Title: Using EMS and Publicly Available Data to Track The Health Impact of Extreme Climate Events

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Background: The increased frequency and intensity of severe climate events is driving a need for climate-related health surveillance. In particular, heat waves are an increasingly common health threat in the western United States, raising new questions about criteria for opening local cooling centers. This study describes the use of easily accessible, real-time Emergency Medical Services (EMS) data to perform surveillance for heat-related illness in Marin County, California to guide local cooling center mobilization criteria.

Methods: Heat-related 911 calls were identified using both EMS medical record diagnoses and language contained in 911 dispatch records. Extreme heat events were identified using publicly available University of California Agriculture and Natural Resources weather data. Heat-related EMS calls were stratified into severe heat illness, indicating heat exhaustion and heat stroke, and broader heat-related symptoms capturing conditions exacerbated by hot weather. The relevant EMS data were then compared with the temperature dataset. Simple linear regression was used to examine the association between the number of heat-related EMS calls and the daily maximum air temperature during a period of extreme heat in September 2022. Regression discontinuity was then applied to assess whether the current temperature criteria for opening local cooling centers was associated with increased risk of heat-related illness, relative to days when the criteria were not met.

Results: There was a significant positive association between the number of heat-related EMS calls and an increase in daily maximum air temperature. During the September 2022 heat wave, EMS calls for milder heat-related symptoms increased as air temperature increased below the temperature threshold where cooling centers were opened and leveled-off on days when cooling centers were activated ($R2=0.52$, $p<0.01$). EMS calls for heat exhaustion and heat stroke, the most serious heat related illnesses, were correlated with maximum air temperature on days that met criteria for activating cooling centers. ($R2=0.74$, $p<0.01$).

Conclusions: EMS data and publicly available climate data can provide surveillance to accurately identify days with high heat-related health risks. This system can provide a framework for counties working to track the impacts of climate events on health, anticipate health infrastructure needs before climate events, and ensure that emergency operation plans use sensitive and up-to-date criteria.