Exposure to Severe Weather Caused by Hurricane Harvey and Mortality among Populations of Vulnerable Older Adults

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Introduction. In 2017, unprecedented rainfall from Hurricane Harvey resulted in severe flooding in parts of Texas. While the association between the immediate effects of severe weather on mortality is well established, less is known about long-term mortality and how risk may differ across vulnerable populations, especially those reliant on health services. This study examines the association between severe weather exposure from Hurricane Harvey and mortality among vulnerable populations of older adults.

Methods. This retrospective cohort study used Medicare administrative claims data from fee-for-service beneficiaries aged 65 years or older who resided in Texas or Louisiana the year before and after Hurricane Harvey. Historic weather data was used to construct a 4-day measure of ZIP code tabulation area cumulative rainfall and identify locales exposed to high rain (above 75mm). Vulnerable older adult populations (e.g., minoritized racial/ethnic or low-income groups), as well as those with health conditions that rely on health services, were identified. Attributable risk and relative risks (RRs) were estimated to quantify the population-level impact of high rain exposure on mortality. Time-to-event analyses estimated the individual association between exposure to high rain and 12-month mortality (adjusted for age, sex, race/ethnicity, health status) among vulnerable older adult populations.

Results. The study included 1,730,693 beneficiaries, of whom 535,794 (37.5%) were exposed to high rain in Texas and 264,265 (87.5%) in Louisiana. Beneficiaries with Alzheimer's disease and related dementias (ADRD) exposed to high rain had a 5% higher risk of mortality in fully adjusted models (HR=1.05, 95% CI: 1.02, 1.07) and 1,192 attributable deaths. High rain resulting from Hurricane Harvey was associated with a 13% higher risk of mortality among beneficiaries with end-stage renal disease (ESRD) in fully adjusted models (HR=1.13, 95% CI: 1.04, 1.23) and 85 attributable deaths. High rain did not affect mortality risk among older adults with congestive heart failure or COPD. Among socioeconomic factors, living in an area with high social vulnerability (Social Vulnerability Index Percentile 90+) exhibited an association between high rain exposure and elevated mortality risk (RR=1.05, 95% CI: 1.03, 1.07); similarly for dual eligibility (RR= 1.10, 95% CI: 1.07, 1.13).

Conclusion. The risk of mortality associated with exposure to severe weather differs based on the type of vulnerability. Those beneficiaries carrying an ADRD or ESRD diagnosis in particular had elevated mortality rates. Similarly, high rain exposure had a significantly larger mortality impact on those of lower socioeconomic status. Emergency planning, especially in the face of climate-change-driven increases in extreme weather events, should pay particular attention to these highly vulnerable groups.