ABSTRACT

Extreme Weather Impacts on Human Health in New Hampshire

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Increasing precipitation and warming temperatures associated with climate change have been documented across the globe, including in the Northeast US. These climate changes threaten human health in many ways. Therefore, research is necessary to understand and explain the relationship between climate change and human health. Extreme weather events such as extreme temperatures, convective storms, floods, lightning events, wintry precipitation, and low visibility, are frequently associated with adverse effects on human health. While more media attention is typically given to events that cause the most structural or economic damage (e.g., tornadoes, hurricanes, earthquakes, etc.), extreme temperatures ultimately account for the greatest loss of life in the US. Extreme weather events can be unpredictable; however, improved knowledge and technology allow meteorologists to accurately forecast many of these events, specifically extreme temperature and precipitation events. Knowledge of how these events are changing over time can benefit meteorologists, as well as federal, state, and local government agencies. Better understanding climate variability and trends in extreme weather can inform: public education programs to alert the community of the dangers of extreme heat or cold, emergency response plans to hazardous weather conditions, and current thresholds for emergency alerts.

This study evaluates trends in extreme weather events across New Hampshire and links these extreme events to adverse health outcomes. Using data from NCEI Global Historical Climatological Network (GHCN) – Daily dataset (1981 – 2015), five daily Extreme Weather Metrics (EWMs) were defined: Daily Maximum Temperature $\leq$ 32°F, Daily Maximum Temperature $\geq$ 90°F, Daily Maximum Temperature $\geq$ 95°F, Daily Precipitation $\geq$ 1”, and Daily Precipitation $\geq$ 2”. Relevant human health outcomes were extracted from the New Hampshire Hospital Discharge Dataset for the years 2001-2009.

Cases were defined based on the International Classification of Disease 9th Revision (ICD-9). Outcomes in this analysis include: All-Cause Injury, Vehicle

Accidents, Accidental Falls, Accidents Due to Natural and Environmental (including excessive heat, excessive cold, exposure due to weather conditions, lightning, and storms and floods), Accidental Drowning, and Carbon Monoxide Poisoning. Temporal and spatial trends were assessed, and the associations between all health outcomes and EWMs, daily maximum temperature, and daily precipitation were evaluated via Spearman correlations. Once the four strongest correlations were determined, a quasi-Poisson regression model was used to evaluate the relationship between each exposure-outcome pair. These pairs were modeled to show the relation between maximum temperature and All-Cause hospital visits, hospital visits related to vehicle accidents, hospital visits related to accidental falls, and hospital visits related to heat. Future work will incorporate these findings into public health planning and programming.

This project is a collaboration with New Hampshire Department of Health and Human Services (NH DHHS) who have a shared interest in understanding the impact of extreme weather events on the citizens of New Hampshire. Furthermore, this work supports an ongoing effort to implement the Centers for Disease Control (CDC) Building Resilience Against Climate Effects (BRACE) Framework, which focuses on identifying climate and weather-related hazards and estimating the associated disease burden.