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## Mortality risks associated with flood events

### All cause, cardiovascular, and respiratory deaths rise in the weeks after an event

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Floods account for 44% of all global natural disasters<sup>1</sup> and are responsible for about half of all deaths resulting from such events. Currently, 1.81 billion people (23% of the world's population) are directly exposed to the threat of severe flooding.<sup>2</sup>

In a linked paper (doi:10.1136/bmj-2023-075081), Yang and colleagues assessed the impact of exposure to flood events on mortality across 761 communities in 34 countries worldwide.<sup>3</sup> Through this extensive time series analysis involving a total of 47.6 million deaths, the authors found compelling evidence of heightened mortality after exposure to floods, with effects persisting for 50-60 days. Specifically, they found cumulative risk increases of 2.1% (95% confidence interval 0.6% to 3.6%) for all cause mortality, 2.6% (0.5% to 4.7%) for cardiovascular mortality, and 4.9% (0.8% to 9.2%) for respiratory mortality.

Flood associated effects included increases in deaths from all causes not just deaths caused directly by flooding. This is one of the study's strengths because conventional approaches commonly used to identify deaths linked to flood events, systematically underestimate mortality risks by focusing only on deaths caused by direct physical forces such as drowning or trauma.<sup>4 5</sup>

Yang and colleagues conducted a pioneering and systematic investigation using recognised datasets of all cause deaths and historical flood events. They carefully examined the data using standard analytical approaches. Deaths linked to flooding may be triggered by contamination of food and water, exposure to pathogens, inaccessibility of healthcare services, and poor mental health during and after flood events.<sup>6 7</sup> So a systematic evaluation of all cause, cardiovascular, and respiratory mortality covering 34 countries will help to address limitations such as exposure misclassifications, small sample sizes, and limited spatial-temporal scope of data, which have contributed to inconsistency in previous findings.<sup>8 -11</sup>

Yang and colleagues' findings also underscore the importance of collaborative efforts among public health authorities, healthcare providers, and communities in mitigating the health harms of floods. Policy makers such as the ministries of health at national and subnational levels must play a leading role in preventing avoidable deaths by making timely responses to flood events, health emergencies, and other disasters a national priority.

Authorities must establish standardised procedures after flood events to monitor the wellbeing of affected populations, assess the risks of death and illness, and track use of healthcare services such as outpatient services and emergency departments. In

Yang and colleagues' study, mortality risks associated with flooding were found to vary by local climate type and were more pronounced in populations with low socioeconomic status or a high proportion of older people and those with poor baseline health.<sup>3</sup> Others report higher mortality risks in populations living in low lying areas with slow or absent flood warning systems, and limited access to healthcare.<sup>12 13</sup>

Timely decision making is essential in areas at risk. Preparedness plans including early alarm systems, protocols for evacuation and relocation of affected populations, and management of health in shelters and evacuee centres, may reduce the burden on local hospitals, improve survival, and facilitate post-disaster resilience. Communities prone to flooding should have priority access to necessary healthcare resources, particularly those with vulnerable populations or healthcare systems.<sup>14</sup>

As drowning accounts for 75% of deaths linked to flood events,<sup>15</sup> adaptation measures such as improvements in infrastructure, land use planning, and flood resilience are crucial to reduce the risk and impact of flooding, particularly as climate change intensifies.<sup>16 17</sup>

Disaster response training and preparedness initiatives targeting healthcare providers such as public health practitioners and primary care professionals can enhance the quality and timeliness of care for communities and individuals affected by flooding. Building on insights from Yang and colleagues' study, continuous monitoring and support at the community level should be available for at least 25 days after a flood event to help reduce associated risks to population safety.

Public education programmes to enhance disaster literacy<sup>18</sup> and promote risk awareness can boost public confidence, disseminate vital information, and facilitate community based services to help prevent or respond to floods. Establishing effective communication channels and disseminating timely risk information among policy makers, healthcare providers, and community members would improve the coordination of multifaceted, flood response measures.<sup>12</sup>

Flood events are projected to escalate in severity, duration, and frequency, owing to the impact of climate change.<sup>17</sup> Recent severe flood events in China's Beijing-Tianjin-Hebei region (2023),<sup>19</sup> Tennessee in the US (2021),<sup>20</sup> Pakistan (2022),<sup>21</sup> multiple European countries, including Germany, Belgium, the Netherlands, and France (2021),<sup>22</sup> and most recently in Libya underscore the urgency of this situation. To address these concerning trends in flood events, measures to mitigate climate change by

## reducing greenhouse gas emissions and transitioning to renewable energy sources are now critical, along with adaptation measures to help protect communities and ecosystems from the increasing risks of flooding associated with climate change.

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