

# Flash Floods

## Sharing of field experience - Kerala

Issue No. 53

Cred Crunch

December 2018

In August 2018, the state of Kerala in India was hit by severe flash floods, which carried heavy human and economic consequences. Flash floods are a particular type of flood disasters, characterized by their rapid onset and potential for infrastructure destruction. In this issue, we discuss flash floods and their global importance, and we present a field mission to Kerala undertaken by the CRED Team in partnership with the Indian NGO Doctors For You.

### Floods vs Flash Floods: Definitions (1)

### (Flash) Floods and health: a review

#### FLOOD

General term for the overflow of water from a stream channel into normally dry land in the floodplain (riverine flooding), higher-than-normal levels along the coast and in lakes or reservoirs (coastal flooding) as well as ponding of water at or near the point where the rain fell (flash floods).

#### FLASH FLOOD

Rapid inland floods due to intense rainfall. A flash flood describes sudden flooding with short duration. In sloped terrain, the water flows rapidly with a high destruction potential. In flat terrain, the rainwater cannot infiltrate into the ground or run off (due to small slope) as quickly as it falls. Flash floods typically are associated with thunderstorms. A flash flood can occur at virtually any place.

Mudslides or landslides often happen during flash floods. In India, mudslides or landslides occurred in 36% of all flash floods since the year 2000.

Knowledge on health impact of floods is scarce. Our review of the few available studies showed that, apart from immediate deaths and injuries, floods also cause an increase of gastrointestinal diseases and of leptospirosis cases. Other health problems include skin diseases, eye infections, worsening of nutrition status in children, respiratory illnesses, and exacerbation of chronic diseases (2).

This research gap is even more accentuated in flash floods. The few existing publications focusing on the health impact of flash floods are mostly from high-income settings, and are limited to mortality and, less frequently, injuries. Flash floods are responsible for the majority of flood-related deaths in high-income countries, and most of these deaths are due to drowning. Also, most of the flash-flood mortality is vehicle-related. Other causes of death include electrocution, heart attack, trauma, and asphyxia by being buried in mudslide (3). However, information is only available for a very small fraction of all deaths, and these findings must be interpreted with caution. In lower income countries, higher mortality related to flash floods is expected. Due to lack of construction standards regulations, infrastructure collapse is more likely.

### (Flash) Flood profile of India and Kerala

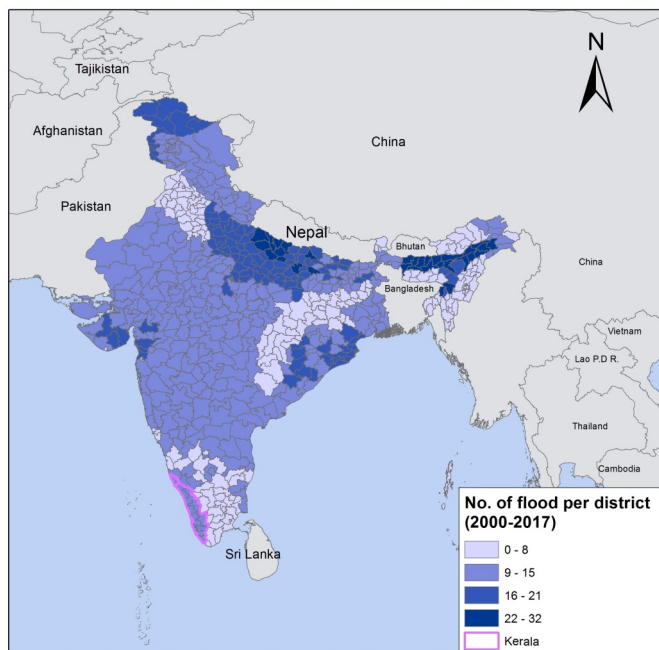


Fig.A: No. of flood events per district in India (2000-2017)

The state of Kerala, in South India, has been affected by 14 floods since 2000 (Fig.A). When looking deeper into EM-DAT data for floods in India (2000-2017), we found that flash floods have a more important human impact than regular floods. Due to their rapid onset, flash floods allow little time to warn the population. On average, 7.6% of the population living in the areas exposed to flash floods were affected, which corresponds to two times the rate of normal floods (3.7%). Regarding mortality, this difference is even greater, with 109 deaths per million people exposed to flash floods, compared to 6 deaths per million people exposed to normal floods.

Other studies show that the number of deaths as a proportion of the number of affected, tends to be higher for flash floods (4).

	Flood Affected / hundred PPE*	Flash Flood Deaths / million PPE
Affected	3.7	7.6
Deaths	6	109

\*PPE= People Potentially exposed to the disaster = living in the area affected

**Despite recurrent events, mitigating the consequences of floods (especially flash floods) remains a challenge. We need better data collection on human impact (e.g. cause of death) to better understand the different dynamics between flash floods and riverine floods. Better knowledge will contribute to an improved response, adapted to the type of flood.**

Graph and Map figures presented in the CRED CRUNCH come from "EM-DAT: The OFDA/CRED International Disaster Database"  
Pictures were gathered during the field mission by Maria Moitinho de Almeida and used upon agreement of the photographer

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## The Kerala Floods



Fig B: Flooded homes in Kuttanad Region-Kerala  
(Credits: Jacob Arikupuram, Doctors For You)

The 2018 Kerala Floods (Fig.B) were the worst in the region since 1924. Between August 7th and 20th, 504 people died and 23 million were directly affected by these flash floods. Economic losses accounted for 2.85 billion US\$, the third costliest flood in India. This disaster also damaged or destroyed 110,000 houses, and deeply affected people's livelihoods, with more than 60,000 ha of culture damaged and many animals killed. Finally, these floods damaged more than 130 bridges and 83,000 km of roads, causing the isolation of certain communities.

The Kerala flash floods had a heavy death toll. Lack of coordination in dam opening contributed to this disaster, as highlighted in our document review. The consequences of the flash floods were aggravated by deadly landslides (Fig. C). Experts believe deforestation and human construction played a role in these landslides, as they provoke runoff and do not allow the soil to correctly absorb the excess water (5).

### CRED Field Mission in Kerala

In partnership with the Indian NGO Doctors For You, a researcher from CRED was deployed on a field mission to Kerala in the beginning of October, to explore the health system impact of these floods. After a thorough desk review of available documents and reports, visits to affected areas, and key informant interviews, we gathered different perspectives and obtained a holistic view of the local health situation.

#### Providing healthcare: challenging settings, adapted strategies

The district of Alapuzha is well-known for its paddy fields and farming below sea level. During the August 2018 Floods, it was almost submerged (5). These unique characteristics make it a challenge to reach everyone even in times of calm. Strategies to provide healthcare include mobile medical boats. On a normal day, each boat provides healthcare to about 100 patients. During the floods, 14 boats were deployed to the flood-affected communities for about one month. Emergency conditions included cardiac diseases, stroke, and snake bites. Severe cases were referred to higher levels of care by water ambulances. At the time of the field mission, respondents felt that mobile boat activities had already returned to normal.

#### Hospitals faced challenges, but back to normal after a couple of days

Roads were submerged, or blocked by landslides, compromising access to (district) hospitals. This may have contributed to an initial decrease in emergency visits, later followed by a substantial increase which lasted four to five days. An additional challenge was equipment shortage: for instance, fear of oxygen supply scarcity led to the decision of some hospitals to shut down operation theatres for some days. However, after this time, hospitals quickly returned to their normal functioning.

#### The fear of leptospirosis

Leptospirosis cases had increased already before the floods, so proactive preventive measures (including doxycycline prophylaxis) were immediately undertaken after the events. Although the number of cases did slightly increase, it did not reach the feared epidemic threshold.

#### Mental Health

Many of the affected lost all of their livelihoods. Minor depressions and PTSD cases were reported, but also suicides. A quick return to normality and a recuperation of livelihoods were seen as essential to mitigate long-term mental health problems.



Fig C: Vehicle stuck in a landslide in Wayanad district  
(Credits: Dr. Raheem Kapoor, Mananthavady District Hospital)

#### References:

1. EMDAT (CRED) : [www.emdat.be/Glossary](http://www.emdat.be/Glossary)
2. Saulnier, D. D., Ribacke, K. B., & von Schreeb, J. (2017). No calm after the storm: a systematic review of human health following flood and storm disasters. *Prehosp and dis med*, 32(5), 568-579.
3. Terzi, G., Ruin, I., Anquetin, S., & Gourley, J. J. (2017). A situation-based analysis of flash flood fatalities in the United States. *Bull Amer Meteorol Soc*, 98(2), 333-345.
4. Jonkman, S. N. (2005). Global perspectives on loss of human life caused by floods. *Natural hazards*, 34(2), 151-175.
5. Oomeren T, Coffman R, Sajinkumar KS, Vishnu CL (2018), Geotechnical impacts of August 2018 Floods of Kerala, India

**Our findings suggest that, despite their high magnitude, these floods did not irreversibly affect the health of Kerala's population. The local health system coped with increased health needs in difficult conditions. Eventhough specific communities may have been particularly vulnerable, they seem to have been well covered by several initiatives, and are now moving forward to "Build Back Better". We argue that a key contributor to health system resilience is a good pre-disaster social and health status of the population. Kerala is well-known for its advanced social development and good health indicators, which strengthen a population in critical times such as these floods. Efforts should be made to improve population health in non-emergency situations, to minimize the long-term and potentially destructive effects of disasters.**

We thank the Doctors For You team, in particular Dr. Ravikant Singh, Jacob Arikupuram, Susan Jacob, and Peehu Pardeshi for making the field mission a success. We are also grateful to all the people who agreed to participate and answer our enquiries, show us the affected areas, and let us witness their operations and activities.

## CRED News

- ◆ Our APHES Summer Course will take place in July 2019. For more information and registrations : [www.aphes.be](http://www.aphes.be)
- ◆ Disaster health impact data is scarce in sub-Saharan Africa. Two CRED researchers were in Mozambique in December to prepare future work
- ◆ New article published: Cuesta JG, van Loenhout JAF, de Lara-Banquesio ML, Isiderio JM, Ajoulat I, Guha-Sapir D (2018) The Impact of Typhoon Haiyan on Health Staff: A Qualitative Study in Two Hospitals in Eastern Visayas, The Philippines. *Front. Public Health* 6:208
- ◆ CRED released in October the report « Economic Losses, Poverty & Disasters », in collaboration with the United Nations for Disaster Risk Reduction: [https://www.cred.be/sites/default/files/CRED\\_Economic\\_Losses\\_10oct.pdf](https://www.cred.be/sites/default/files/CRED_Economic_Losses_10oct.pdf)

Please note that disaster data are subject to change as validation and cross-referencing of the sources is undertaken and as new information becomes available. For any enquiries please contact [contact@emdat.be](mailto:contact@emdat.be) or visit [www.emdat.be](http://www.emdat.be)

