

Title: Emergency Department Utilization and Unplanned Hospitalizations Associated with Floods in the US from 2008-2017: An Interrupted Time Series and Cohort Analysis

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Background: Flooding is a major environmental hazard, with events increasing in intensity and frequency in the context of climate change. Floods cause significant health and economic impacts particularly among vulnerable populations, including older adults. However, comprehensive analyses of the health consequences of flooding-remain limited.

Methods: We used a retrospective cohort design to analyze emergency department (ED) utilization and unplanned hospitalization among Medicare beneficiaries over age 65 exposed to large-scale flood events in the US from 2008 to 2017. Using a spatially distributed flood inventory that captures 20-year floods, the study employed a conditional fixed-effects regression approach to explore the incidence of all-cause and cause-specific ED visits and hospital admissions pre- and post-flood. We also evaluated healthcare costs associated with these events, standardized to 2017 USD.

Results: The analysis included over 11.8 million Medicare beneficiaries living in areas exposed to major floods. The rate of all-cause ED visits and hospital admissions rose by 4.8% and 7.4%, following flood exposure, respectively. Cost analysis indicated a cumulative increase of over \$261 million in acute care costs attributable to major flooding events. Stratified analyses highlighted greater impacts on certain demographic groups, including adults over 85 years, and specific seasonal patterns.

Conclusions: Our findings demonstrate a clear association between flood exposure and increased healthcare utilization and costs to taxpayers. Prior flood-related expenditure methodologies have underestimated the costs of morbidity associated with floods, which in this investigation were substantial. These findings contribute to our understanding of the health and societal burden of climate change-related environmental hazards and highlight the need for healthcare system preparedness for resilience in the face of these disasters and their associated increased healthcare utilization. The findings also underscore the need for targeted public health strategies and improved disaster preparedness, especially for older adults.