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

Authors: Sue Anne Bell[1,3], PhD, FNP-BC, FAAN; Melissa Fiffer,[2] PhD; Marie Lynn Miranda,[2] PhD, Jonathan Martindale[1,4], MSc; Julie Bynum[3,4], MD, Matthew A. Davis[1,3,4], MPH, PhD

[1] School of Nursing, Department of Systems, Populations, and Leadership, University of Michigan, Ann Arbor, MI
[2] University of Illinois at Chicago, Children's Environmental Health Initiative, Chicago, IL
[3] Institute for Healthcare Policy and Innovation, University of Michigan, Ann Arbor, MI
[4] School of Medicine, University of Michigan, Ann Arbor, MI

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 among vulnerable populations, especially those reliant on health services. Therefore, the purpose of this study was to examine 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 for which reliance on health services differ, 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 and other individual demographics) among vulnerable older adult populations.
Results. 1,730,693 beneficiaries were included in the study. 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. Mortality risk did not differ among older adults with congestive heart failure and COPD. Among socioeconomic factors, living in an area with high social vulnerability (Social Vulnerability Index Percentile 90+) (RR=1.05, 95% CI: 1.03, 1.07) and dual eligibility (RR= 1.10, 95% CI: 1.07, 1.13) exhibited an association between high rain exposure and elevated mortality risk.
Conclusion. The risk of mortality associated with exposure to severe weather differs based on the type of vulnerability. Older adults experienced higher mortality one-year post exposure to high rain from Hurricane Harvey, including those with certain types of health conditions that require regular healthcare (ADRD and ESRD); likewise, those of lower socioeconomic status.