



Unfolding multi-hazard interactions: Zooming in on the links between flood events and the Covid-19 infection rate in Romania

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The third decade of the century started with a major epidemiological disturbance that favoured the increase in the co-occurrence of hazards in both developed and developing countries. This translated into a multi-hazard research boost, aiming to explore the interactions between concurrent or cascading hazards, but also to propose improved multi-hazard management strategies.

Since floods represent frequent and impactful natural hazards, their spatial and temporal overlap with the Covid-19 pandemic resulted in compounded negative effects that are difficult to mitigate applying classical flood management plans. In return, the efforts of curbing SARS-CoV-2 infection rates become even more of a tall order during flood events. Therefore, both flood and pandemic management practices need to be amended considering each other's aims, priorities, limitations, and strengths; which cannot be achieved without a proper understanding of the ways the two hazards interact.

This study questions whether the river flood events that occurred during the Covid-19 pandemic in Romania, and the way that they were managed, had an impact on the infection with the SARS-CoV-2 virus at county scale. The challenge of data scarcity was addressed by identifying the flood events of 2020-August 2022 based on the hydrological warnings issued by the National Institute of Hydrology and Water Management. In addition, hazard management data were extracted from autochthonous online press. Only flood events that were severe enough to impose the evacuation of population were corroborated with the Covid-19 confirmed cases dataset, and also with milestones of the Covid-19 preventive legal framework.

The flood events under analysis were followed by an increase in the total confirmed cases at the end of the Covid-19 incubation time range at county level, with only one exception. Infection rates varied in size, most of the counties registering under 50 new Covid-19 confirmed cases after 2 weeks since flood events. The viral load increased by a maximum of 208 new cases of Covid-19. These increases correspond to the late spring and summer months, defined by climatic conditions that hinder the spread of the virus, simultaneously allowing the relaxation of Covid-19 preventive

measures. Consequently, low-level local and national viral loads prevented a post-flood spike in the Covid-19 positive cases, which explains the prevalence of increases under 50 new cases. In counties where the infection rate exceeded 150 additional cases, local-scale particularities should be considered. Thus, it is difficult to establish a definite link between flood events and the dynamics of the Covid-19 infection rates recorded in the selected counties.

This research work contributes to the multi-hazard research field by adding important insights on i) the impact of flood events on the number of Covid-19 confirmed cases in a country with high flood risk, and ii) the interactions between the Covid-19 and flood management practices, also providing an example on how to tackle the data scarcity problem through an adapted data collection procedure. The findings may be used to ground decision-making aiming to address the present-day multi-hazard riddle: natural hazard management requires collaboration, while Covid-19 management practices hold social distancing to the core.