Serious and widespread flooding seems to occur more and more frequently around the world. Although every flood can have a number of unique characteristics, many health risks associated with flooding are commonly observed around the world.

Flood waters and standing waters pose a variety of risks, including infectious diseases, chemical hazards and injuries. Flooding is often associated with an increased risk of infection although this is low unless water sources are compromised and/or there is a significant displacement of the local population.

The rate of diseases that were present before a flood may increase owing to decreased sanitation or overcrowding among displaced people. Practising good hygiene including frequent handwashing, securing a clean water supply and using safe food preparation techniques will help to reduce your risk of ill-health.
The advice below is of particular relevance to those involved in providing flood relief, aid and support to the victims of floods rather than the flood victims themselves.

FLOOD-RELATED HEALTH RISKS IN THE TROPICS

Flooding caused by heavy rains, tropical storms, meltwaters or tsunamis cause two main problems in the tropics:

- Food and water-borne diseases such as cholera, dysentery and leptospirosis.
- Insect-borne diseases such as malaria, dengue fever, Japanese encephalitis and yellow fever.

Food and water borne diseases following flooding

In the tropics these include:

- **Diarrhoea and dysentery**: drinking water sources are often contaminated during flooding. Take extra precaution to boil water and keep clean water or other safe drinks with you. Eat only recently prepared hot food or take your own supply of food with you. Wash your hands frequently or use alcohol gel/wipes (that contains at least 60% alcohol) where this is not possible. Use clean water to brush your teeth.
- **Cholera**: there is a substantial risk that cholera, normally present in many areas regularly affected by floods e.g. south Asia, might spread and reach epidemic proportions. Follow the precautions above.
- **Hepatitis A**: Outbreaks of hepatitis A may become more common after flooding so make sure you are up-to-date with this immunisation.
Leptospirosis: is spread through the excreta of infected rodents, especially rats. It becomes more common during and after floods, especially for aid workers, including water and sanitation engineers or others involved in direct clean-up operations. It is spread mainly through cuts and abrasions in the skin, when in contact with floodwaters, damp soil and mud.

Skin & eye infections: Existing skin problems such as eczema can become infected more easily. Infections in the ear canal can also increase if contaminated water enters the ear canal and is not drained immediately. Eye infections, such as conjunctivitis, are more common following flooding.

Typhoid fever: this is found in virtually all tropical areas where flooding occurs. Once again, follow the advice above on food and water and also ensure you are up-to-date with your typhoid immunisation.

Dengue fever is rapidly increasing its worldwide spread and usually becomes more common after flooding in areas where it already occurs. Be aware of the symptoms of dengue fever and the importance of protecting yourself from mosquito bites.

Malaria. There is a greater risk of malaria following the arrival of the first floodwaters (around 6-8 weeks after). All travellers to affected areas must take extra precautions.

INSECT AND ANIMAL BITES FOLLOWING FLOODING

Flood waters can displace animals and reptiles to new areas presenting a new and unknown risk to both humans and local animals. Standing water provides ideal conditions for mosquitoes to breed in high numbers unless a large amount of sea water is present. Flooding can flush out mosquito breeding initially, but breeding returns when the waters recede.

Consider the following risks:

- **Dengue fever** is rapidly increasing its worldwide spread and usually becomes more common after flooding in areas where it already occurs. Be aware of the symptoms of dengue fever and the importance of protecting yourself from mosquito bites.
- **Malaria.** There is a greater risk of malaria following the arrival of the first floodwaters (around 6-8 weeks after). All travellers to affected areas must take extra precautions.
This includes using DEET/Icaridin containing insect repellent, sleeping under insecticide-impregnated mosquito nets and taking appropriate malaria prevention tablets.

- **Other local mosquito-borne diseases**: e.g. Japanese encephalitis, yellow fever, Zika virus infection, West Nile fever and chikungunya fever may be present in the area and can increase following flooding.

- **Rabies**. In flooded areas animals such as rats and dogs occasionally behave more erratically, so rabies immunisation is advised if there is time to complete a course before travelling. If you have had a primary course of 3 injections in the past, you would need 2 post exposure vaccines if you have a Rabies contact.

- **Snakebite**. Floodwaters may have caused snakes to move into new areas where they would not normally be seen or expected. Be aware of snakes swimming in the water or hiding under debris. Back away from a snake slowly and do not touch it. After entering floodwaters check your skin for puncture wounds, redness or swelling around a bite mark and seek medical attention quickly if you think you may have been bitten by a snake.

**OTHER HEALTH RISKS**

- **Chemical Hazards**. Floodwaters may have caused dangerous chemicals to drift away from their usual storage area and leak. Be alert for leaking containers and report any to the authorities to organise their disposal.

- **Corpses**. Dead bodies only pose health risks in a few special cases requiring specific precautions. Corpses should be handled by those with appropriate training, where possible, to ensure universal precautions for blood and body fluids, use of gloves and body bags and disinfection of vehicles and equipment.

- **Hypothermia**: if trapped in floodwaters for a prolonged period.
- **Drowning, injuries and trauma**: caused by rapidly rising and fast flowing waters full of debris. Head for higher ground as quickly as possible, keep away from the water’s edge and do not attempt to cross floodwaters or drive through them. Bridges may be significantly weakened by a flood.
- **Moulds**: grow best in damp, warm environments so flooding can provide optimal mould growth opportunities. People with asthma, allergies, breathing conditions and those who have a weakened immune system (immunosuppressed) are more susceptible to mould infections. Mould can cause people to experience eye and skin irritation, wheezing and shortness of breath and a stuffy nose.
- **Polio**: This is still found in some countries and theoretically floods could increase its transmission, as polio can spread rapidly, particularly in environments with poor hygiene and sanitation. This is especially the case in South Asia.
- **Power cuts** caused by flooding may interrupt water treatment services and clean water supplies, increasing the risk of water-borne diseases. They can also affect the effective operation of health centres. Look out for fallen power lines and be aware of the increased risk of electrocution.
- **Respiratory tract infections**: There is an increased risk owing to exposure (lack of shelter and vulnerability to floodwaters and the weather).
- **Tetanus**: This is a risk because of the increased danger of cuts to the skin or stepping on sharp objects. Make sure you are up to date with your tetanus immunisations.
FLOODING RELATED RISKS IN TEMPERATE REGIONS

The risk of insect-borne diseases caused by flooding in temperate regions is often lower, although the incidence of West Nile fever can increase. The risk of hypothermia and exposure increases significantly. Leptospirosis is also a risk in temperate regions affected by flooding.

How to minimise flooding-related ill-health and injuries

Humanitarian workers can keep fit and well whilst engaging in flood relief work by taking the following sensible precautions:

- Assess the situation and listen to news reports and warnings. Do not go out into areas where flash floods may occur after heavy rains.
- When working in areas affected by flooding, always wear appropriate clothing. This may include rubber boots, rubber gloves and goggles. Appropriate footwear will protect your feet from standing on potentially hazardous objects in the water. Wear a life-jacket if travelling by boat or working close to fast flowing water.
- If you have any open wounds, cover with waterproof plasters or bandages after washing them with soap and clean water. Seek medical attention if your wound becomes red, swollen or discharges.
- Use a DEET-based insect repellent or one containing Icaridin to minimise insect bites and reapply frequently.
- When you return to your accommodation strip off wet clothes and shower or wash down and dry yourself well.
- Wash clothing which comes into contact with floodwaters in hot water and detergent if possible. Wash them separately from uncontaminated clothes.
- Carry a torch/alarm to use to get attention should you need help.
- Always check electrical equipment carefully before use. Assess whether any connections or wiring have become wet. Turn off the power if in any doubt.
SOURCES

- Personal Hygiene and Handwashing After a Disaster or Emergency, US Centers for Disease Control & Prevention (CDC), 5 August 2021
- Natural Disasters and Severe Weather Floods, CDC, 14 June 2022
- Flood Water after a Disaster or Emergency, CDC, 17 September 2020
- Mold Prevention Strategies and Possible Health Effects in the Aftermath of Hurricanes and Major Floods, Mary Brandt et al, CDC, 9 June 2006
- Mold After a Disaster, CDC, 28 July 2020