Words into Action Guidelines:
National Disaster Risk Assessment
Special Topics

E. Health Aspect in Disaster Risk Assessment

Key words:
public health risk assessment, health emergency risk assessment, Strategic Tool for Assessing Risks (STAR)

UNISDR
2017 - UNISDR

UNISDR
United Nations Office for Disaster Risk Reduction

Public health risk assessments are carried out across the different stages of disaster risk management of prevention, preparedness, response and recovery, where diverse types of health information are needed to determine evidence-based actions for dealing with natural and man-made hazards, including biological hazards.

To ensure comprehensive multi-hazard and multisectoral National Risk Assessment (NRA) for disasters, public health risk assessments should be integrated, including exposure, vulnerability and capacity analyses, as an integrated policy approach. This is aligned with the broad scope of the Sendai Framework, which covers all types of hazards, including biological hazards.

The integration can be done through the following means:

- Identifying linkages between public health and DRR risk assessment and also the trade-offs, particularly when the two are considered in isolation.
- Defining levels of intervention in integration by strengthening the base for health risk management.
- Ensuring that health is considered by the government agencies or coordination mechanisms charged with making decisions about how a risk may be mitigated, avoided, or reduced (such as DRR national platforms and other policy or technical coordination mechanisms) so that integrated policy measures are developed, including addressing emerging needs for health for the different population groups or geographical areas.
- Ensuring that specific DRR policy measures address the potential impact of disasters of all types of hazards on health.

This section outlines the objectives, principles and types of public health risk assessments as conducted throughout the emergency risk management stages.

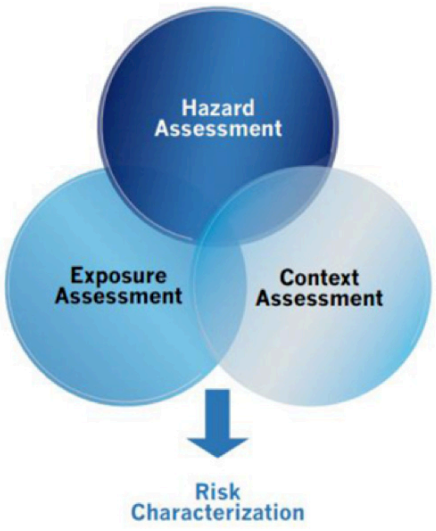

Figure 1 – Public health risk assessment components

The public health risk assessment process

Public health risk assessment is the process of estimating the nature and probability of adverse health effects in humans who may be exposed to different hazards, including biological hazards, now or in the future.

Information used in public health risk assessments

Despite the different needs during the preparedness and response phases of disaster risk management, all forms of risk assessment use health information to determine actions to reduce the public health risk of and potential for an ongoing event.

The main question answered in such assessments refers to the potential public health impact (i.e. what is the risk related to exposure to a particular hazard in a particular location, or to a particular population at a particular time) in terms of health consequences of mortality, morbidity and disability and also refers to the health measures required to minimize this impact. Risk questions typically focus on who is likely to be affected, the likely exposure to a hazard, and when, why and how a population might be adversely affected by exposure to a hazard.

A public health risk assessment includes four basic steps leading to risk characterization:

1. **Identifying the characteristics of a hazard and its associated health consequences**
   Hazards to health can be biological, geological, hydrometeorological, technological or societal. They can include infectious, toxic or radiological agents under the International Health Regulations (IHR). Hazards can be specifically identified during the risk assessment process, but at the early stages of an actual event the specific aetiology (specific cause of disease) is often unknown.

2. **Evaluating the exposure of individuals and populations to likely hazards**
   This provides information on the number of people exposed to the hazard and the number of exposed people or groups who are likely to be susceptible (i.e. capable of getting a disease because they not immune). The information required to evaluate exposure includes the following: mode of transmission (e.g. human-to-human, droplet spread, sexual transmission, animal-to-human; occupational risk); information related to the vector (e.g. distribution, density, infectivity) and/or animal hosts (density, prevalence, existing control programmes); incubation period (known or suspected); estimation of the potential for transmission (e.g. R0 basic reproduction number); immune status of the exposed population; and dose and duration of exposure.

3. **Analysing the context, vulnerabilities and capacities associated with the hazard**
   The context and/or vulnerability analysis takes into account the evaluation of the environment in which the event is taking place, the underlying health characteristics of the exposed populations and the capacity of a health system to respond to a given event.
   This can include analysing the physical environment such as climate, vegetation, land use (e.g. farming, industry) and water systems and sources, as well as the health of the population (e.g. nutritional status, disease burden and previous outbreaks), infrastructure (e.g. transport links, health-care and public health infrastructure), cultural practices and beliefs.
   The information about the capacity of the health system to deal with the event can be used to determine the likelihood that events will be identified, the likelihood that events will require medical care and the likelihood of severe disease or outbreaks or a large-scale impact of natural disasters on health.

4. **Characterizing the public health impact**
   Public health impact is the estimation of the overall extent of the direct or indirect consequences of hazards on the health of a population. It relies on the understanding of all components of the risk – hazard, exposure and the context, capacities and vulnerabilities.
   All types of consequences, in addition to the expected morbidity, mortality and direct long-term health consequences of the event (e.g. disability) should be taken into consideration, including the STEEEP consequences (social, technical and scientific, economic, environmental, ethical, and policy and political).

Risk characterization

The characterization of the overall level of risk is then based on estimates of the likelihood, in combination an estimate of the public health impact. A useful tool to assist the team in this characterization is a risk matrix, which also helps to assess and document changes in risk before and after control measures are implemented.

Types of Public Health Risk Assessment

A strategic risk assessment is used to catalyse action to prevent, prepare for and reduce the level of risk associated with a particular hazard and its consequences on health.

Actions that stem from this type of risk assessment can include prioritizing limited resources towards hazards whose impact and likelihood are the

greatest, identifying particularly vulnerable populations or locations, developing emergency response and contingency plans, and implementing preparedness and risk mitigation activities.

Numerous approaches exist for conducting strategic risk assessments and for prioritizing risks. One example is the Strategic Tool for Assessing Risks (STAR). The range of hazards to assess under STAR includes the health consequences of natural or human-induced emergencies, the health events covered under IHR (zoonoses, chemical, radio-nuclear, food safety) and events occurring in neighbouring countries or regions.

When an event occurs, and in order to inform early warning and response measures, the level of risk posed by the event itself is assessed on a continuous basis through a process of Rapid Risk Assessment, a systematic, consistent and interdisciplinary approach. It includes defined search strategies and the use of any pre-prepared relevant information, ensures a transparent, reproducible risk assessment, which also records available information and reasons for judgments, and documents uncertainties.

During the initial phase of acute public health events, since the hazard may be unknown, such as in emerging infectious diseases, the initial rapid risk assessment can be used to develop a differential diagnosis on the basis of the known or suspected characteristics[1]. The stages of a rapid risk assessment include preparing and collecting event information, performing structured literature search/systematically collecting information about the (potential) etiologic agent, extracting relevant evidence, appraising the evidence and estimating the risk[2].

Under IHR[3], event risk assessments[4] (the rapid collection of ad hoc information about acute public health events) also include the risk to human health, the risk of international spread of disease and the risk of interference with international travel or trade. The four decision criteria to be used by States Parties in assessing a public health event are (a) the seriousness of the event's public health impact, (b) the unusual or unexpected nature of the event, (c) the risk of international disease spread and (d) the risk that travel or trade restrictions will be imposed by other countries.

Also under IHR, countries build their core capacities[5] to detect, report and

---

[1] http://ecdc.europa.eu/en/publications/Publications/emerging-infectious-disease-threats-best-practices-ranking.pdf

[2] http://ecdc.europa.eu/en/publications/Publications/1108_TED_Risk_Assessment_Methodology_Guidance.pdf

[3] The International Health Regulations (2005) (IHR) are an international agreement that is legally binding on 194 countries (States Parties).

[4] The scope of IHR is purposely broad and inclusive in respect of the public health event. It covers communicable, chemical, biological and radio-nuclear hazards.

[5] The scope of IHR is purposely broad and inclusive in respect of the public health event. It covers communicable, chemical, biological and radio-nuclear hazards.

respond to public health events, including biological, chemical and radio-nuclear hazards, and monitor their progress in doing so.

IHR capacity requirements are defined in article 5 as "the capacity to detect, assess, notify and report events". Each State Party must assess the ability of existing national structures and resources to meet the minimum requirements described in IHR, annex1. Annex 1A covers "Core capacity requirements for surveillance and response" and annex 1B covers "Core capacity requirements for designated airports, ports and ground crossings".

The core capacity monitoring framework has a checklist and indicators that are used for monitoring progress in the development of countries' IHR core capacities. As a result of such assessments, States Parties must develop and implement plans of action to ensure that these core capacities are present and functioning.

Following risk assessment, Member States use the IHR annex 2 decision instrument for the assessment and notification of events to decide whether an acute public heath event requires formal notification to the World Health Organization (WHO) and then a declaration of a public health emergency of international concern.

Recently, Joint External Evaluations (JEE)[6] have been implemented as a voluntary, collaborative and multisectoral process to assess a country's IHR capacity for ensuring health security and inform joint planning processes to increase capacity. The tool draws on the original IHR core capacities and incorporates lessons learned from other tested external assessment tools and processes that have supported the building of capacity to health threats.

The assessment tool consists of three core elements: preventing and reducing the likelihood of outbreaks and other public health hazards and events defined by IHR (2005), detecting threats early, and multisectoral, national and international coordination and communication for rapid, effective response.

[6] www.jeealliance.org/global-health-security-and-ihr-implementation/joint-external-evaluation-jee/ and http://apps.who.int/iris/bitstream/10665/204368/1/9789241510172_eng.pdf

CASE STUDY

Box 1

Case study of health emergency risk assessment

Event: A cluster of 22 cases of severe respiratory diseases with seven deaths in country X were admitted to hospital over the past 17 days. The event is occurring 8km from the border and cases have been reported from three villages by a local health-case worker (HCW). The area is charge a consultation fee and consequently the local population self-medicates during mild illness. There are also beliefs that 'strange diseases' are caused by sorcery.

Risk Question: What is the likelihood of further spread of sever cases of respiratory disease and what would be the consequences (type and magnitude) to public health if this were to occur?

Information used to assess the likelihood of further spread:

- Cases are still being reported 17 days after the first known cases were detected
- The specifications and modes of transmission have not been identified
- It is also likely that some cases are not being detected (e.g. mild cases are less likely to seek care from health services and are therefore not included in the official reports).

Therefore, it is highly likely that further cases will occur if nothing is done.

Information used to assess the consequences of further spread:

- The disease has a high case fatality ratio (even when under reporting is taken into account)
- The health-care system is poor and the ability to treat the cases is already limited; new admissions will further stress acute care services and lead to worse clinical outcomes for hospitalized patients.
- Negative economic and social impact of the cases and deaths in the affected communities
- There is potential for unrest in communities because of cultural beliefs that sorcery is causing the deaths
- The event is occurring in a border area and could affect the neighbouring country
- Therefore the consequences if the further cases occur will be severe.
- Using the risk matrix to combine the estimate of the likelihood and the estimate of consequences leads to estimate of the overall risk; in this case, the overall level of risk is high.
- The confidence in the risk assessment is low-medium.
- Although the report is from a local HCW, the information is limited and it is not clear if the HCW has examined the suspect cases or is reporting a rumor.

CASE STUDY

Box 2

A case of a country good practice

Iceland - Iceland is an island country located in the North Atlantic Ocean. It has a population of approximately 330,000 inhabitants and an area of 103, 000 km2, making it one of the most sparsely populated countries in Europe. Over two thirds of the population live in the southwest part of the country, which makes up the Reykjavik capital area, while the rest is scattered along the coastal area.

The Chief Epidemiologist in Iceland and Civil Protection of the National Commissioner of Police are responsible for the national health crisis preparedness planning for communicable, chemical, biological and radio-nuclear hazards, as well unknown events. They are also responsible for national risk assessment, risk reduction and response management during times of a public health crisis.

The preparedness plans in Iceland are all-hazard plans and involve the following sectors: the primary health care and hospitals, ambulance services, distributors of medicines, Icelandic Medicine Agency, Icelandic Food and Veterinary Authority, food suppliers and distributors, Icelandic Farmers Association, Icelandic Transport Association, Icelandic Tourist Board, the financial sector, Icelandic Environmental Agency, Icelandic Federation of Energy and Utility Companies, Icelandic road and coastal administration, prisons, Icelandic Red Cross and rescue services, Icelandic National Broadcasting Service and the Evangelical Lutheran Church of Iceland.

Currently, two national preparedness plans have been published and implemented, including an influenza preparedness plan and a plan for airports and aviation. Plans for health care institutions, ships and harbours and a chemical, biological, radiological or nuclear (CBRN) hazard plan are also being processed and will be finalized and implemented in the near future.

The main health hazards in Iceland result from natural disasters such as volcanoes, earthquakes, avalanches and severe weather. CBRN hazards are also considered important and are included in the preparedness planning.

The preparedness plans in Iceland have been used in real life scenarios during the pandemic influenza in 2009 and during several volcanic outbreaks in recent years. The plans have proven to be very useful and the main challenge in the coming years is to keep them updated regularly.

Authors:

Jonathan Abrahams (World Health Organization), Catherine Smallwood (World Health Organization), Anne Anacia (WHO), Chadia Wannous (UNISDR), Laura Espinosa (ECDC), Massimo Ciotti (ECDC), Vetla Tsolova (CEPS), Graham Fraser (ECDC), Tarik Derrough (ECDC), Ettore Severi (ECDC), Thorolfur Gudnason (The Directorate of Health), Jonathan Suk (ECDC)

Contributors and Peer Reviewers:

Ali Ardalan