Special Topics

7 - Health Aspect in Disaster Risk Assessment

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

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

To ensure comprehensive multi-hazard and multi-sectorial 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 for DRR that cover all types of hazards including biological hazards. The integration can be done through the following: 1) identifying linkages between public health and DRR risk assessment and also the trade-offs, particularly when the two are considered in isolation; 2) defining levels of intervention in integration by strengthening the base for health risk management; and 3) ensure health is considered in the decision making of relevant 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, and 4) ensure that specific DRR policy measures address the potential impact of disasters of all types of hazards on health.

Due to the specificities for managing health risks, including biological hazards, and the specific terms employed within the health sector, this section outlines the objectives, principles and types of public health risk assessments as conducted throughout the emergency risk management stages.

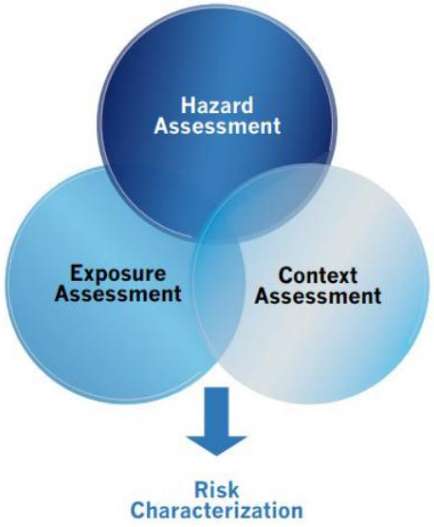

FIGURE 1 – Public health risk assessment components

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The process in public health risk assessment

Public Health risk assessment is the process to estimate 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 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 to the health measures required in order to minimise this impact. Risk questions typically focuses 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.

Public health risk assessment includes 4 basic steps: hazards, exposure and context/vulnerability assessments leading to risk characterization.

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

2. The evaluation of the exposure of individuals and populations to likely hazards.
   This provides information 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). Information required to evaluate exposure includes: mode of transmission (e.g. human-to-human, droplet spread, sexual transmission, animal-to-human; occupational risk etc.); 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. R_0 basic reproduction number); the immune status of the exposed population; and Dose and duration of exposure.

3. The analysis of 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 analysis of 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 (see IHR section) 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 large-scale impact of natural disasters on health.

4. Characterising the public health impact
   Public health impact is the estimation of the overall extent of the consequences, direct or indirect, of hazards on the health of a population. It relies on the understanding of all components of the risk i.e. hazard, exposure and the context, capacities and vulnerabilities. Consideration of 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. This includes consideration of the STEEEP consequences (Social, Technical and scientific, Economic, Environmental, Ethical, and Policy and Political).

Risk characterization

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

Types of Public Health Risk Assessment

Strategic Risk Assessments are undertaken before an event occurs. 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 the prioritisation of limited resources towards the hazards whose impact and likelihood are the greatest, in-depth capacity and identification of particularly vulnerable populations or locations, development of emergency response and contingency plans, and the implementation of preparedness and risk mitigation activities. There are numerous approaches for conducting Strategic Risk Assessments and for prioritising risks. One example of the strategic risk assessment is The Strategic Tool for Assessing Risks (STAR). The range of hazards to assess under the STAR tool includes the health consequences of natural or human-induced emergencies, the health events covered under the IHR (zoonoses, chemical, radio-nuclear, food safety), and events occurring in neighboring 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. The Rapid Risk Assessment is a systematic, consistent and interdisciplinary approach, including defined search strategies and the use of any pre-prepared relevant information, ensures a transparent, reproducible risk assessment, which also records available information, reasons for judgments, and documents uncertainties. During the initial phase of acute public health events the hazard may be unknown such as in emerging infectious diseases, and 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 preparation, collect event information, Perform structured literature search/systematically collect information about the

(potential) etiologic agent, Extract relevant evidence, appraise the evidence and then estimate the risk.[2]

Under the International Health Regulations (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 their assessment of a public health event are: (1) the seriousness of the event's public health impact; (2) the unusual or unexpected nature of the event; (3) the risk of international disease spread; and (4) or the risk that travel or trade restrictions will be imposed by other countries.

Also under the IHR, countries build their core capacities[5] to detect report and 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 shall assess the ability of existing national structures and resources to meet the minimum requirements described in Annex1 of the IHR. Annex 1A covers "Core capacity requirements for surveillance and response"; and Annex 1B covers "Core capacity requirements for designated airports, ports and ground crossings". In addition, the core capacity monitoring framework has a checklist and indicators which are used for monitoring progress in the development of IHR Core Capacities in States Parties. As a result of such assessment, States Parties shall develop and implement plans of action to ensure that these core capacities are present and functioning.

Following risk assessment, the IHR Annex 2 decision instrument for the assessment and notification of events is used by Member States to decide whether an acute public heath event requires formal notification to the WHO and then a declaration of public health emergency of international concern.

Recently, **Joint External Evaluations (JEE)**[6] have been implemented as a voluntary, collaborative and multisectoral process to assess capacities to evaluate 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 multi-sectoral, national and international coordination and communication for rapid, effective response.

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BOX 1 - Case study of health emergency risk assessment

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

Risk question: What is the likelihood of further spread of severe 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 specific hazard and mode(s) 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 further cases occur will be **severe.**

Using the risk matrix to combine the estimate of the likelihood and the estimate of consequences leads to an estimate of the overall risk; in this case, the overall level of risk is **high.**

The confidnce 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 rumour.

BOX 2 - A case of a country good practice

Iceland - The republic of Iceland is an island country located in the North Atlantic Ocean. It has a population of approx. 330 000 inhabitants and an area of 103 000 km2, making it one of the most sparsely populated country in Europe. Over two-thirds of the population lives 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 The Civil Protection of the National Commissioner of Police are legally responsible for the national health crisis preparedness planning for communicable, chemical, biological and radio-nuclear hazards as well unknown event. Additionally, the Chief Epidemiologist and Civil Protection are responsible for the national risk assessment, risk reduction and response management during times of 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, The Icelandic Medicine Agency, The Icelandic Food and Veterinary Authority, food suppliers and distributors, The Icelandic Farmers Association, The Icelandic Transport Association, The Icelandic Tourist Board, the financial sector, The Icelandic Environmental Agency, The Icelandic Federation of energy and utility companies, The Icelandic road and coastal administration, prisons, The Red Cross and rescue services, The Icelandic National Broadcasting Service and the Evangelical Lutheran Church of Iceland.

Currently two national preparedness plans have been published and exercised including an influenza preparedness plan[7] and a plan for airports and aviation. Furthermore, plans for health care institutions, ships and harbours and a CBRN hazard plan are being processed and will be finalized and exercised in the near future.

The main health hazards in Iceland result from natural disasters like volcanoes, earthquakes, avalanches and severe weather. Additionally, chemical, biological and radiological (CBRN) hazards are 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 year. The plans have proven to be very useful and the main challenge in coming years is to keep them updated and exercised regularly.

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

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