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Heat Related Illness in New Mexico 2013-2017

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Global changes in climate have and will continue to impact the people of New Mexico. The state has experienced an average annual maximum temperature increase of 3.3°F since 1970, making it the second-fastest -warming state in the nation.[1] The National Oceanic and Atmospheric Administration (NOAA) reports that days for which temperatures exceed the upper and/or lower tenth percentile for the average temperature have increased for the months of April through September from 20.7% in 2001-2005 to 42.4% in 2014-2018 for the American Southwest.[2] The number of warm nights where the minimum temperature exceeds 70°F have increased from an average of 4 days in 1990- 1994 to 8 days in 2010-2014. Between 1979 and 2011, New Mexico has experienced, on average annually, 93 days when the daily maximum temperature exceeded 90°F, and NOAA predicts that the number of these hot days will increase at a rate of one additional day per year.

Because of these changes, experts expect to see more health problems and deaths caused by heat.[3] Heat-related illnesses (HRI) are a group of preventable health conditions ranging from mild forms (e.g., heat edema, heat cramps) to potentially lethal heat stroke, the point at which the body is unable to dissipate heat adequately. This report examines the current impact of the shift to a hotter climate on the New Mexico population.

Methods

HRI cases were defined as any emergency department visit or hospitalization that had International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes of 992.0-992.9, E900.0, or E900.9 and/or International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes of T67.0-T67.9; X30.0 or X32.0, or death certificates with an ICD-10 code of T67, X30 or X32. These codes were identified and validated based on previous analyses. Any cases with coding for heat exposures from human-made origin, ICD-9-CM code of E900.1, ICD-10-CM of W92.0, or ICD-10 of W92, were excluded from the analysis. Heat stroke (ICD-9-CM 992.0; ICD-10-CM T67.0XX), the most serious form of HRI, was analyzed separately across all data sets, as were hospitalizations and deaths with a co-morbidity of circulatory disorder documented (ICD-9-CM 390.0-459.9, ICD-10-CM I00.0-I99.9 or ICD-10 100-199).

A separate analysis was also performed for HRI emergency department visits and hospitalizations with co-morbidities of acute kidney failure (ICD-9-CM 584.9 or ICD-10-CM N17.9) and/or rhabdomyolysis (ICD-9-CM 728.88, or ICD-10-CM M62.82). Both of these conditions are closely associated with HRI.

Data were made available by the Bureau of Vital Records and Health Statistics and the Health Systems Epidemiology Program within the Epidemiology and Response Division at the New Mexico Department of Health.

Non-resident HRI cases were excluded from the analysis as well as NM residents being served by Texas, federal, or Indian Health Service hospitals.

Age-adjusted and age-specific hospitalization and emergency department rates were calculated for the summer months between May and September for each year. HRI current trends utilized the years of 2013-2017. Data from 2001-2005 were used as the historical baseline in comparisons of hospitalizations and deaths. Historical baseline data for emergency department visits from 2001-2005 were not available.

Results

The May-September age-adjusted HRI death rate per 100,000 residents in New Mexico has increased from 0.1 in 2001-2005 (95% CI: 0.046-0.179) to 0.3 in 2013-2017 (95% CI: 0.180- 0.386). Between 2013 and 2017, there were 31 recorded HRI deaths among New Mexico residents. The average age of New Mexico residents

who died from HRI was 50 years. The place of injury prior to their death as listed on the death record in sixty -one percent of HRI deaths was the outdoors. Of those residents whose injury occurred outdoors, fifty-six percent of deaths occurred in or near populated areas (such as businesses, parking lots, etc.). Forty-one percent of all HRI deaths occurred at a medical facility. However, HRI deaths in June were least likely to have happened at a medical facility (27%).

The May-September age-adjusted hospitalization rate per 100,000 residents for HRI in New Mexico increased from 0.9 in 2001-2005 (95% CI: 0.7-1.1) to 1.5 in 2013-2017 (95% CI: 1.2-1.7). From May-September between 2013 and 2017, there were a total of 153 hospitalizations for HRI. The months of June and July had the highest number of HRI hospitalizations for NM residents. Crude HRI hospitalizations rates per 100,000 residents from 2013-2017 were highest among individuals aged 75 years or older (3.0, 95% CI: 1.7-4.2) followed by individuals aged 45-54 years old (2.5; 95% CI: 1.6-3.3); 35-44 year old (2.4; 95% CI: 1.6-3.3), 65-74 years old (1.9; 95% CI: 1.1-2.8); 55-64 years old (1.5; 95% CI: 0.8-2.1); 25-39 years old (1.1; 95% CI: 0.6-1.7); 18-24 years old (0.9; 95% CI: 0.3-1.4); and children under 18 years of age (0.3; 95% CI: 0.1-0.5). Heat stroke accounted for 48% of HRI hospitalizations (95% CI: 40%-54%).

The May-September HRI age-adjusted emergency room visit rate per 100,000 residents in New Mexico increased from 7.6 in 2008 (95% CI: 6.4-8.9) to 15.9 in 2017 (95% CI: 14.2-17.9). Between 2013 and 2017, there were a total of 1,416 emergency room visits for HRI. The counties in the southeastern part of New Mexico had some of highest rates for HRI emergency room visits (Figure 1). Individuals aged 15-24 years old were disproportionately impacted within the southeast (Figure 2).

Between 2013 and 2017, twenty-three percent of all HRI emergency room case visits and 52% of all HRI hospitalization cases also had a co-morbid circulatory disorder diagnosis. Of HRI cases who also had a circulatory disorder, 80% of the HRI emergency room visits and 47% of HRI hospitalizations had essential hypertension. Of HRI cases who also had a circulatory disorder, fourteen percent of HRI emergency room visits, 35% of HRI hospitalizations, and 25% of all HRI deaths in New Mexico also had ischemic heart disease. None of the HRI deaths with ischemic heart disease occurred at a medical facility.

For the years 2013-2017, there were 108 HRI emergency room visits of New Mexico residents for severe heat stroke who also had either acute kidney failure or rhabdomyolysis, a serious condition where muscle fibers break down and release their contents into the bloodstream. Rates of people who were seen in the emergency department with both HRI and either acute kidney failure or rhabdomyolysis were highest among individuals aged 15-24 years (1.1; 95% CI: 0.5-1.8) and for individuals aged 75 years or older (1.0; 95% CI: 0.4-1.9) followed by individuals aged 25-39 years old (0.9; 95% CI: 0.3-2.0); 40-54 years old (0.9; 95% CI: 0.3-2.1); 65-75 years old (0.5; 95% CI: 0.1-0.9); or 55-64 years old (0.4; 95% CI: 0.1-0.8). Residents of Lea (7.2, 95% CI 3.1-9.5); Eddy (3.2; 95% CI: 1.4-5.9), Chaves (2.4; 95% CI: 0.9-4.8) and Doña Ana (1.8; 95% CI: 0.8-4.2) counties had the highest HRI emergency room visit rates with either acute kidney failure or rhabdomyolysis.

During 2013-2017 New Mexico HRI emergency room visits peaked around 4:00 PM on any given day with the most emergency room visits occurring in the month of June. However, New Mexico HRI emergency room visits for children under 15 years of age during the weekdays peaked around 5:30 PM. About a quarter of HRI emergency room visits (22.2%) in New Mexico occurred on Saturdays. Heat stroke accounted for 8% of HRI emergency room visits in New Mexico. The severity of HRI visits in a given year did not change as the summer progressed. Most HRI emergency room visits (79%) were discharged the same day.

Discussion

The last decade has been the warmest decade on record. The number of cooling degree days is one measure that NOAA uses to determine how hot a given period is. It is calculated as the difference of the average temperature from 65°F, which is the temperature when people tend to start turning on cooling equipment. The average number of cooling degree days between May and September in 2001-2005 was 985 compared to 1,005 in 2013-2017.[2]

When compared to the relatively cooler preceding decade, there has been an increase in HRI emergency room visits, hospitalizations, and deaths. As the average temperature for New Mexico continues to increase,

heat-related illnesses and deaths will be more prevalent than in the past. This risk may be amplified by existing risk factors including age, chronic conditions, outdoor activities, access and quality of health care, and adequate housing. The risk of HRI may have been underestimated by this study because 1) only the most severe cases of HRI typically seek medical attention, and 2) NM residents being served by Texas, federal, and Indian Health Service hospitals, and non-NM residents were not included.

Recommendations

This analysis indicates that heat alerts should be issued earlier in the summer and at lower temperatures, when the public is less aware. Best practices to stay cool are relevant for all residents starting in late May, including limiting time in the sun and staying well hydrated (https://nmtracking.org/environment/climate/ExtremeTemperatures.html). However, certain groups will need to plan for how to avoid heat exposure during the summer. This includes those with heart disease and all individuals 75 years and older. New Mexicans 15-24 years of age in the SE region of the state who work and play sports outdoors should be extra cautious and follow NMDOH Rest-Water-Shade (https://www.facebook.com/nmdoh) recommendations to avoid heat stress.

References

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[3] Centers for Disease Control and Prevention and Environmental Protection Agency. *Climate Change and Extreme Heat: What You Can Do to Prepare.* **2016.** https://archive.epa.gov/epa/sites/production/files/2016-10/documents/extreme-heat-guidebook.pdf

Figure 2. Rate of HRI Emergency Room Visits Per 100,00 Residents by Region and Age Group, New Mexico, 2013-2017

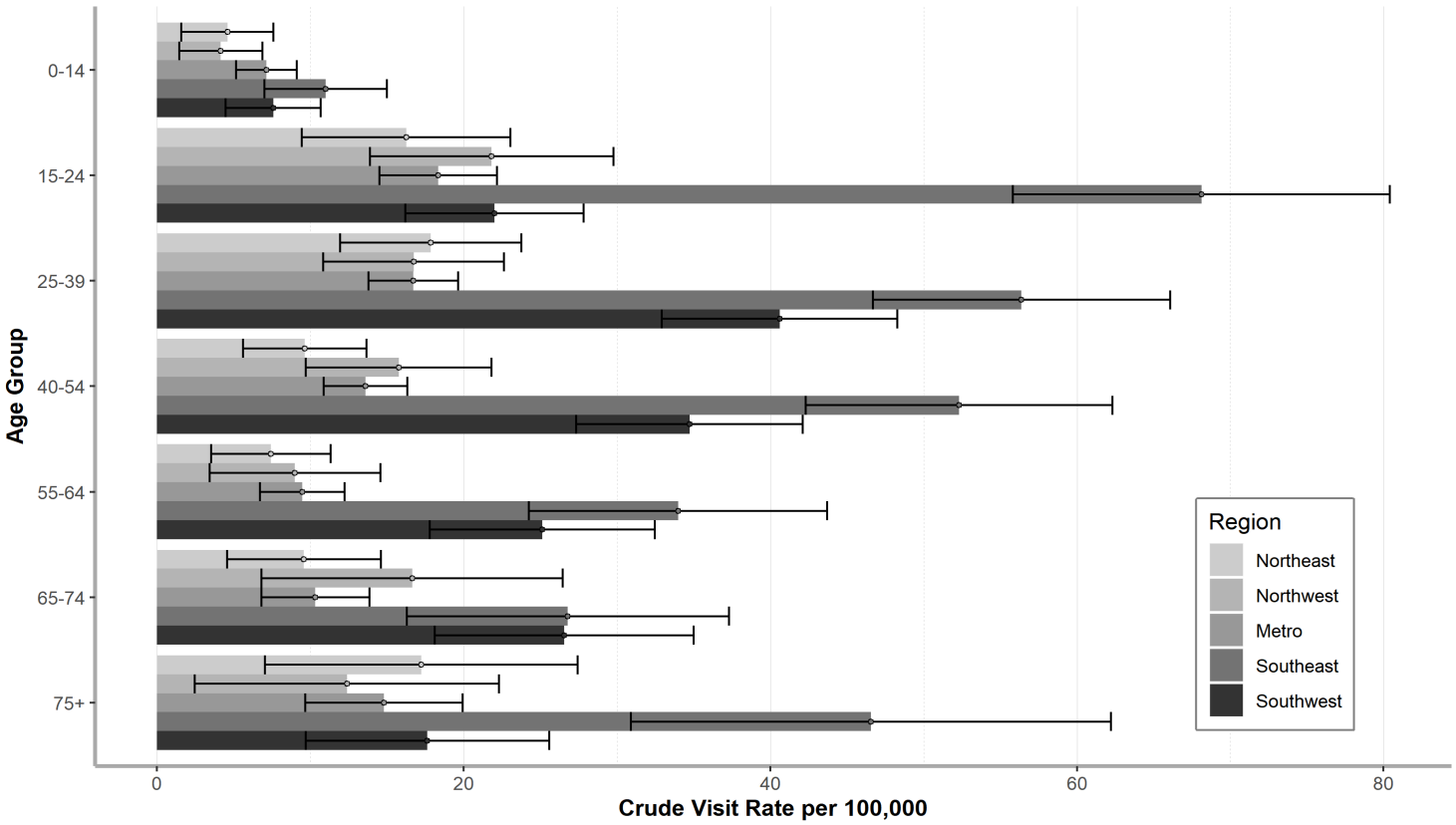

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Figure 1. Rate of HRI Emergency Room Visits Per 100,000 Residents by County, New Mexico, 2013-2017