



Immediate health impacts of volcanic ashfall from Hunga Tonga Hunga Ha'apai and recommendations for health sector response

What is volcanic ashfall?

Volcanic ash is formed during explosive eruptions. Ash consists of small fragments of rock created by fragmentation of magma as the volcano erupts. Fresh ash particles can have an acid layer on their surface from the acidic volcanic gases but this is rinsed off by rainfall or if the ash falls in water. Every explosive eruption creates ash with different properties, so it is important to analyse the ash each time to determine its properties.

Immediate respiratory health impacts of ashfall

The ash may persist in the air for days after each volcanic event unless rainfall clears the air. Deposited ash may also be remobilised by wind, vehicles and clean-up activities. In large volcanic explosions, a high proportion of very fine particles (known as PM_{2.5}) may be generated that are small enough to be breathed into the smallest air sacs of the lung, adversely affecting people suffering from chronic lung and heart diseases. Slightly larger particles (PM₁₀) irritate the airways and cause coughs, sore throat and bronchitis symptoms even in healthy people and will exacerbate chronic conditions such as asthma and bronchitis, including pneumonia.

Healthy people can tolerate quite high levels of ash in the air for short periods of time. The most vulnerable are those people with pre-existing lung problems whose conditions worsen during periods of poor air quality. Many individuals, including children, do not know that they suffer from asthma and this condition may present for the first time or get much worse during ash exposures and require hospital admission.

Recommendations for health sector response

- Establish a health surveillance system in hospitals and shelters, with special emphasis on the reporting of respiratory disorders. A health survey team should make regular risk and impact assessments while the eruption continues and the results communicated to government and to the population by media outlets. As the programme continues, specific advice may need to be given to hospitals and health care professionals, as well as specific groups of vulnerable patients, e.g., pregnant women, children or the elderly.
- Advise people with respiratory conditions such as asthma, COPD or chronic bronchitis, or heart conditions, that they are at higher risk of experiencing ill effects from breathing ash. They should keep their relief medication handy and use as prescribed, and call their family doctor or health clinic if they are concerned.
- Advise public to stay indoors and keep children indoors. Children should be discouraged from playing in the ash.
- Advise public to keep ash out of houses by keeping doors and windows closed and placing damp towels or cloths to cover any gaps. Ashy clothing and shoes should be left outside.
- Advise people to wear respiratory protection when outdoors. Health agencies should consider distributing effective face masks (P2- or N95-certified) to the public if possible. Adult masks do not fit very well to children, or to people with beards and do not give any protection against volcanic gases. Homemade cloth face masks (for community Covid protection) will give some protection but do not work as well as certified masks that are fitted properly.



- Once ash has stopped falling and it is safe to do so, ash clean-up should start. Clearing away ash improves living and working conditions as well as reducing the health risk from ash inhalation. It is best to use shovels and brooms to clean up rather than using up water supplies.
- Clean-up workers need protection from ashfall: industry-certified face masks fitted properly (ideally, checked by fit testing), goggles, full length clothing and covered shoes.
- Driving should be kept to a minimum to reduce the ash being stirred up into the air, and because deposited and airborne ash makes driving conditions dangerous.
- Clearing ash from roofs is hazardous. Health and safety guidance for doing this safely is given here: https://www.ivhhn.org/uploads/IVHHN_briefing_note_clean-up_health_safety.pdf
- Buildings at higher risk of collapse due to ash accumulation on roofs include those with long-span roofs and traditional buildings made of forest materials. Long-span traditional buildings can collapse with as little as 25 mm of ash loading. If possible, clear ash from these roofs to avoid heavy accumulation if this can be done safely (see previous point). People should stay out of any buildings with signs of deformation to their structure due to ash loading.
- Provide alternative water supplies to households in need.
- Advise public to wash ash off fruit and vegetables before eating.
- Consider having seafood tested for volcanic contaminants and advise public accordingly.
- Advise public to keep animals under shelter if possible and to provide clean water and feed if required.
- Work with other agencies such as Geological Survey to coordinate collection and testing of ash samples, interpretation of results and communicating these to the public.

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Further resources:

- IVHHN epidemiological protocols: <https://www.ivhhn.org/guidelines#epidemiological>
- Advice on air quality management: https://www.ivhhn.org/uploads/IVHHN_briefing_note_air_quality_monitoring.pdf
- Advice on water quality management: https://www.ivhhn.org/uploads/IVHHN_briefing_note_water_quality.pdf
- Information on preparedness for ashfall: <https://www.ivhhn.org/information#ash>
- Information on protection from breathing ash: <https://www.ivhhn.org/ash-protection>
- Information on actions to take to reduce exposures to volcanic gases: <https://www.ivhhn.org/information/health-impacts-volcanic-gases>
- Health and safety considerations for ashfall clean-up: https://www.ivhhn.org/uploads/IVHHN_briefing_note_clean-up_health_safety.pdf
- Advice on urban clean-up operations: <https://www.gns.cri.nz/content/download/14551/77028/file/Urban.pdf>



- Advice for road network operators:
<https://www.gns.cri.nz/content/download/14550/77024/file/Road-network.pdf>
- Protocols for ash collection and analysis for rapid health hazard assessment:
<https://www.ivhhn.org/guidelines#ash-collection>
- Information on impacts to agriculture:
https://volcanoes.usgs.gov/volcanic_ash/agriculture.html