



# Chemical, biological, radiological and nuclear (CBRN) hazards

Last update: 2023-08-10

## Key facts

- **Chemical hazards** are the unintended or deliberate release of a substance that is potentially harmful to humans or the environment (e.g. nerve and blistering agents, toxic industrial chemicals).
- **Biological hazards** include infectious disease outbreaks, epidemics, animal plagues and insect infestations. Insect infestations are described as the pervasive influx, swarming or hatching of insects affecting humans, animals, crops and perishable goods. Insects are responsible for significant losses to the world's total crop production annually. Climate change is expected to increase the risk for biological hazards.
- **Radiological hazards** involve all other sources of radiation.
- **Nuclear hazards** involve the accidental or intentional release of potentially harmful radioactive materials from nuclear fission or fusion, such as those associated with power plants, research reactors or nuclear weapons.
- **Weapon contamination hazards** refer to contamination from both conventional weapons (explosive devices, landmines...) and chemical, biological, radiological or nuclear hazards.

The events may be acute or chronic, from a known or unknown source, localized or widespread.

An event may be airborne, waterborne, foodborne or transmitted through contaminated soil. An additional source of concern is that most CBRN agents are invisible, odourless or impalpable – being difficult to detect. The increasing frequency of climate-related disasters, such as wildfires and flooding, is also increasing the risk of "Natech events" - technological accidents caused by natural hazards.

## Main health impacts

Health concern	Risk factors
----------------	--------------

<p>Health effects are specific to the agent, dose and route of exposure. The agent may be an irritant or may have specific toxicity. The agent can contaminate the skin and eyes, be inhaled or ingested or the agent can contaminate a person by simple fact of proximity.</p> <p>The health effects range from sickness and injury to serious illness and death, can be temporary or long-term, may be immediately apparent or may take some time to appear. The effects are often exacerbated by adverse psychological reactions, caused by uncertainty about the extent or the effects of exposure.</p> <p>Some of the main causes of mortality from CBRN include multi-organ failure, respiratory failure and neurological events including seizures, coma and stroke.</p> <p>Radiation exposure occurs when all or one part of the body is irradiated. Acute radiation injuries can either cause a localized injury (typically on the skin causing redness, ulceration and sometimes necrosis/death of tissue) or a systemic acute illness. The mortality rises with an increased radiation dose.</p>	<ul style="list-style-type: none"> <li>• Direct or indirect exposure to the agent: e.g. contaminated water, food or air.</li> <li>• Close exposure to CBRN agents (e.g. at work, home, school, during displacement of populations).</li> <li>• Extreme weather events increasing the risk of Natch events and biological hazards.</li> <li>• Inadequate or crowded shelters, bad sanitation and hygiene facilities and practice and vaccination gaps increase the risk of infectious disease outbreaks.</li> <li>• Unintended or deliberate release of a potentially harmful substance (e.g. industry, agriculture, military).</li> <li>• Armed conflicts with use of chemical, biological, radiological and nuclear agents (CBRN).</li> <li>• Damaged nuclear power plants or research reactors.</li> </ul>
<p>Malnutrition</p>	<p>CBRN hazards can lead to a loss of food. As an example, insect infestations can lead to a loss of food stock and crops, which can increase the risk of malnutrition. Likewise, chemical or nuclear contamination of farmland can reduce arable land as well as access to water for food production leading to food insecurity with increased risk of malnutrition.</p>

## Priority actions for teams with community and public health response capacity

## Immediate steps

- Firstly cooperate with authorities for correct procedures and safety for volunteers and staff (e.g. personal protective equipment) before any response action is initiated.
- Assess environmental and health risk factors and establish the context. Gather the data to understand if and how Red Cross and Red Crescent staff/volunteers and the civilian population are affected, their capacities and vulnerabilities and evaluate the risks to different target groups.
- Provide first aid and ensure ambulance transport for injured survivors, with appropriate safety measures (including PPE) for rescue personnel.
- Identify and support authorities to manage possible sources of toxic contamination. Special technical interventions might be required to mitigate the risk of toxic or weapon contamination. In certain circumstances this technical support might be requested from the ICRC.
- Define affected zones and forecast of new zones potentially affected (weather/wind patterns, downstream rivers, food chain). It can be useful to create and update a hazard map and “safe area map” and share it with the community so people can become aware of the dangers.
- Define health risks, health impact and capacity of local health infrastructure to cope.
- Transport people away from zone of contamination and provide first aid after displacement.
- Decontaminate victims (where appropriate).
- For infectious disease outbreaks and epidemics, please refer to specific disease tools on the website and to the key concepts.

## Surveillance

- Assess existing surveillance mechanisms (if any). Determine, if there is a need, the extent to which the National Red Cross Red Crescent Society could feasibly support community-based surveillance efforts. If necessary and appropriate, set up a community-based surveillance system with high priority to volunteer and staff safety.
- Activate disease early warning systems.
- Ensure that a monitoring system for collecting incident data (data related to a hazardous event that has led or could lead to an accident) is established.
- Follow up exposed cases and refer to a health centre, if needed.
- Look out for new exposures in the community and investigate sources of contamination.

## Community-based action and social mobilization

- Implement community engagement focusing on prevention of exposure through contaminated food, land, or water; proximity to radiological hazards; and airborne transmission.
- Ensure that the community knows the symbols with which chemical, biological, radiological and nuclear agents should be marked.
- Collect incident data in conjunction with the national authority.
- Provide training on safety messages and hazard-mapping, first-aid and decontamination procedures.
- If necessary, provide PPE and training on how to use it.
- Provide or restore a safe water, food and fuel supply to prevent people meeting their basic needs by accessing contaminated areas.
- Move at risk populations to “safe zones” and install sanitation facilities to provide safe alternative options where people would otherwise have to enter dangerous zones.
- Create safe play spaces for children, so they will not play in contaminated areas.
- Assure convenient clothing and accommodation facilities for people forced to move.
- Social mobilization for emergency vaccination or medical countermeasures campaigns as needed.
- Identify in the community cases of high-risk diseases (see list of disease tools below) and refer to pre-identified health structures. This requires a prior identification of a referral pathway, that is, mapping of existing primary health facilities and assessment of minimum quality care standards and accessibility (including geographic and cost-related barriers).
- Ensure procedures are in place to safely manage human and animal corpses.
- Ensure access to Mental Health and Psychosocial Support (MHPSS) services for community members and staff/volunteers which may include (but are not limited to): regularly assessing MHPSS needs; providing information on the situation regularly in cooperation with authorities; training volunteers for the provision of psychosocial support (PSS); using mobile teams providing a range of support; embedding PSS into evacuation centre/shelter facilities; providing special support to vulnerable groups; working closely with authorities in family tracing; coordinating points for further care.
- Make sure to take care of Red Cross Red Crescent staff and volunteer security and well-being: provide communication equipment and PPE to staff and volunteers.

Further resources:

- Guidelines produced to help the International Red Cross and Red Crescent Movement better manage the risks associated with weapon contamination resulting from conventional weapons and/or chemical, biological, radiological and nuclear hazards. The document covers developing and conducting risk awareness and safer behaviour interventions to reduce the likelihood of casualties among staff, volunteers and the civilian population. It also outlines key considerations in assessing, designing, implementing and monitoring activities to raise awareness of weapon-contamination hazards and to promote change in the behaviour of Movement staff and affected communities. Available at: [www.icrc.org/en/publication/4381-increasing-resilience-weapon-contamination-through-behaviour-change](http://www.icrc.org/en/publication/4381-increasing-resilience-weapon-contamination-through-behaviour-change)
- A leaflet developed by the International Committee of the Red Cross (ICRC) to raise awareness on basic measures to protect oneself and others in case of nuclear, radiological, biological and chemical events. Available at: [www.icrc.org/en/publication/4137-nuclear-radiological-biological-and-chemical-events](http://www.icrc.org/en/publication/4137-nuclear-radiological-biological-and-chemical-events)
- UN 2022 *Insect Infestation*. Available at: <https://www.un-spider.org/category/disaster-type/insect-infestation>
- IFRC 2022 *CBRN hazards*. Available at: <https://www.ifrc.org/technological-and-biological-hazards>
- IFRC 2021 *Chemical, biological, radiological and nuclear hazards*. Available at: <https://www.ifrc.org/media/13381>
- WHO Europe 2008. *Public Health Significance of Urban Pests*. Available at: [https://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0011/98426/E91435.pdf](https://www.euro.who.int/__data/assets/pdf_file/0011/98426/E91435.pdf)
- To help communities to be ready for a crisis or emergency when it happens: Livelihoods centre 2020. *Section 11: Early Warning Early Action*. Available at: <https://www.livelihoodscentre.org/documents/114097690/114438848/Easy+Volunteer+Actions+-Section+11+-+Early+Warning+Early+Action.pdf/47e965a3-d7b5-0e23-1a66-7f65c80a1d4e?t=1591268358292>

## For teams with additional clinical capacity

Please always refer to the appropriate local or international guidelines for clinical management.

## List of important primary health care interventions

- Ensure any staff working clinically are trained in the treatment of CBRN and understand the risks and necessary precautions to take to not endanger their safety. If there are any concerns, ensure co-ordination with the relevant local authority before intervening.
- Ensure a functioning system of triage, treatment and ambulance transport for exposed people with referral to secondary level of care.

- Care for psychological needs.
- Support continuity of main service delivery including maternal and child services.
- If disrupted, advocate and/or support authorities to ensure access to services and medication for patients with noncommunicable diseases (NCD) and who require palliative care.
- Care of minor wounds and skin infections. Tetanus vaccination, if appropriate.
- If requested by local authorities, assist in the administration of potassium iodine tablets. It is important to understand that potassium iodine is only helpful in specific situations for certain groups of people and only protects the thyroid gland. Note that potassium iodine tablets for nuclear radiation exposure are different from nutritional iodine supplements.

## Disease tools that may be relevant

- .\_> [Hepatitis A](#)
- .\_> [Measles](#)
- .\_> [Malaria](#)
- .\_> [Acute respiratory infections \(ARI\): Influenza \(avian and seasonal\)](#)
- .\_> [Diarrhoeal diseases](#)
- .\_> [Hepatitis E](#)
- .\_> [Meningococcal meningitis](#)
- .\_> [Poliomyelitis \(polio\)](#)
- .\_> [Typhoid fever](#)