PRI FACTSHEET

CLIMATE CHANGE

IMPACTS AND COSTS TO ILLINOIS COMMUNITIES

ILLINOIS STATE CLIMATOLOGIST DR. TRENT FORD

Illinois has experienced significant changes in weather patterns over the past 120 years. Air temperature and precipitation have increased in all seasons since the turn of the 20th Century, amplifying the risk of extreme warm periods and heavy precipitation. Illinois' climate is expected to continue changing over this century, with significant impacts to urban and rural communities in Illinois.

IMPACTS TO COMMUNITY WATER RESOURCES

Historical changes in precipitation and land use in Illinois have led to an **increase in flooding** at most gaged streams and rivers across the state over recent decades. Fluvial flooding events that impact key rivers like the Mississippi and Illinois, such as the 2019 flood that caused over $60 billion in damages[1], are likely to continue increasing in frequency in the future with projected changes in precipitation and development.

The **increased rainfall intensity** associated with climate change has already stressed aging urban drainage systems across the state, many of which are prone to flooding due to undersized stormwater systems and land development patterns. Between 2007 and 2014, 94.63% of the $2.319 billion in private and National Flood Insurance Program claims were in urban areas, and over 90% of those claims were outside of the mapped floodplain[2].

Climate change is also expected to increase the incidence of combined sewer outflows (CSOs), and both CSOs and increased overland flooding cause environmental damage and create **public health hazards**, such as exposure to infectious diseases and contaminated drinking water. Urban flooding impacts to residents and infrastructure are expected to grow with continued increases in heavy precipitation through this century.

Although Illinois has gotten wetter over the past 120 years, increases in summer temperature could result in **more frequent drought stress** to agriculture and water resources across the state. Climate change impacts are expected to increase water demand by mid-century in multiple water supply planning regions, including the Kankakee[3], thereby exacerbating water shortages due to drought in the future.

IMPACTS TO PUBLIC HEALTH

The warmer and wetter climate in Illinois has already created conditions that permit **mosquitoes and ticks** to survive in previously unsuitable locations (Figure 1). Increasing temperatures have lengthened the biting season for these vectors in Illinois, and projected increased biting season length is expected to increase the risk of vector-borne diseases such as Lyme disease and West Nile virus[4].

Rising temperatures in Illinois are leading to **more severe and frequent heat waves**. High daytime and nighttime outdoor temperatures in combination with high humidity can lead to a spectrum of heat-related illnesses. People with chronic medical conditions and mental illness, those who live alone, people without access to air conditioning or who cannot afford to use it, and the elderly are at greatest risk of serious illness or death in heat waves[4]. Additionally, people who do physically demanding work outdoors are also at risk for developing heat exhaustion and heat stroke.

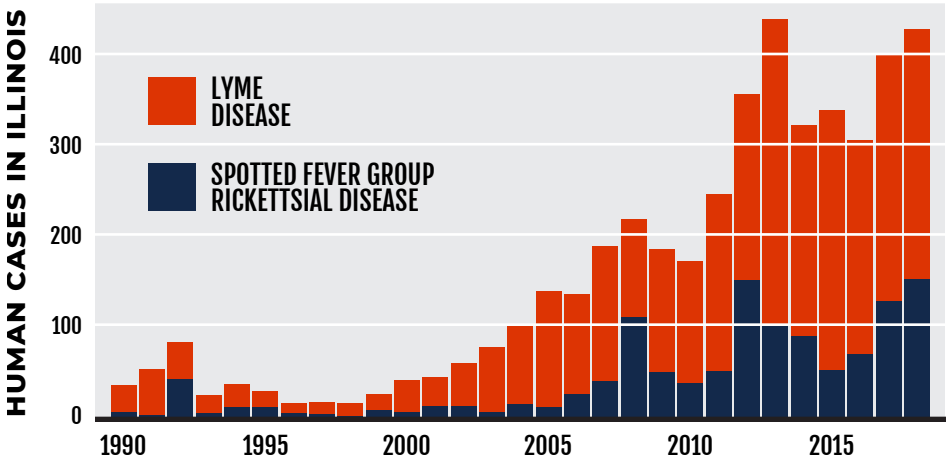

FIGURE 1. REPORTED HUMAN CASES IN ILLINOIS OF TWO COMMON TICK-BORNE ILLNESSES, LYME DISEASE AND SPOTTED FEVER GROUP RICKETTSIAL DISEASE BY YEAR FOR THE PERIOD 1990-2018. DATA SOURCED FROM ILLINOIS DEPARTMENT OF PUBLIC HEALTH.

People of color and low-income earners are more likely to have asthma, self-report fair or poor health, and live in communities with fewer green and blue spaces, placing them at a higher risk of extreme heat. In urban areas of Illinois, higher temperatures from climate change combined with the urban heat island could result in record temperatures in urban and suburban neighborhoods lacking green space, further increasing the risk of heat-related illness in those communities[4].

On a per capita basis, people in parts of **rural Illinois** are at greater risk of being hospitalized with heat-related illness than people in urban areas. Exposure to heat, a larger proportion of elderly residents, larger distances between homes and to hospitals and healthcare facilities, and lack of transportation to cool centers all contribute to increased heat hospitalization risk in rural areas of the state[5,6].

More precipitation and more frequent heavy rain events are expected to increase **public health threats from flooding** in Illinois. Communities with combined sewer systems, including Chicago, are vulnerable to combined sewer overflow into surface waters due to increased rainfall intensity, which is linked to increased rates of diarrheal illness in children[7].

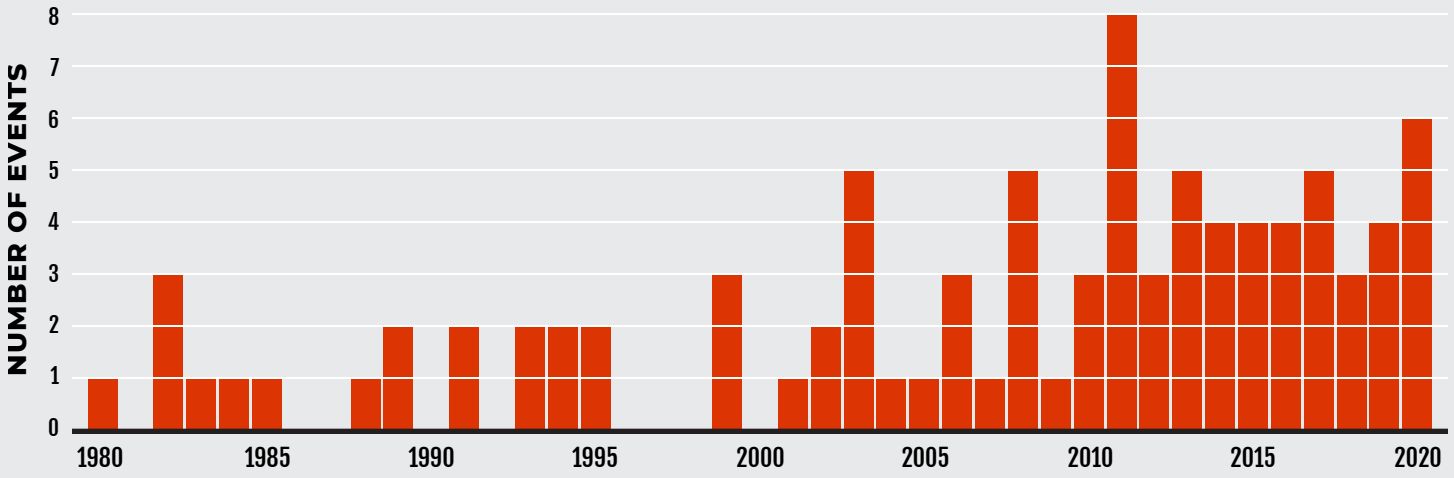

FIGURE 2. NUMBER OF (CPI-ADJUSTED) BILLION DOLLAR WEATHER-RELATED DISASTERS IN ILLINOIS FROM 1980 TO 2020.
DATA SOURCED FROM NOAA'S NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION.

Flooding can threaten the ability of health care facilities to function. **Dozens of Illinois health care facilities are located in mapped floodplains**, which could limit their accessibility or operation during floods[8].

Increased precipitation and higher temperatures can result in **air quality** problems, which exacerbate respiratory health conditions, trigger new ones, and affect healthy lungs. Flooding of homes and workplaces promotes the growth of fungi and bacteria, which can trigger upper respiratory tract symptoms. Climate change is also expected to increase exposure to seasonal allergies. Warmer winters and springs will extend the growing season for pollen-producing plants. Given that pollen is a trigger of asthma attacks and seasonal allergies, climate change is expected to substantially increase the prevalence of allergies and the frequency of asthma attacks. Asthma prevalence in Illinois is highest among African Americans, women, and low-income communities[9].

Climate change has significant impacts on **mental health and well-being**. Major weather disasters like floods, drought, and extreme heat can directly impact mental health by causing emotional distress and trauma, which is linked to numerous mental health disorders. Displacement due to disasters is also linked with poor mental health outcomes caused by loss of emotional belonging and physical property.

Illinois farmers and farm workers are at particular risk for mental health challenges as a result of climate change. Long work hours, heavy workloads, financial risks, and reliance on weather all contribute to adverse impacts to farmer mental health in Illinois from climate change. In addition, rural access to mental health care in Illinois is lacking, as Illinois' rural communities have one of the highest ratios of population per mental health provider in the country (2,779:1)[4].

The estimated **economic costs of climate change** in Illinois are immense. Since 1980, Illinois ranks fourth in the nation in the frequency of billion-dollar weather and climate events (Figure 2), resulting in an estimated $38.4 billion in damages specific to Illinois[10]. However, these estimates do not account for healthcare costs and economic losses due to deaths. One study estimated the cost of excess all-cause mortality, hospital admissions, and emergency department visits attributable to exposure to high temperatures in the Minneapolis-St. Paul metropolitan area alone was $1.17 billion per year[11]. Another study estimated $82.8 million in costs from morbidity and mortality associated with flooding and heavy precipitation in Ohio in 2018 alone[12].

Climate change is impacting Illinoisans now, and our communities are vulnerable to the impacts of climate change into the future. However, we can take action to minimize risk, adopt best management and planning practices, and improve the ability of our developed and naturalized areas to adapt to the changing climate.

REFERENCES

1. NOAA National Centers for Environmental Information, State of the Climate: National Climate Report for Annual 2019, published online January 2020, retrieved on August 2, 2021 from **https://www.ncdc.noaa.gov/sotc/national/201913**.
2. Winters, B.A., and Coauthors, 2015: Report for the Urban Flooding Awareness Act. Illinois Department of Natural Resources, Office of Water Resources, **https://www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf**.
3. Meyer, S.C., B. Dziegielewski, Z. Zhang, D. Abrams, and W.R. Kelly, 2019: Water Demand in the Kankakee Water Supply Region, 2010-2060. Illinois State Water Survey Contract Report 2019-01, **http://hdl.handle.net/2142/102367**.
4. Wuebbles, D., J. Angel, K. Petersen, and A.M. Lemke (Eds.), 2021: An Assessment of the Impacts of Climate Change in Illinois. The Nature Conservancy, Illinois, **https://doi.org/10.13102/B2IDB-1260194_V1**.
5. Jagai, J.S., E. Grossman, L. Navon, A. Sambanis, and S. Dorevitch, 2017: Hospitalizations for heat-stress illness varies between rural and urban areas: an analysis of Illinois data, 1987-2014. *Environmental Health*, 16, 38.
6. University of Wisconsin Population Health Institute, County Health Rankings 2020, Illinois, published online April 2021, retrieved on August 3, 2021 from **https://www.countyhealthrankings.org/reports/state-reports/2020-illinois-report**.
7. Jagai, J.S., and coauthors, 2015: Extreme Precipitation and Emergency Room Visits for Gastrointestinal Illness in Areas with and without Combined Sewer Systems: An Analysis of Massachusetts Data, 2003-2007. *Environmental Health Perspectives*, 123, 873-879.
8. Grossman, E., and coauthors, 2021: A Web-Based Interactive Map to Promote Health-Care Facility Flood Preparedness, *Disaster Medicine and Public Health Preparedness*, 1-4, doi:10.1017/dmp.2020.482.
9. Illinois Department of Public Health (IDPH), 2018a: Asthma Trends BRFSS 2011-2017. Accessed 3 August 2021, **https://www.dph.illinois.gov/sites/default/files/publications/122018ohpm-brfsstrendscombined.pdf**
10. NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2021). **https://www.ncdc.noaa.gov/billions/**, doi:10.25921/stkw-7w73.
11. Liu, Y., S. Saha, B.O. Hoppe, and M. Convertino, 2019: Degrees and dollars – Health costs associated with suboptimal ambient temperature exposure. *Science of the Total Environment*, 678, 702-711.
12. Limaye, V.S., W. Max, J. Constible, and K. Knowlton, 2019: Estimating the Health-Related Costs of 10 Climate-Sensitive U.S. Events During 2012. *Geohealth*, 3, 245-265.

PRAIRIE RESEARCH INSTITUTE

GET IN TOUCH

The State Climatologist Dr. Trent Ford serves as Illinois' authoritative voice on climate science and conducts research on and monitoring of Illinois weather and climate conditions. **For more information about how the Office of the State Climatogist at the Prairie Research Institute (PRI) works across Illinois or additional ways we could help, contact Dr. Trent Ford:**

217-333-0729 • statecli@isws.illinois.edu