**7**	**24**	**31**	**22.6**	**10**	**36**	**46**	**21.7**	**1**
Mixed salad	**20**	**11**	**31**	**64.5**	**3**	**38**	**41**	**7.3**	**8.8**

In the example provided in the table above, more than 200 people attended the wedding. It was possible to interview 120 people out of which 60 fulfill the case definition. Attack rates for those who did and did not eat each of 7 food items are indicated in the table. From the table which item shows the highest attack rate? Is the attack rate low among people who did not eat that item? Mixed salad can be identified as the implicated source. The relative risk

(RR) is calculated as 64.5 / 7.3 = 8.8. This relative risk indicates that people who ate the mixed salad were 8.8 times more likely to become ill than were those who did not eat the mixed salad.

A Case-control study is used when the population is not well defined, and so cohort studies are not feasible. In these instances, the case-control study design should be used. In a case-control study, Both cases (ill) and controls (not ill) should be asked about their exposures. Then calculate a simple mathematical measure of association-called an odds ratio (OR)-to quantify the relationship between exposure and disease. This method does not prove that a particular exposure caused a disease, but it is very helpful and effective in evaluating possible sources of infection/disease.

When you design a case-control study, the most important decision is who the controls should be. Conceptually, the controls must not have the disease in question, but should be from the same population as the cases. In other words, they should be similar to the cases except that they do not have the disease. Common control groups consist of neighbours and friends of cases.

In general, the more cases and controls identified, the easier it will be to find an association. In an outbreak of 50 or more cases, 1 control per case will usually suffice. In smaller outbreaks, use 2 - 4 controls per case.

In a case-control study, AR cannot be calculated because the total number of people in the community who were and were not exposed to the source of the disease under study is unclear. Without an AR, an RR cannot be calculated; instead, the measure of association to be used in a case study is an OR. When preparing to calculate an OR, it is helpful to look at the data in a 2x2 table. For instance, suppose in an outbreak of hepatitis A in a small town, and a restaurant was suspected source. After questioning cases and controls about whether they had eaten at that restaurant, the data might look like this:

		Cases	**Controls**	**Total**
Ate at Restaurant 'A'	**Yes**	a=30	B=36	66
	No	C=10	D=70	80
Total		40	106	146

The odds ratio is calculated as axd/bxc. The OR for Restaurant A is thus 30 x 70 / 36 x 10, or 5.8. This means that people who ate at Restaurant A were 5.8 times more likely to develop hepatitis A than were people who did not eat there. Even so, it cannot be concluded that Restaurant A was the source without comparing its odds ratio with the odds ratios for other possible sources. It could be that the source is elsewhere and that it just so happens that many of the people who were exposed also ate at Restaurant A.

The final step in testing the hypothesis is to determine how likely it is that the study results could have occurred by chance alone. In other words, how likely is it that the exposure the study results point to as the source of the outbreak was not related to the disease after all? A test of *statistical significance* is used to evaluate this likelihood.

The first step in testing for statistical significance is to assume that the exposure is not related to disease. This assumption is known as the *null hypothesis*. Next, compute a measure of

association, such as a relative risk or an odds ratio. These measures are then used in calculating a chi-square test (the statistical test most commonly used in studying an outbreak) or other statistical test. Once the value for chi-square was obtained, look up its corresponding p-value (or probability value) in a table of chi-squares.

In interpreting p-values, use a cut-off point 0.05. When a p-value is below the 0.05 cut off point, the finding is considered "statistically significant," and the null hypothesis may be rejected in favor of *the alternative hypothesis*, that is the exposure is associated with disease could be concluded. The smaller the p-value, the stronger the evidence that the finding is statistically significant.

4.8 Refine Hypotheses and Carryout Additional Studies

When analytic epidemiological studies in steps above do not confirm the hypotheses, the hypothesis needs to be reconsidered and look for new vehicles or modes of transmission. This is the time to meet with cases to look for common links and to visit their homes to look at the products on their shelves.

Even when the analytic study identifies an association between an exposure and a disease, often the hypotheses need to be refined. Sometimes more specific exposure histories or a more specific control group are required.

When an outbreak occurs, whether it is routine or unusual, consider what questions remain unanswered about the disease and what kind of study to be used in the particular setting to answer some of these questions. The circumstances may allow to learn more about the disease, its modes of transmission, the characteristics of the agent, and host factors.

While epidemiology can implicate vehicles and guide appropriate public health action, laboratory evidence can confirm the findings. Environmental studies often help explain why an outbreak occurred and may be very important in some settings.

4.9 Implement Control and Prevention Measures

Even though implementing control and prevention measures is listed as step 9, in a real investigation this should be done as soon as possible. The data gathered in the course of these investigations should reveal why the outbreak occurred and the mechanisms by which it spread. This in turn, together with what is known about the epidemiology and biology of the organism involved, will make it possible to define the measures needed to control the outbreak and prevent further problems.

An outbreak may be controlled by eliminating or reducing the source of infection, interrupting transmission and protecting persons at risk. In the initial stage of an outbreak in an emergency situation, the exact nature of the causative agent may not be known and general control measures may have to be taken for a suspected cause. Once the cause is confirmed, specific measures such as vaccination can be undertaken according to the disease-specific guidelines.

During a response to an outbreak, encourage health staff at all health facilities to be vigilant in surveillance of the disease or condition. It should be ensured that the health staffs:

- Search for additional persons who have the specific disease and refer them to a health facility or treatment center for treatment or quarantine the household and manage the patient,
- Update line lists and monitor the effectiveness of the epidemic or response activity,
- Monitor the effectiveness of the outbreak response activity.
- Report daily the surveillance data.

Control strategies fall into four major categories of activity.

- Control and prevention measures specific for the disease.
- Prevent exposure (e.g. isolation of cases in cholera outbreak).
- Prevent infection (e.g. vaccination in measles outbreak).
- Treat cases with recommended treatment as in national or WHO guidelines.

Prevention of exposure: the source of infection is reduced to prevent the disease spreading to other members of the community. Depending on the disease, this may involve prompt diagnosis and treatment of cases using standard protocols (e.g. cholera), isolation and barrier nursing of cases (e.g. viral hemorrhagic fevers), health education, and improvements in environmental and personal hygiene (e.g. cholera, typhoid fever and shigellosis), control of the animal vector or reservoir (e.g. malaria, and yellow fever) and proper disposal of sharp instruments (e.g., hepatitis B).

Prevention of infection: susceptible groups are protected by vaccination (e.g. meningitis, yellow fever and measles), safe water, adequate shelter and good sanitation.

Prevention of disease: high-risk groups are offered chemoprophylaxis (e.g. malaria prophylaxis may be suggested for pregnant women in outbreaks) and better nutrition).

Prevention of death: through prompt diagnosis and management of cases, effective health care services (e.g. acute respiratory infections, malaria, bacterial dysentery, cholera, measles, and meningitis).

Patient isolation: The degree of isolation required depends on the infectiousness of the disease. Strict barrier isolation is rarely recommended in health facilities, except for outbreaks of highly infectious diseases such as viral hemorrhagic fevers. The isolation room must be in a building separate from other patient areas and access must be strictly limited. Good ventilation with screened doors is ideal, but fans should be avoided as they raise dust and droplets and can spread aerosols. Biohazard warning notices must be placed at the entrances to patients' rooms. Patients must remain isolated until they have fully recovered.

During outbreaks, isolation of patients or of those suspected of having the disease can reinforce stigmatization and hostile behavior of the public toward ill persons. The establishment of isolation rules in a community or in a health facility is not a decision to be taken lightly, and should always be accompanied by careful information and education of all members of the involved community. Every isolated patient should be allowed to be attended by at least one family member. Provided that enough supplies are available, designated family attendants should receive barrier nursing equipment, and be instructed on how to protect themselves when in contact with the patient.

Table 4-4 General precautions to be taken for isolation of cases in outbreaks

Isolation measure	Contagiousness of cases	Route of transmission	Type of protective measure	Diseases
Standard precautions	Moderate	Direct or Indirect contact with feces, urine, blood, bodyfluids and Contaminated articles	Hand-washing, safe disposal of contaminated articles	Most infectious diseases except thosementioned below
Enteric isolation	High	Direct contact with patients and with feces, and oral secretions	Contact precautions	Cholera, shigellosis,typhoid fever, Gastroenteritis, caused by rotavirus, E. coli, hepatitis A
Respiratory isolation	High	Direct contact with patients or oral secretions and droplets	Separate room, masks, contact precautions	Meningococcal meningitis, diphtheria, measles
Strict isolation	Very high	Airborne, Direct Contact with infected bloods, secretions, organs or semen	Separate room, Biohazard notification	Viral haemorrhagic fevers

Take steps to support improved clinical practices. Health staffs must be prepared to take these and other responses.

- Review with each health facility to learn whether the clinical staff know and use recommended protocols for case management of epidemic diseases.
- Make sure that clinicians receive laboratory confirmation of the epidemic disease, if the disease is laboratory confirmable.
- In a large epidemic, ask the medical officer at each health facility to identify an area that can be used for a large number of patients.
- Establish an isolation room for highly infectious diseases (for example; pandemic influenza, yellow fever, etc.)
- Ensure availability of safety and protective measures for health workers.
- Make the necessary drugs and treatment supplies available.
- Give clear and concise directions to health staff taking part in the response.

4.10 Communicate Findings

Communicate to Decision Makers and Health Workers

The final task in an outbreak investigation is to communicate the findings to people who need to know. This communication usually takes two forms:

1) an oral briefing for local health authorities and

2) a written report.

Oral briefing should be attended by the local health authorities and people responsible for implementing control and prevention measures. This presentation is an opportunity to describe what was done, what was found, and what should be done about it. Findings should be backup by scientific evidence and presented in a scientifically objective fashion.

A written report shouldfollows the usual scientific format: introduction, background, methods, results, discussion, and recommendations. By formally presenting recommendations, the report provides a blueprint for action. It also serves as a record of performance, a document for potential legal issues, and a reference if the health authorities encounter a similar situation in the future. Finally, a report that finds its way into the public health literature serves the broader purpose of contributing to the scientific knowledge base of epidemiology and public health.

Communicate to the Public and Media

Communication to the community will foster the prevention and control activity through their participation. Appropriate and timely information has to be delivered to the community on a regular basis.Some of the issues that might be included into the message are:

- Signs and symptoms of the disease;
- How to treat the disease at home, if home treatment is recommended;
- Prevention measures that are feasible and that have a high likelihood of preventing disease transmission (safe water handling, latrine construction and utilization, hand washing and personal hygiene, solid waste disposal, proper use of bed nets etc.);
- When to come to the health facility for evaluation and treatment;
- Immunization recommendations, if any.

Before the information is disseminateddecision should be made on how to state the message and make sure that the messages:

- Use local terminology easily understandable by the community,
- Are culturally sensitive, should be non-offensive,
- Are clear and concise,
- Address wrong beliefs about the disease,
- Promote good beliefs about the disease.

Give health education messages to community groups and service organizations and ask that they disseminate them during their meetings. Select appropriate communication methods that are present in the area such as:

- Radio, Television,
- Newspapers,
- Meetings with health personnel, community, religious and political leaders,

- Posters, brochures, leaflets, stickers, banners,
- Presentations at markets, health centers, schools, women's & other community groups, service organizations, religious centers.

Select and use a community liaison officer or health staff to serve as spokesperson to the media. As soon as the epidemic has been recognized:

- Tell the media the name of the spokesperson, and that all information about the epidemic will be provided by the spokesperson,
- Release information to the media only through the spokesperson to make sure that the community receives clear and consistent information.

Section 5. Recovery from Public Health Emergency

Disasters can have profound impacts on the livelihoods and health of affected populations. Restoring lifesaving services and assisting communities to cope with former and new health threats is a necessity to mitigate the impacts of disasters on human development needs, as reflected by the health-related Sustainable Development Goals (SDGs).

Recovery in the health sector also represents opportunities to catalyze action on health policy and to strengthen the capacity of countries and communities to manage risks of future events.

Reconstructing infrastructure and provision of supplies will not be sufficient if the overall system inhibits effectiveness of essential health services. For this reason, other aspects, such as management, performance, and other support systems have to be taken into consideration.

Recovery is defined as the process of rebuilding, restoring, and rehabilitating the community following an emergency, but it is more than simply the replacement of what has been

destroyed and the rehabilitation of those affected. It is a complex social and developmental process rather than just a remedial process. The manner in which recovery processes are undertaken is critical to their success. Recovery is best achieved when the affected community is able to exercise a high degree of self-determination.

There will be parallel plan and activities aimed at protecting lives and reducing disease, malnutrition and disabilities among the vulnerable populations in the affected areas, and strengthening of longer-term health development goals.

Recovery is a complex and long running process that will involve many more sectors and participants. Therefore, recovery plans are implemented and coordinated with all responsible government sectors at all levels, in collaboration with the non-profit sector and non-governmental relief organizations. Economic and social impacts estimation and priority setting for recovery activities have to be made together.

The recovery phase should begin at the earliest opportunity following the onset of an emergency, running in cycle with the response to the emergency. It continues until the disruption has been rectified, demands on services have returned to normal levels, and the needs of those affected have been met.

The key principles for recovery and reconstruction of the health sector include:

Equity: Expansion of service to underserved areas, the poor and vulnerable population;

Effectiveness: Increasing the access to and the quality of key services;

Appropriateness: Adoption of new service delivery models to respond to new health needs if the previous system was outdated; and

Efficiency: Greater overall efficiency with savings used to finance some of these measures.

5.1 Scope and Challenge

There are four interlinked categories of impact that individuals and communities will need to recover from. The nature of the impacts- and whether and at what level action needs to be taken - will depend in large part on the nature, scale, and severity of the emergency itself.

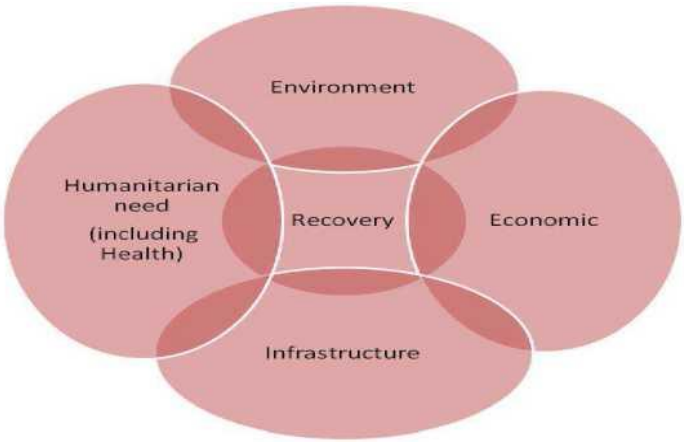


Figure 5-1Major areas impacts of an emergency that require recovery

Recovery is most effective where recovery management arrangements provide a comprehensive and integrated framework for managing all potential emergencies and where assistance measures are provided in a timely, fair and equitable manner and are sufficiently flexible to respond to a diversity of community needs.

For the purpose of PHEM, the goal of recovery is to implement short- and mid-term recovery processes after a major public health incident. This will include identifying the extent of damage caused by an incident, conducting thorough post-event assessments and determining and providing the support needed for recovery and restoration activities to minimize future loss from a similar event.

A *major public health incident* is defined as the occurrence of an outbreak or another disaster which disrupted the social, cultural, and psychological integrity of the community, interrupted health service provision or required additional health manpower and requires attention of the health sector.

The challenge is to find the right balance in restoring the system to its previous level and how much better it needs to be rebuilt. This will depend on the status of development of a country and what a country can afford to sustain.

First, it is better that the reconstruction addresses key issues currently faced by the health sector and provide better health service like accessibility to the poor and other vulnerable population sub-groups.

Second, the future health system should be designed to be prepared for and responsive to all major hazards in the future. Risk based and all-hazard approach for emergency preparedness and response should be practiced.

Third, the existing health system in the affected areas may need to be streamlined to meet the changed needs because of different population profiles and epidemiology.

Table 5-1 Roles and responsibilities of actors at different levels

Level	Responsibility
State level	Remain vigilant about outbreak /possibility of any epidemics and take

PHEM	effective steps against them. Determine the need for recovery or rehabilitation (sanitation, temporary settlements, psychosocial assistance, reconstruction etc.) and disseminate those needs to partners. Send reports of health-related activities in affected areas to the national level for future planning purposes. To account for expenditures and determine the cost of the emergency. Organize, when appropriate, a lesson learned workshop or meeting for improving future preparedness and response. Consider the convenience of including selected (most active) partners in this exercise.
District	Organize initial and subsequent technical assessments of the emergency management processes and nature of relief required. Request state government assistance for early recovery when additional resources may be needed. Keep the Regional Emergency Management Committee and the national level informed of the situation. Ensure supply of nutritional treatment, safe drinking water, medical supplies and other emergency items to the affected population with special attention to those groups most vulnerable or with limited access to government services. Asses the need and make arrangement to provide psychosocial assistance as necessary. Visit, coordinate and document the implementation of various rehabilitation programs. Coordinate the activities of NGOs in recovery and rehabilitation programs.
PHC/CHC level	Organize initial and subsequent technical assessments of the emergency management processes and nature of relief required. Request regional/zonal government assistance for early recovery when additional resources may be needed. Ensure supply of nutritional treatment, safe drinking water, medical supplies and other emergency items to the affected population with special attention to those groups most vulnerable or with limited access to government services. Asses the need and make arrangement to provide psychosocial assistance as necessary. Visit, coordinate and document the implementation of various rehabilitation programs. Coordinate the activities of NGOs in recovery and rehabilitation programs
Local level/NGOs	Assist the PHEM Center, when pertinent, in the economic valuation of the damages to the health sector. Implement rehabilitation works as per the organization's capacity and area of expertise. Mainstream risk considerations into all new development projects and activities. Prepare reports on assessment of damage and actions taken, and make them available for general review and planning. Provide periodic reports on execution of rehabilitation activities in the field.

After an emergency or a disaster, the impact of damage that occurred on the health of the population and the system that serves them needs to be objectively assessed to clearly identify the gaps and to design the appropriate strategy for the specific context. Hence, a

major activity during the recovery process is an effective Post Emergency/Event Assessment (PEA) to guide the implementation of recovery activities.

Hence, the next pages are dedicated to see how best to conduct this assessment and benefit from this process. The section proposes a framework for the Post Emergency/Event Assessment that allows a systematic analysis of the impact of an emergency/disaster on the health of communities, the identification of new risks the population is exposed to, and determining the post-disaster functionality of the health infrastructure and the performance of the health system building blocks.

5.2 Post Emergency Assessment and its Interventions

The health sector PEA is led and coordinated by the health sector itself, from Ministry of Health to the District health offices depending on the degree of the emergency, in collaboration with its partners and other sectors. It also needs to be linked with humanitarian coordination mechanisms as well as with pre-existing sector wide coordination and (multi-sectoral) development partners.

This section also provides guidance on how to manage the PEA process, followed by a description of the information that will be required and the data collection methods that may be applied. In addition, guidance on and how to address cross-cutting issues is mentioned as well as information on how to prioritize recovery response options in order to generate input for the Recovery Framework (RF) from early- to long-term recovery.

The health sector PEA identifies the relevant issues that need to be assessed in the context of the six health system building blocks by giving emphasis on:

- changes in the epidemiology of the burden of disease (BOD),
- damage and loss, and
- the performance of the main health programs

The framework facilitates consistency in the data requirements for pre-emergency baselines, the assessment of the impact of the disaster including the estimation of damage and losses, and the analysis of the needs for recovery and reconstruction.

While the processes focus on assessing the impact of the disaster on health and the delivery of health services, they also take into account other determinants of health, such as nutrition and livelihoods, water and sanitation, environment, and education.

5.2.1 Health system framework

The health system framework is made up of six building blocks, with a strong interdependence between the building blocks. The elements within each building block to be taken into account during the assessment include the following examples:

1. *Service delivery:* availability and accessibility of essential services, damage to infrastructure (pre-hospital units, mobile clinics etc.); package of services; organization and management; safety andquality.

2. *Leadership and governance:* health sector policies; harmonization and alignment; oversight and regulation; governance capacity; and coordination mechanisms.
3. *Health work force:* national workforce policies and plans; human resource norms, standards and data; (remaining) numbers and types of health workers, distribution and competencies of health workers; supervision mechanisms; effects on and capacities of training institutions.
4. *Information:* facility and population-based information and surveillance systems; analysis capacity for decision making.
5. *Medical products, vaccines and technologies:* access to essential medical products, vaccines and technologies with assured quality, safety, and efficacy, norms, standards, and policies; procurement and supply chains; quality; drug donations; health transport and logistics, warehouses, cold chain.
6. *Financing:* health financing policies; costing of services; tools and data on health expenditures and financial barriers to access services; ability to pay, catastrophic health expenditures; temporary waiving of user fees.

5.2.2 Health sector PEA and analysis matrix

The analytical matrix (see Table 5.2 below) provides a step-by-step assessment and analysis for the health sector PEA. It serves to undertake the assessment for the identification of critical issues that will have implications for the response and revitalization and reconstruction of the system.

Note: The analysis will then help in defining a strategy to address the issues.

The assessment required to estimate damage and losses is integrated in this matrix, as the assessment of infrastructure needs to be analyzed together with their functionality to provide services, the health system functions required to support such services, and the impact the disaster had on the health of communities.

Table 5-2 Analytical matrix for the health sector PEA and RF

Health programs and health system functions	Pre-crisis challenges Baseline indicators	Impact of the crisis, key challenges for early recovery	Humanitarian response	Response for recovery, Strategy for reconstruction	Products and expexted results for receovery, short and medium term	Activities and resources for the short and medium term	Key indicators for monitoring
1a. Service delivery; health programs							
1b. Service delivery; Organization							

and management of services, including infrastructure, equipment, transport							
2.Leadership and governance							
3. Human resource for health							
4. Health information System							
5. Health financing							
6. Medical products, vaccines and technology							

- *Pre-crisis baseline:* health status and pre-existing health risks, pre-existing policies, performance and challenges in the health system (including preparedness strategies and plans, disaster risk management program in the health system)
- *Impact of the disaster:* Impact on the BOD, health infrastructure and on health system functions. Impact averted by preventive and mitigation efforts, capacity of the health system to respond.
- *Response:* includes humanitarian interventions to address changes in the BOD, (re)-establish lifesaving services, and restore the functioning of the health system (where the costs for these interventions are borne by the Ministry of Health, they are included in the estimation of losses).
- *Recovery strategy:* planning for outcome, outputs, and monitoring indicators with targets for the short and medium term (including integrating disaster and emergency risk management into the health strategy and preparedness planning).
- *Estimates of costs* to address recovery and reconstruction needs, based on Building Back Better approaches.

5.2.3 Using the analytical matrix for the assessment and monitoring

By adding key indicators and examples of minimal qualitative data requirements in the analytical matrix, it becomes a standardized protocol for assessment data collection and analysis.

Guided by the headings and the indicators in the template, the PEA team collects and provides the information based on the best available data, evidence and/or professional expert judgments, while remaining sensitive to the perspectives of those most affected by the disaster.

Note 1: Use the information provided in Annex 3, which uses examples of key indicators for the assessment of the pre-disaster baseline within each health subsector as described above as well as for the health system building block.

Note 2: The indicators are to be used to assess the impact of the disaster as well as for monitoring. The indicators should be disaggregated and analyzed by age and sex. The choice of indicators can be reviewed and adapted based on the context.

Note 3: The matrix also provides examples of typical impacts, and issues or responses in relation to the immediate relief and early to medium recovery responses, which are to be used to formulate products and activities for the short and medium term in the report.

5.2.4 Managing the PEA process and its outputs

The health sector PEA is led by the Ministry of Health structure in collaboration with other relevant sectors, and the overarching national governmental body managing disasters such as the Ministry of Agriculture. This ensures alignment of the recovery framework to the national health development plan. Clear roles and responsibilities should be developed and assigned to different departments, and various levels.

It is important to include the health development partners in the PEA process, such as WHO, UNICEF, donors, NGOs, community-based organizations, civil society, professional associations, and the private sector.

Where development coordination mechanisms exist, these partners need to be consulted to assist in the assessment process, and to ensure the harmonization of their support to the recovery plan. It is particularly important to ensure that the PEA builds on the health, nutrition and other cluster assessments to the extent possible.

The health sector PEA has two main outputs:

- The first is a document that provides a more detailed report from the assessment, and a more detailed plan for the recovery.
    - The time horizon for the recovery plan is determined by the government, but usually covers 2-3 years, although in some disasters the recovery timeframe can (and should) be much longer. The health sector recovery plan can then be used as a basis for longer term development plan of the areas affected.
- The second output is a summary as a contribution to the overall PEA report. The sectoral components are usually no more than 3 to 4 pages. When conducting the PEA it is important to follow the same guiding principles that apply to the entire recovery process in the health sector:

- Promote a locally driven and -owned process o Promote - and capacitate national leadership
- Align the PEA with the government's strategy, policy, and systems
- Ensure coordination with other sectors
- Adopt a system approach using the six healthsystem building blocks
- Ensure appropriate sequencing o Think medium to long-term
- Reflect the priorities and concerns of those populations and stakeholders most affected

Steps for the PEA process:

1. When a disaster or any emergency occurs:

- Start collecting baseline information and start filling in relevant information in the analytical matrix.
- Establish database of pre-existing health facilities. o Start collecting information on functionality/damage of health facilities. o Start collecting information on disease trends, and interventions done to mitigate health consequences of the disaster.
- Collect relevant reports that describe the health system and its performance. o Prepare to send expert(s) to assist the affected area.

2. When the PEA is initiated:

- Government to appoint Focal Health experts from partner organization to liaise with MoH focal point.
- Prepare for the training of the health component of the PEA as part of the usual 1–2-day workshop on PEA to formally initiate the PEA and train relevant stakeholders.
- Call for a meeting with health development partners, identify key stakeholders that can assist in the assessment.
- Establish a Steering Committee to oversee the health assessment and divide tasks
- Present PEA to the humanitarian health coordination; identify NGOs with an interest and capacity to support the recovery process. o Develop time schedule, according to the overall deadlines of the PEA, including for example:
  - site visits to verify reports of damages,
  - workshops or focus group discussions to analyze the performance of health system functions,
  - regular meetings with the Steering Committee,
  - engagement with other sectors and cross cutting topics,
  - validation workshop of first draft.
- Prepare for the donor conference when this is organized and advocate for the importance of health in the recovery framework and resource mobilization.
- Inclusion of the H&FW department in the governing structures to manage the allocation of funds to and/or within the health sector.

5.2.5 Staffing requirements and logistics for PEA health team

- The PEA health team will be led by the focal points as appointed by the government. Sectoral experts will be asked to assist. In general, the team needs to have at least one

health system expert, and one health economist, an additional epidemiologist is required.

- Several national health development partners need to support the health assessment.
- A TWG needs to be formed, inclusive of the most relevant stakeholders, to oversee the health assessment.
- Relevant national experts from departments in the MOH and from the country offices of health partners need to be included in the process.
- Depending on the areas affected by the disaster, the respective regional/zonal or District health authorities need to be represented in the TWG.
- Transport for the assessment team is required to meet stakeholders and to conduct site visits for direct observation and consultation with affected communities, representative of the health authorities in the affected area and managers of affected health facilities.
- The transport for the PEA assessment should be organized with support from development partners. This will allow the national authorities to dedicate their transport capacity to support other priority functions.

5.2.6 Data collection process, assessment tools, methods and indicators

The data collection strategy and information requirements for the health sector recovery should be seen as a process and placed in the cycle of PHEM. This means that assessments and information required for (early) recovery build on data that is collected before the disaster happened, from routine IDS, HMIS and other reports, including from disaster preparedness, as pre-disaster baseline, and rapid assessments in the early humanitarian phase.

It should then become a monitoring system of the health system performance.

Note: The PEA should therefore, be understood as a process and not a standalone activity.

The assessment teams needs to make use of existing data whenever possible, such as data that has already been collected through the humanitarian interventions, and decide on critical additional information that needs to be collected specifically for the PEA and recovery framework.

There is no single source or a single method that can provide all the necessary information. Information is collected by various stakeholders using various sources of information.

The main sources for the PEA are:

- key informants, for example from the Ministry of Health and development partners,
- focus group discussions with stakeholders and relevant experts,
- health facility-based information systems, observations, complemented by surveys of health facility performance and population-based surveys.

When interviewing people, there needs to be a gender balance of the assessment team as well as of informants and participants to focus group discussions.

- Key source documents include the:
- WHO statistics information system,

- National policy documents,
- Demographic Health Surveys,
- Cluster Surveys,
- Annual reports and Mid Term Reviews of the national health plan,
- National statistics and Health Information Management System reports,
- Vulnerability assessments, etc.

Priority should be given to using existing national and local information collection systems as this would also provide a unique opportunity to strengthen these systems when needed.

5.2.7 Capacity assessment

Assessing capacities in the health sector is essential for two reasons:

The first is to understand the ability of the national health system to manage the recovery process.

- This includes assessing the financial management and procurement aspects of health system as these are necessary for effective management of the response.
- Assessing the adequacy of the financial management system is required to make choices on managing the resources being made available, and to judge the absorption capacity for recovery funding.
- The PEA also needs to take into account the capacities that are brought to the response through NGOs, to see how this capacity can be used to support the recovery process.

The second reason is to identify technical support needs for planning effective capacity strengthening interventions, as required for medium and long term recovery. Nine areas of capacity building with key questions are shown in Annex 4.

5.2.8 Links to other sectors and cross cutting issues

Inter-sectoral discussions should take place prior to the design phase of any assessment or more generally any data collection or analysis exercise to agree on standards which will provide a solid basis for data comparability and therefore cross-sectoral analysis.

Several other sectors are considered as determinants of health such as environmental health (including hygiene, water and sanitation), nutrition and food security, shelter and education.

Cross cutting issues relevant for health include:

- the status of children,
- pregnant and lactating women,
- the elderly,
- persons with disabilities, and
- persons living with long-term or chronic illnesses such as HIV/AIDS.

Gender and Age: In disaster situations, women and men, boys and girls are affected differently. Available data suggest that there is a pattern of gender differentiation at all levels

of the disaster process: exposure to risk, risk perception, preparedness, response, physical impact, psychological impact, recovery and reconstruction.

Contribution to peace-building and stability: Where relevant, the recovery health strategy should promote the Primary Health Care principles of equity, solidarity and social justice, as this contributes to the creation of conditions for stability, hope and peace.

Section 6. Monitoring and Evaluation of PHEM

Monitoring and Evaluation is the important component of PHEM. It is carried out at each level starting from preparedness to recovery from incidents. *Monitoring* is a routine and continuous tracking of planned activities over the process. *Evaluation* assesses whether the objectives set are achieved or not. Monitoring and evaluation is usually carried out using a selected and agreed up on indicators; it can also measure progress towards implementing an overall program target.

6.1 Monitoring and Evaluation of PHEM preparedness

Measuring the level of preparedness of the PHEM system at different levels is critical to know the capacity of the program to handle outbreaks and any other emergencies in an effective manner.

The following are the key elements for the evaluation:

- The presence of an epidemic preparedness and response plan
- Availability of emergency stocks of drugs, vaccines and supplies during the last 12 months
- Availability of funds for outbreak response
- Presence of a well-equipped, trained PHC/CHC rapid response team to conduct an outbreak investigation
- Presence of a functional PHEM task force
- Availability of trained/oriented health staff for the response
- Availability of redundant and uninterrupted communication facility
- Presence of Roaster of Expertise who are oriented and ready for Emergency response on call to the EOC.

Table 6-1 Indicators to monitor level of preparedness of PHEM

Category	Expected outputs	Indicator	Means of verification	Level to carry out activity
Coordination and collaboration	Functioning coordinating preparedness forum mechanisms involving all partners, sectors,authorities, and community members, includingbetween the center and the field Up-to-date mapping of health actors and service delivery activities (4Ws Matrix) Up-to-date information on the health hazards and risks available toall stakeholders	Number of coordination forum activity reports	Activity reports	State, District, PHC/CHC level
		Number of coordinated responses given to health emergencies	Meeting attendance reports	
Vulnerability assessment	Hot spot areas and vulnerable groups identified	List of hot spot areas identified by type of hazard	VARM report	State

and risk Mapping	for risk mitigation	Vulnerable groups identifiedby type of hazards	VARM report	State, District
Planning	Operationalized preparedness plan developed, rehearsed and regularly updated	Preparedness plan available at all level Number of Rehearsal exercise per year	EPRP plan document, Supervision Report, Rehearsal exercise report	State, District
Capacity building	Capacity developed at all level to respond to identified public health emergencies risks.	**System development** Proportion of district, CHC/PHC and health facilities withPHEM structure	Supervision Report, annual activity Report	Health Facility, CHC/PHC level, District, State
		Human resource Number of need-based trainings conducted Number of PHEM structure fully staffed at all levels Proportion of PHEM staff trained in EPRP atall levels	Supervision Report Training reports Annual activity Report	Health Facility, CHC/PHC level, District, State
		Supply Proportion of district, PHC/CHC with available stockpile to cover at least threemonths at national and District levels; and one month at lower	Stock registers Supervision Report	Health Facility, CHC/PHC level, District, State

6.2 Monitoring and Evaluation of Quality of Surveillance Activities

An important indicator of a quality reporting system is the timeliness and completeness at each level. When reports are sent and received on time, the possibility of detecting a problem and conducting a prompt and effective response is greater. Completeness of reporting describes whether all the reporting units have reported as expected. If reports are late, or are not submitted, the aggregated information for the district (or other administrative area) will not be accurate. Outbreaks can go undetected and other opportunities to respond to public health problems will be missed.

If the monitoring information shows that a health facility or other reporting unit has not provided a report, or if the report is not on time, contact the surveillance focal point at the facility. Work with the designated staff to identify what has caused the problem and develop solutions together. Make plans with the reporting unit to find solutions for improving the situation.

Explain that when information is complete, the district can assist health staff more efficiently with planning responses and carrying them out. For example, if lack of supplies is a problem, the district can use the reporting information to advocate with higher levels in the system.

A list of indicators to monitor at health facility, district and state levels are identified with their anticipated level of targets are indicated in tables below.

Table 6-2 Core indicators to monitor at the health facility level

Indicator	Purpose	How to calculate	Source of information	Target
Proportion of Completely filled surveillance reports submitted on time to the district	Measures the practice of health facilities in submitting timely surveillance reports to the next level	Number of complete surveillance reports submitted on time to the district DIVIDED BY Number of expected surveillance reports from the health facility	Monitoring chart for timely submission of report	80%
Proportion of health facilities submitting surveillance reports to the district in a week	Measures practice of complete submission of surveillance data from health facilities to district	Number of health facilities submitting reports to the district DIVIDED BY Number of health facilities expected to report	Summary reporting forms	80%

Proportion of priority diseases for which a current (data within the past 3 months) line graph is available	Measures the practice and capacity to analyze surveillance data	Number of priority diseases for which a current line graph is available. DIVIDED BY Number of priority diseases	The activity checklist for the "in charge" at the health facility and the IDS summary reporting forms from the health facility	80%
Proportion of cases of diseases selected for case-based surveillance reported with case- based forms or line lists.	Measures reporting of surveillance data with detailed information to use for further analysis	Number of diseases selected for case-based surveillance reported with case- based forms or line list DIVIDED BY Total number of cases of diseases selected for case-based surveillance thatoccurred in the health	Routine summary reports and case- based or line listing reports	80%
Proportion of suspected outbreaks of epidemic prone disease notified to the district level within 30minutes of surpassing the alert threshold	Measures early detection and timely reporting of outbreaks	Number of suspected outbreaks of epidemic prone diseases notified to the district within 30minutes of surpassing the alert threshold DIVIDED BY Total number of suspected outbreaks of epidemic prone diseases in the health facilitysurpassing the alert threshold	Health facility log of suspected outbreaks and rumors	80%
Case fatality rate for each epidemic prone disease reported	Measures quality of case management	Number of deaths from each of the epidemic-prone diseases DIVIDED BY Number of cases from the same epidemic- prone disease	Routine reports and outbreak investigation reports	Depends on disease

Table 6-3 Core indicators to monitor at district level

Indicator	Purpose	How to calculate	Source of information	Target
Proportion of health facilities submitting surveillance reports on time to the district	Measures the timeliness of submission of surveillance reports	Number of health facilities that submitted surveillance reports on time to the district DIVIDED BY Number of health facilities in a district expected to report	Monitoring chart	80%
Proportion of cases of diseases selected for case-based surveillance reported with case- based forms or line lists.	Measures reporting of surveillance data with detailed information to use for further analysis	Number of diseases selected for case-based surveillance reported with case-based forms or line list DIVIDED BY Total number of cases of diseases selected for case-based surveillance that occurred in the district	Routine summary reports and case- based or line listing reports	80%
Proportion of suspected outbreaks of epidemic prone disease notified to the zone/region within 30 minutes of surpassing the epidemic threshold	Measures use of data and thresholds for early detection and timely reporting of outbreaks	Number of suspected outbreaks of epidemic prone diseases notified to the district within 30 minutes of surpassing the epidemic threshold DIVIDED BY Number of suspected outbreaks of epidemic prone diseases in the districtsurpassing the epidemic threshold	Log of suspected outbreaks and rumors district analysis book orother routine analysis tool	80%
Proportion of priority diseases for which a current (data within the past 3 months)line graph is available (malaria, meningitis, measles)	Measures the practice and capacity of the district to analyze surveillance data	Number of priority diseases for which a current line graph is available and current. DIVIDED BY Number of priority diseases	Indicator monitoring chart district analysis book	80%

Proportion of health facilities that have current trend analysis (line graphs) for selected priority diseases	Measures the practice and capacity of the health facility team to analyze surveillance data	Number of health facilities that have current trend analyses for selected priority diseases DIVIDED BY Total number of health facilities in the district	Supervisory report Health facility data analysis tools	80%
Proportion of reports of investigated outbreaks that include analyzed case-based data	Measures availability of additional variables for further analysis	Number of outbreak investigation reports that include case based data DIVIDED BY Total number of outbreak investigation reports conducted in the district	Investigation report Epidemic curve Map Person analysis table Line lists or case- based reporting forms	80%
Proportion of investigated outbreaks with laboratory results	Measures capacity of laboratory to confirm diagnosis and involvement of laboratory in surveillance activities	Number of investigated outbreaks with laboratory results in a given time period DIVIDED BY Total number of investigated outbreaks that occurred in a given time period	Log of suspected outbreaks and rumors Laboratory reports Outbreak investigation reports	80%
Proportion of investigated outbreaks with laboratory results recommended public health response	Measures capacity of the district to respond to outbreaks	Number of confirmed outbreaks with a nationally recommended response DIVIDED BY Number of confirmed outbreaks in the district	Log of suspected outbreaks and rumors Outbreak investigation reports Supervisory reports	80%
Case fatality rate for outbreaks of priority disease	Measures quality of case management	Number of deaths from each of the outbreak diseases DIVIDED BY Number of cases from the same outbreak due to that disease	Routine summary reports and outbreak investigation reports	Will vary; Depends on disease

Attack rate for eachoutbreak of a priority disease	Helps to identify the population at risk and efficacy of the intervention	Number of new cases of an epidemic-prone disease that occurred during an outbreak DIVIDED BY Number of populations at risk during the outbreak	Demographic data about the district Outbreak investigation report with line lists or case-based forms	Will vary; Depends on disease

Table 6-4 Core indicators to monitor at State Level

	Indicator	**Purpose**	**How to calculate**	**Source of information**	**Target**
1	Proportion of weekly surveillance reports submitted from the district to the state level on time	Measures the practice of timely submission of surveillance data	Number of Districts that submitted IDSR reports on time to the state level DIVIDED BY Total number of districts that report to the state level	Monitoring chart Routine summary reports	80%
2	Proportion of health facilities submitting surveillance reports to state level	Measures practice submission of surveillance data from health facilities to state level through district	Number of health facilities submitting reports to state level DIVIDED BY Number of total health facilities expected to report	Summary reporting forms	80%
3	Proportion of cases of diseases selected for case-based surveillance reported with case- based forms or line lists.	Measures reporting of surveillance data with detailed information to use for further analysis	Number of diseases selected for case-based surveillance reported with case-based forms or line list DIVIDED BY Number ofDiseases selected for case-based list	Routine reports and outbreak investigation reports	80%
4	Proportion of suspected outbreaks of epidemic prone	Measures early detection and timely	Number of suspected outbreaks of epidemic prone diseases notified to	Log of suspected outbreaks and rumorsRoutin	80%

	disease notified to the district level within 2 days of surpassing the alertthreshold	reporting of outbreaks	the district within2days of surpassing the alert threshold DIVIDED BY Total number of suspected outbreaks of epidemic prone diseases	e summary reports	
5	Proportion of Districts in which a current (data of the past 3 months) line graphs is available for selected priority diseases (malaria, meningitis, measles)	Measures the practice and capacity to analyze surveillance data	Number of priority diseases for which acurrent line graph is available in the district DIVIDED BY Number of districts	Supervisory report District data analysis book	80%
6	Proportion of reports of investigated outbreaks that include analyzed case-based data	Measures availability of additional variables for further analysis including possible risk factors involved	Number of outbreak investigation reports that include epi curve, mapping, personal table, case-based forms and line lists DIVIDED BY Number of outbreak investigation reports	Investigation report Routine summary reports	80%
7	Proportion of investigated outbreaks with laboratory results	Measures capacity of laboratory to confirm diagnosis and involvement of laboratory insurveillanc e activities	Number of investigated outbreaks with laboratory results DIVIDED BY Number of investigated outbreaks	Outbreak investigation reports Laboratory reports Routine summary reports Log of outbreaks and rumors	80%
8	Proportion of confirmed outbreaks with a stately recommended public health response	Measures capacityto respond to outbreaks	Number of confirmed outbreaks with a stately recommended public health response DIVIDED BY Number of confirmed outbreaks	Log of suspected outbreaks and rumors Outbreak investigation reports Supervisoryvi sit reports	80%

9	Case fatality rate for each epidemic prone diseasereported	Measures quality of case management	Number of deaths from each of the epidemic prone diseases DIVIDED BY Number of cases from the same epidemic prone disease	Routine reports and outbreak investigation reports	Depends on disease
10	Attack rate for eachoutbreak of a priority disease	Helps to identify the population at risk and efficacy of theinterventio n	Number of new cases of an epidemic-prone disease that occurred during an outbreak DIVIDED BY Number of populations at risk during the outbreak	Demographic data about the district Outbreak investigation report with line lists or case-based forms	Will vary; Depends on disease
11	The number of epidemics detected at the state level and that were missed by the district level	Checks the capacity of the entire health system to detect epidemics and shows that the state level is checking whether districts are observing trends	Number of epidemics detected by the district or state level from analyzing district specific data DIVIDED BY Total number of epidemics reported by the districts	District summary reporting forms District analysis book Supervisory reports Standard surveillance reports	Zero
12	Proportion of districts that report laboratory data for diseases under surveillance	Measures if districts are collecting and reporting lab data to higher level	Number of district labs that submitted monthly data to higher level DIVIDED BY Total number of district labs	State log book of reports received	

6.3 Monitoring and Evaluation of PHE Response Activities

Up-to-date information is needed on a continuous basis throughout the emergency to inform decisions on response actions, monitor the effects of health interventions and enable adjustments to be made when necessary, and to support resource mobilization efforts.

The following are some of the elements to be monitored:

- Disease trends in order to assess the effectiveness of the response measures, the extension of the outbreak and risk factors
- Resources assessment of the rational utilization, adequacy and sufficiency and determination of additional needs
- Effectiveness of the response: case fatality rate, incidence rate
- Implementation status of the identified intervention activities (program coverage, safe water coverage, immunization, hygiene and sanitation activities, public communication and education, ITNs distribution, etc.

Table 6-6 Monitoring indicators for Public health emergency response

Indicators	**Numerator/Denominator**	**Means of verifications**	**Unit of measure**	**Target**
Proportion of rumors of PHE verified within 3 hours of initial notification	Number of rumors verified DIVIDED BY Total # of rumors reported to state level	district log book Weekly response Monitoring reports	%	100
Percentage of districts with functional RRTs	Number of districts with active RRT DIVIDED BY Total number of districts	Reports Supervisory visits	%	100
Percentage of out breaks that have been investigated within 48 hours	Number of out breaks reported within 48 hours DIVIDED BY Number of out breaks in the district	District log book Weekly response monitoring reports	%	100
Percentage of outbreaks that have CFR within the accepted norm	Number of deaths due to specific disease outbreak DIVIDED BY Number of cases due to specific out breaks	Weekly/daily epidemic report	%	100
Proportion of suspected outbreaks of epidemic prone diseases in which lab confirmation are completed according to the guideline	Number of Laboratory confirmed outbreaks DIVIDED BY Total number of outbreaks that have occurred	Weekly/daily epidemic report Laboratory reports	%	100
Proportion of PHE with prevention and control measures initiated	Number of PHE with prevention and control measures initiated within 48 hours confirming the	Weekly response Monitoring	%	100

within 48 hours of identification of risks and characterization of threats	outbreak DIVIDED BY Total number of public health emergencies that have occurred	reports		

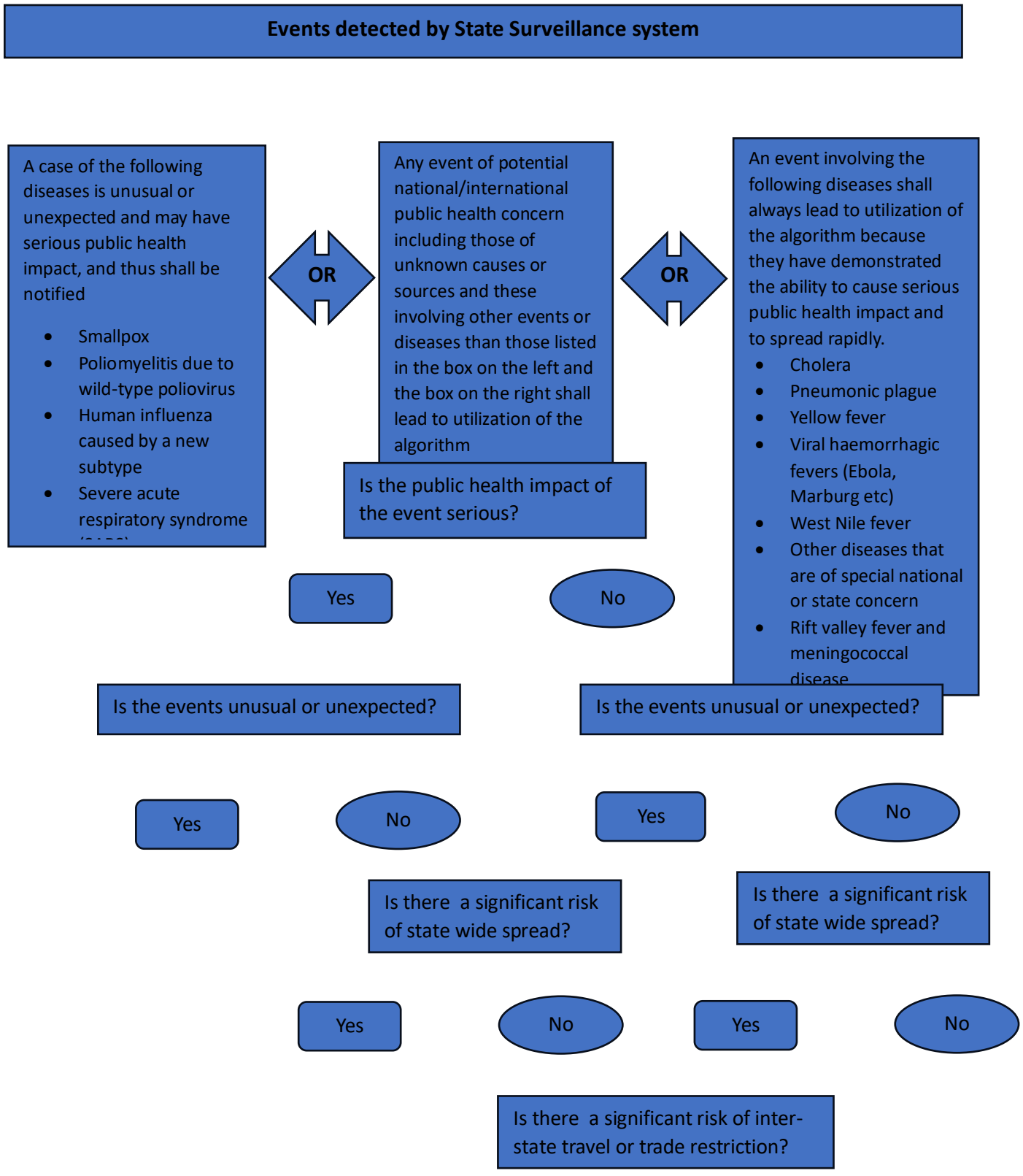
6.4 Monitoring and Evaluation of Recovery and Rehabilitation

Monitoring the level of responses given to recover rehabilitate the community affected by major public health emergency will give as the level of completeness of our overall response activities.

Indicators	**Numerator/Denominator**	**Means of verifications**	**Unit of measure**	**Target**
Proportion of post event assessments conducted for encountered major public health emergencies	Post event assessment conducted DIVIDED BY Major public health emergencies occurred	Reports	%	100
Proportion of community affected by major PHE provided recovery support	Population provided recovery support DIVIDED BY Affected Population needing recovery support	Reports	%	100
Proportion of rehabilitated health system	Rehabilitated health system DIVIDED BY Damaged or affected health system	Reports	%	100

Annexure 1. Decision Instrument for Assessment and Notification of Public Health Emergency Events

DECISION INSTRUCMENT FOR THE ASSESSMENT AND NOTIFICATION OF EVENTS THAT MAY CONTITUTE A PUBLIC HEALTH EMERGENCY OF DISTRICT/STATE/NATIONAL CONCERN



Annexure 2. Health Impact of Types of Disasters and Response Options

Disaster type	**Impact on Public Health**	**Humanitarian and Early Recovery Health Priorities**	**Recovery & Reconstruction Priorities**
Epidemics Environmental Pollution	Immediate increased risk of death, illness and disability Risk of infection or contamination for relief personnel (longterm) exposure of public to toxic substances Overload of facilities and services Rumors Diversion of resources	confirm the problem identify and confirm the cause issue guidelines, educate staff and mobilize resources case diagnosis, case confirmation, patient care, case treatment and referral activation of surveillance and monitoring systems to monitor caseload, case fatality rates, morbidity and mortality prevent spread protect staff and facilities care of the dead public information, dealing with the media and international aid	health education, public awareness, public information and community involvement documentation and analysis of the incident social services for the affected groups
Storm Earthquake Volcano Flood Landslide Tsunami Fire Explosion Accidents	immediate increased risk of death, physical and mental illness and disability; mass casualties and injuries, possible environmental pollution (long term) exposure of public to toxic substances damage to or loss of essential life support services - water, food, shelter, displacement of population breakdown in security breakdown in communications networks and information flows damage to and loss of facilities, services and staff	search and rescue, triage, first aid, medical evacuation, hospital emergency care protect staff and facilities activate mass casualty management plans activation of surveillance and monitoring systems for injury, disease, nutritional status, water quality and disability special services for the homeless and displaced - water, food, shelter, health, security stress management; care of the dead public information, dealing with the media	health education, public awareness, public information and community involvement documentation and analysis of the incident health and mental health services infrastructure demolition, repair and replacement economic regeneration

	high levels of psychosocial stress	and international aid	
Drought Famine Pests Plagues Infestations	long term risk of increased morbidity and mortality breakdown in food security populationdisplacement high levels of psychosocial stress exposure to toxic substances (chemical sprays)	reinforcement of essential services activation of surveillance and monitoring systems for disease, nutritional status and waterquality special services for the homeless and displaced - water, food, shelter, health, security stress management care of the dead public information, dealing with the media and international aid	health education, public awareness, public information and community involvement documentation andanalysis of the incident health and mental health services economic regeneration

Annexure 3. Core Indicators and Issues by Health System building blocks

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact-Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
Health Outcomes	CMR, disability Proportional mortality Life expectancy (by sex)	Increased number of deaths due to the immediate impact of the disaster New Health risks (e.g. potential outbreaks or interruption of services for chronic diseases) Effects on health related SDGs	Analyze top 5 causes of mortality to prioritize the health interventions, and adjust these as morbidity patterns evolve over time Appropriate management of dead bodies.	Rehabilitation of disabled persons
Service Delivery 1 : Organization & Management (including infrastructure, equipment and transport)				
	Disaster and emergency risk management capacities in the State Availability of functioning 24/7 referral system between levels of care Average population covered by functioning health facility by type of health facility (HF) and by admin unit #of hospital beds per 10 000 population by admin unit #of outpatient consultations per person per year by admin unit #of consultations per clinician per day by admin unit Cost per case (treatment, transport, etc.)	Availability of health resources and services HF damaged/ destroyed, including equipment and furniture and records Assess damage and loss Estimate reconstruction costs by type and extend of destruction ($) Effect on transport, logistics for supplies and referral between levels of care, including communication network, accessibility by roads that may be blocked, etc. Blood banks destroyed Staff killed, injured or displaced?	(Re) establish provision of essential service package services: cost per case/per capita per year When necessary set up temporary health facilities, and deploy medical brigades, supported by international assistance Support health facilities in areas that received high numbers of IDPs Temporary Pre hospital units to treat injuries, and/or medical evacuation (Temporary) Increase outreach Services Make buffer	Support to the decentralization process when this is part of the national health policy Support to management of health facilities Repair of health facilities Replacement of damaged health and medical equipment (based on safe hospital concept, see section on DRR) Replacement of furniture Relocation of facilities Re-establish blood banks Review health network and rationalize numbers, types, and distribution of health facilities when appropriate

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
	Costs for campaigns #and % of HF that meet basic service capacity standards, #HF with BEm0c/500 000 population by admin unit #of HF with CEmOC/500 000 population by admin unit % of HF with availability of clinical management of rape survivors +EC +PEP % of births assisted by skilled attendant	Increased demand for health services in unaffected areas due to population movements	emergency medical supplies and emergency medical teams available, establishment of semi-permanent Structures.	
1.1 Child Health				
1.1 Child Health	Under-five mortality rate Infant mortality rate Proportion of 1 year-old children immunized against measles (and estimate of coverage 6 months - 15 years Coverage of DPT3 in under 1 year by admin unit	Increased Child mortality/ U5MR/ neonatal mortality Disruption of routine vaccination services? Increase in malnutrition /disease interactions among vulnerable children?	Total cases of respiratory tract infection + cost per case Total cases of U5 diarrhea + cost per case Mass vaccination campaigns (combined with vitamin A and bed-nets, de worming, etc.) Basic neonatal care for newborns linked to deliveries in health facilities	Re-establish routine vaccination 2x/year de-worming campaigns in schools Scale up IMCI as part of EPHS, including a strengthened community component
1.2 Nutrition				
1.2 Nutrition	#of admissions to TFP (age/sex) %/# of U5	Food shortage, lack of access to food by vulnerable populations,	Incorporate vitamin A, zinc, and iron foliate in ongoing	Growth monitoring Nutrition programs within IMCI

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
	GAM and SAM cases detected at OPD/IPD Prevalence of underweight children U5 Proportion of population below minimum level of dietary energy consumption Prevalence of GAM + SAM Level of food security based on IPC	reduced diversity in diets, changes in breastfeeding practices as a result of the disaster; treatment of malnutrition disrupted by disaster? Increased risk of malnutrition (women, children and elderly?)	immunization campaigns Screening for malnutrition in health facilities and population based Supplementary and therapeutic feeding programs	
1.3 Communicable Diseases				
1.3 Communicable Diseases	#of incidence rates for selected diseases (by age/sex) (cholera,measles, acute meningitis, others) CFR for most common diseases Incidence, prevalence and death rates associated with tuberculosis # and proportion of tuberculosis cases detected and cured under DOTS Incidence and death rates associated with malaria Proportion of children under 5 sleeping under insecticide treated Proportion of children under 5	Treatment disruption for patients on ARV (including for PMTCT) and DOTS Increased risk of HIV transmission increased risk of malaria (increased exposure due to loss of homes, bed nets etc) Total cases of typhoid/ fever + cost per case Total cases of diarrhea + cost per Case Total cases of malaria + cost per	Disease control surveillance Treatment of increased morbidity Tracing and treatment of known TB patients Ensure appropriate HIV prevention measures Tracing and provision of ART for people previously on treatment, including PMTCT Mass distribution of bed-nets Environmental vector control (in crowded places)	Community health education/promotion Restore or establish a comprehensive TB, Malaria and HIV control program Further integration of vertical programming with other services.

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
	with fever who are treated with appropriate anti-malarial drugs HIV prevalence among population aged 15-24 years Case prevention and control of disease outbreaks # of patients on ART Condom use at last high-risk sex Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years Proportion of population with advanced HIV infection with access to antiretroviral drugs		Establish standard precautions (Distribution of hygiene kits, Provision of disinfectants ; safety and boxes	
1.4 Sexual & Reproductive Health				
1.4 Sexual & Reproductive Health	% of births assisted by a skilled attendant % expected Deliveries by CS by admin unit # of cases or incidence of sexual(by sex and age) Maternal mortality ratio:	Increased risk of maternal and infant mortality and mortality Increased risk of sexual and other forms of gender-based violence Disruption in access to family planning Disruption of regiments for	Ensure provision of Provision of reproductive Health services guaranteeing availability of MISP and expanding as possible Clinical management of rape services and emergency	Ensure sustainable provision of MISP and beyond establish minimal Availability for MISP including EmOC Integration of interventions, including antenatal care(ANC) , PMTCT, nutrition and immunization Strengthening of national family planning program

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
	fertility rate Contraceptive prevalence rate Adolescent birth rate Antenatal care coverage(at least one visit and atleast four visits) Unmet need for family planning	HIV+ pregnant women	obstetric care(basic and comprehensive) Financial protection maternity services: free access deliveries, to EmOC, and follow up	
1.5 Non Communicable Disease				
1.5 Non Communicable Disease	Prevalence of hypertension and diabetes	Patients lost for treatment of hypertension and diabetes	Tracing of old cases on hypertension and diabetes treatment; treatment of skin and eye infections	Re-establish data system for patients on treatment Strengthen home care for patients with chronic diseases(communicable and non-communicable)
1.6 Injuries				
1.6 Injuries	% of population with severe or extreme difficulties in functioning	Potentially high number of injuries Increase # people with disabilities Untreated wounds and infections of wounds are major public health problem, risks for tetanus	Treatment of injuries- prevention of long-term disability # of total cases of injuries and cost per case Field hospitals, surgery & basic EmOC Set up referral mechanism. Vaccination campaigns to include tetanus Amputations follow up care to be done at	Rehabilitation of persons with disability Strengthen capacity for prostheses and rehabilitation Disability care to be taken into consideration in new health system

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
			primary care level	
1.7 Mental Health and Psychosocial Support				
1.7 Mental Health and Psychosocial Support	% of population with severe or extreme difficulties in functioning Severe disorder (e.g, psychosis, severe depression, severely form of anxiety disorder): 2-3% Mild or moderate mental disorder (e.g mild and moderate forms of depression and anxiety disorders, including mild and moderate PTSD): 10%	Decrease in functioning On average prevalence of severe mental disorder increases 1% On average rates of mild or moderate mental disorder increase 5-10% Mild or moderate: 15-20%	Strengthen community self-help and social support Ensure access to psychological first aid to people in acute distress Manages new and pre-existing severe mental disorders in general health care Address the safety, basic needs and rights of people in mental hospital + cost per case	Initiate development of sustainable community mental health system Build long-term, basic, sustainable community mental health services in areas affected by emergencies In districts without psychiatric inpatient care, plans for new general hospitals as part of health recovery investment should include considering planning for a staffed acute psychiatric care inpatient unit Include mental health in curriculum and of PHC staff
1.8 Environmental Health				
1.8 Environmental Health	Proportion of people with less than 15 l of water /day % population urban/rural, access to improved water Sources and sanitation by sex Distance to nearest water access point, by sex and age Distance to nearest	Destruction of clean water supply Health hazards resulting from stagnant waters and deteriorated water quality	Provision of safe drinking water; provision of wastewater and solid waste disposal Environmental vector control (in crowded places) Disposal of medical waste	Drinking water supply restoration to prevent the further spread of waterborne diseases Reconstruction of wastewater and solid waste disposal

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
	sanitation facility, by sex and age			
Leadership and Governance				
Leadership and Governance	Existence of a health sector preparedness and response strategy document linked to national needs and priorities that includes the role of the lead and partner agencies; Existence of a functioning coordination mechanism at central level and field level within the health sector and cross-cutting themes; Existence of an essential medicine list that satisfy the priority health care needs of the population and that is adequate for the competence level of health Workers	Reduced capacity to respond to disaster Many stakeholders already present, and new national stakeholders entering, further challenging health coordination Governments likely to send technical assistance/experts to strengthen MoH functions for longer term H&FW infrastructure and governance capacity compromised (loss of human resources, infrastructure and equipment damaged)	Coordination mechanism in the acute response/ leadership (humanitarian Health Cluster - Government) Ensure/ promote national ownership Ensure adherence to national guidelines by international actors	Link recovery planning to coordination with development partners Exit strategy for international humanitarian NGOs, and/or use capacity of (1)NGOs to support recovery process and capacity building Integrating disaster risk reduction & disaster management in health strategy. Preparedness strategies/ plans: identification of hazards, vulnerabilities & capacities, hazard early warning systems, established \disaster risk management, risk awareness and, risk prevention programs
Health Workforce				
Health Workforce	# of health workforce(MD, nurse, midwife) per 10000 population by admin unit (by	Loss of workforce, health staff affected by the disaster- (displayed, family members to care for etc.)	Replacing, strengthening, and/or reactivating workforce Financial	Replacing/strengthening/reactivating workforce Reconstruction and reopening of training facilities Adapt training programs on new

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
	sex) # of CHWs per 10000 by admin unit Annual # of graduates of health professions educational institutions per 100000 population by level and field of education	# of health workforce (MD, nurse, midwife) per 10,000 population by admin unit (by sex) remaining Damages in schools for health workers, # of training facilities affected Damages to institutes of public health and research	incentives to re-activate the health workforce Train and deploy community outreach workers (appropriate sex and age balance)	relevant issues Task shifting Capacity, building in first aid, disaster preparedness, response and recovery
Information				
Information	# of HF routinely collecting, analyzing and reporting relevant data	Break down of information system	Strengthen early warning system including disease surveillance Coordinate information collection & analysis by all partners	Re-establish routine health information system and reporting by age & sex (as relevant) Risk assessment, including hazards, vulnerabilities and capacities
Financing				
Financing	Existence of user fee protection for those unable to pay External resources for health as % of private expenditure on health Per capita total expenditure on health at average exchange rate	Further loss of livelihood and reduced ability to pay for health services Increased dependence on external funding Lost of revenue due to free health service Increased expenses for treatment, transport etc.	Ensure free health services and access to essential medicines in the public and private not for profit facilities: initially months then review NB: Consider effect of waiving fees on private sector, in particular if they also waive or reduce fees	Establish capacity to analyze possible consequences on quality and access when waiving user fees Medium-long term reform of financing system, exploring different modalities of (mixed) prepayment mechanisms, that include adequate social protection for health, Ensure links between financing and delivery of services for the population and vulnerable groups, exploring modalities of performance-based funding

	Key indicators: Pre-disaster baselines and challenges, impact of crisis and monitoring	Disaster Impact- Key Issues	Possible Humanitarian Responses	Possible (Early) Recovery Response
	Per capita government expenditure on health at average exchange rate (US$) Out of pocket expenditure on health			
Medical Products and Technology				
Medical Products and Technology	% of HF without stock out of a selected essential drug in 4 groups of drugs by administrative unit Existence of an essential medicine list that satisfy the priority health care needs of the population and that is adequate for the competence level of health workers	Break down of supply chain and medical logistics Damage to warehouses, equipment and stocks (Inappropriate) drug donations NB: consider effect on private pharmacies when donated medicines are provided for free	Provision of kits, medicines and medical inputs; replacement of drug kits/ vital medicines Advocate for application of national essential medicine list by service providers Free access to medicines during the emergency phase (first 3 months, then review)	Procurement of medicines, safe delivery kits, medical equipment and generators; reestablishment of the cold chain Integrate access to essential medicine within the new financing modalities (including creation of social solidarity or emergency fund to finance purchasing of services and essential medicine)

Annexure 4. Areas and Key Questions for Capacity Assessment

Nine Areas for Capacity Assessment	Link to Health System Building Blocks
1.Performance capacity:	Service delivery

Are the tools, money, equipment, consumables, etc. available to do the job? A doctor, however well trained, without diagnostic instruments, drugs or therapeutic consumables is of very limited use.	Medical products Financing
2.Personal capacity: Are the staffs sufficiently knowledgeable, skilled and confident to perform properly Do they need training, experience, or motivation? Are they deficient in technical skills, managerial skills, interpersonal skills, gender-sensitivity skills, or specific role-related skills?	Human resources
3.Workload capacity: Are there enough staff with broad enough skill to cope with the workload? Are job descriptions practicable? Is skill mix appropriate?	Human resources
4.Supervisory capacity: Are there reporting and monitoring systems in place? Are there clear lines of accountability? Can supervisors physically monitor the staff under them? Are there effective incentives and sanctions available?	Human resources Information
5.Facility capacity: Are training centres big enough, with the right staff in sufficient numbers? Are clinics and hospitals of size to cope with the patient workload? Are staff residences sufficiently large? Are there enough offices, workshops and warehouses to support the workload?	Service delivery
6.Support service capacity: Are there laboratories, training institutions, supply organizations, building services, administrative staff, laundries, research facilities, quality control services? They may be provided by the private sector, but they are required.	Service delivery Tools
7.Systems capacity: **Do the flows of info**and managerial decisions function in a timely and effective manner? Can purchases be made without lengthy delays for authorization? Are proper filing and information systems in use? Are staff transferred without reference to local managers' wishes? Is there good communication with the community? Are there sufficient links with CBOs/NGOs?	Governance Information
8.Structural capacity: Are there decision-making forums where inter-sectoral discussion may occur and decisions made, records kept and individuals called to account for non-performance?	Governance
9.**Role capacity:**This applies to individuals, to teams and to structure such as committees. Have they been given the authority and responsibility to make the decisions essential to effective performance, whether regarding schedules, money, staff appointments, etc?	Governance Financing