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.

(Flash) Floods and health: a review

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 in gastrointestinal diseases and 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.

<table>
<thead>
<tr>
<th>Flood</th>
<th>Affected / hundred PPE*</th>
<th>Flash Flood</th>
<th>Deaths / million PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected</td>
<td>3.7</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>Deaths</td>
<td>6</td>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

*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.
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 flooded-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. Suicides were reported along with minor depressions and PTSD cases. A quick return to normality and a recuperation of livelihoods were seen as essential to mitigate long-term mental health problems.

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
- Disaster health impact data is scarce in sub-Saharan Africa. Two CRED researchers were in Mozambique in December to prepare future work

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 or visit www.emdat.be