NIAGARA COUNTY

Heat-Health Profile Report

NEW YORK STATE | Department of Health

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This report was created by the New York State Department of Health to support the work by New York State counties to reduce the impacts of extreme heat. It is intended to help local public health leaders, emergency planners, and others with developing targeted strategies and allocating resources. This report is also available at https://www.health.ny.gov/environmental/weather/profiles/

For more information contact the New York State Environmental Public Health Tracking Program at epht@health.ny.gov.

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INTRODUCTION

All areas of New York State (NYS) have natural variation in weather year-to-year and across different seasons. Extreme heat refers particularly to when summertime temperatures are substantially hotter, more humid, or a combination of both compared to the usual conditions for a location and date.[1] An extended period of unusually hot weather conditions that can harm human health is called an extreme heat event.[2] For most NYS counties, the National Weather Service (NWS) issues heat alerts when extreme heat events occur.[3]

NWS HEAT ALERTS

A **Heat Advisory** is issued when the heat index is forecast to reach 95°F or more for 2 consecutive hours.

An **Extreme Heat Warning** is issued when heat index values are forecast to reach or exceed 105°F for at least 2 consecutive hours.

An **Extreme Heat Watch** is issued when conditions are favorable for an extreme heat event, but its occurrence and timing is still uncertain.

From 1901 to 2022, average temperatures in NYS increased by almost 2.6°F, and the warmest 10-year periods in recorded history have occurred since 2000.[4] Climate projections indicate that NYS summers will continue to get hotter and that extreme heat events will last longer, be more severe, and more intense in the coming decades.[2,4]

Extreme heat can cause heat-related illness, including heat cramps, heat exhaustion, heat rash, or heat stroke, and death.[1,5] Extreme heat can also worsen existing health conditions such as cardiovascular disease, respiratory disease, and kidney disease.[6] Everyone is at risk for heat-related illness, but some people are at greater risk than others based on individual, environmental, or community characteristics.[7] People who are at greater risk for heat-related illness include older adults (65 and older), young children (5 years old and younger), people

who work outdoors, people with certain existing health conditions, people who are socioeconomically disadvantaged, and people living in socially or environmentally vulnerable regions.[1,8,9]

Heat-related illness is preventable.[10] Most heat-related health impacts occur from being exposed to extreme heat for too long with little or no access to cool spaces. Communities can prepare for extreme heat and reduce risks of health impacts by developing and maintaining a heat emergency preparedness and response plan which includes plans for providing access to cool spaces. A heat emergency plan includes coordinated action and planning through alerting the community of extreme heat events, educating the public on how to stay safe in the heat, and by providing support services for people who are at greater risk for heat-related illness. Providing access to cool spaces can include programs that fund home air conditioning, identifying and maintaining cooling centers, and creating opportunities to seek shade in public spaces.

This County Heat and Health Profile summarizes the impacts of extreme heat on health in NYS for Niagara County based upon four factors: exposure, sensitivity, vulnerability, and building resilience.[11,12] These factors can affect an individual's ability to respond to and cope with the impacts of heat and extreme heat events.

EXPOSURE

NYS has experienced an increase in annual average temperatures over recent decades, resulting in a growing number of very hot summer days (above 85°F). July consistently ranks as the hottest month in the region. This warming trend is reflected in the summer (June–August) average maximum heat index, which rose from 79°F during 1980–1984 to 82°F in 2020–2024. **Figure 1a** displays the number of days each year between 1980 and 2024 with a summer maximum heat index above 85°F in Niagara County. The 85°F benchmark is informed by research conducted in NYS, which found that heat-related health impacts are already occurring at this temperature.[13] **Figure 1b** illustrates the average summer maximum temperature between 1980 and 2024 compared to the 30-year average summer maximum temperature in Niagara County. A negative value (blue bar) denotes years when the average summer maximum temperature fell below the 30-year average while a positive value (red bar) denotes years when it exceeded the 30-year average.

Figure 1a. Days with Maximum Heat Index Above 85°F in Niagara County 1980 to 2024

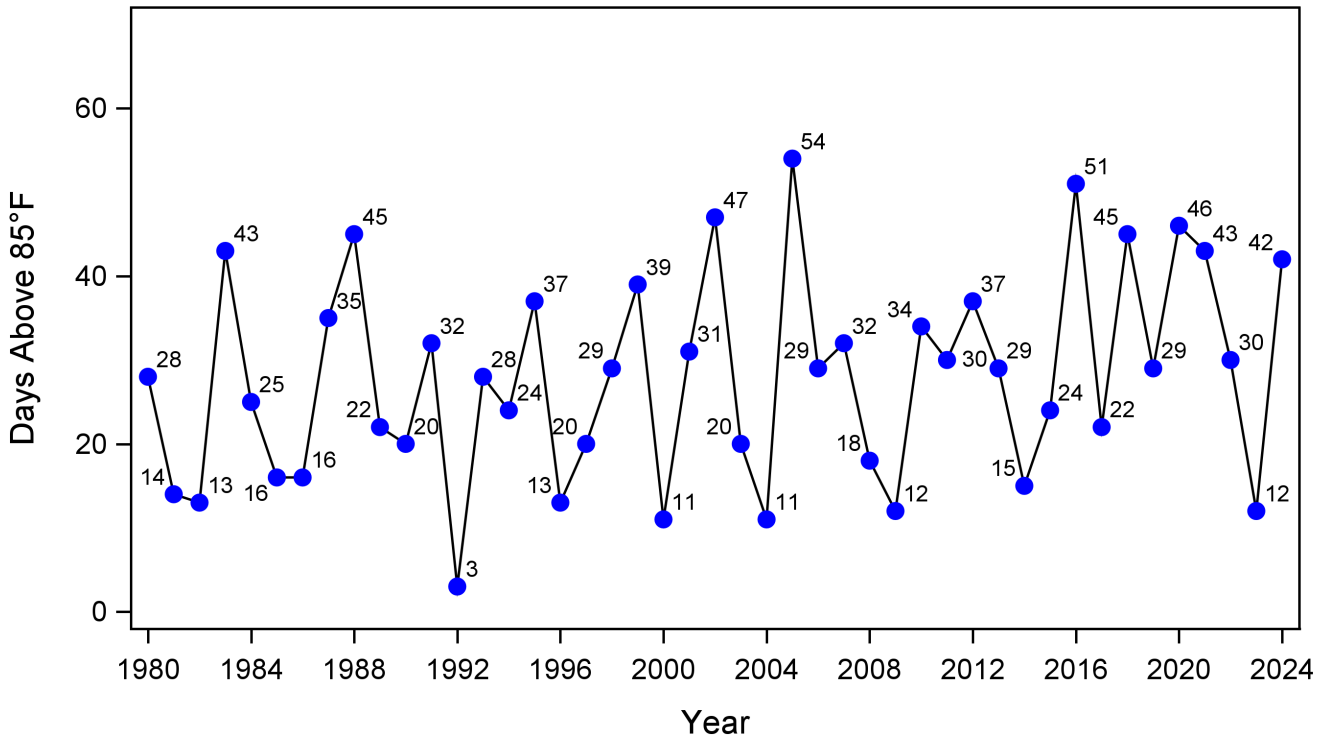
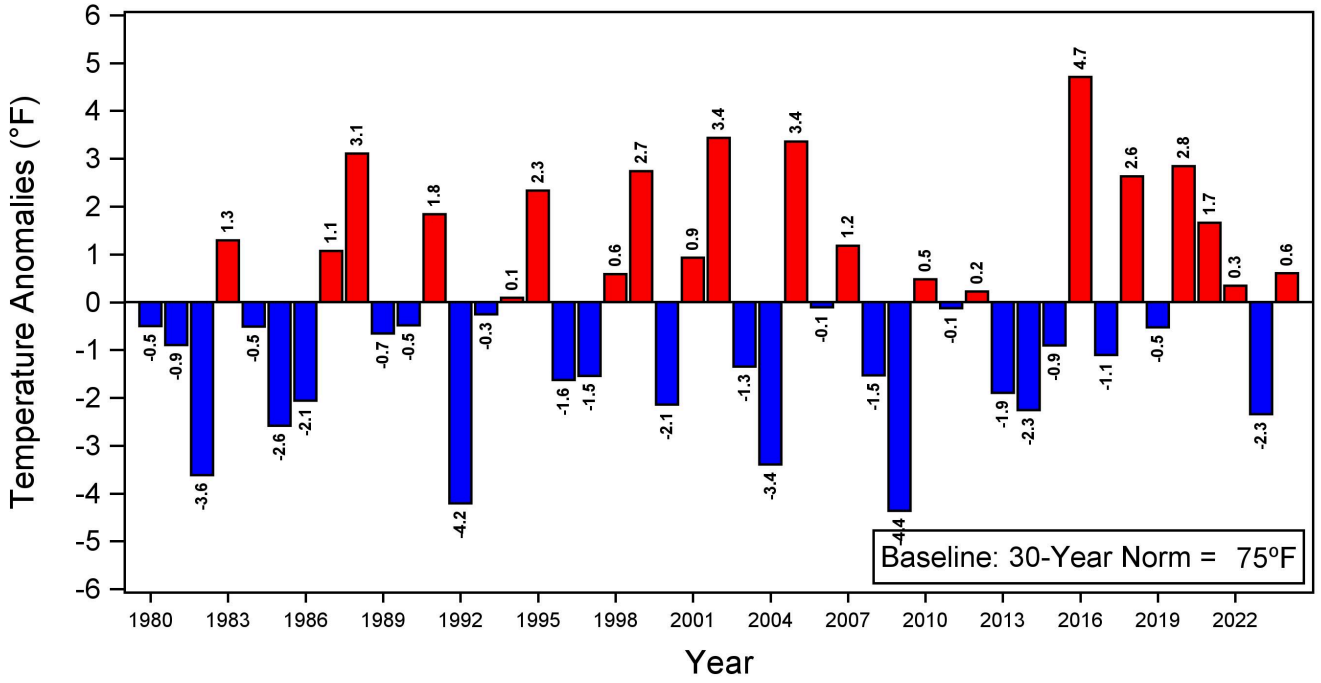


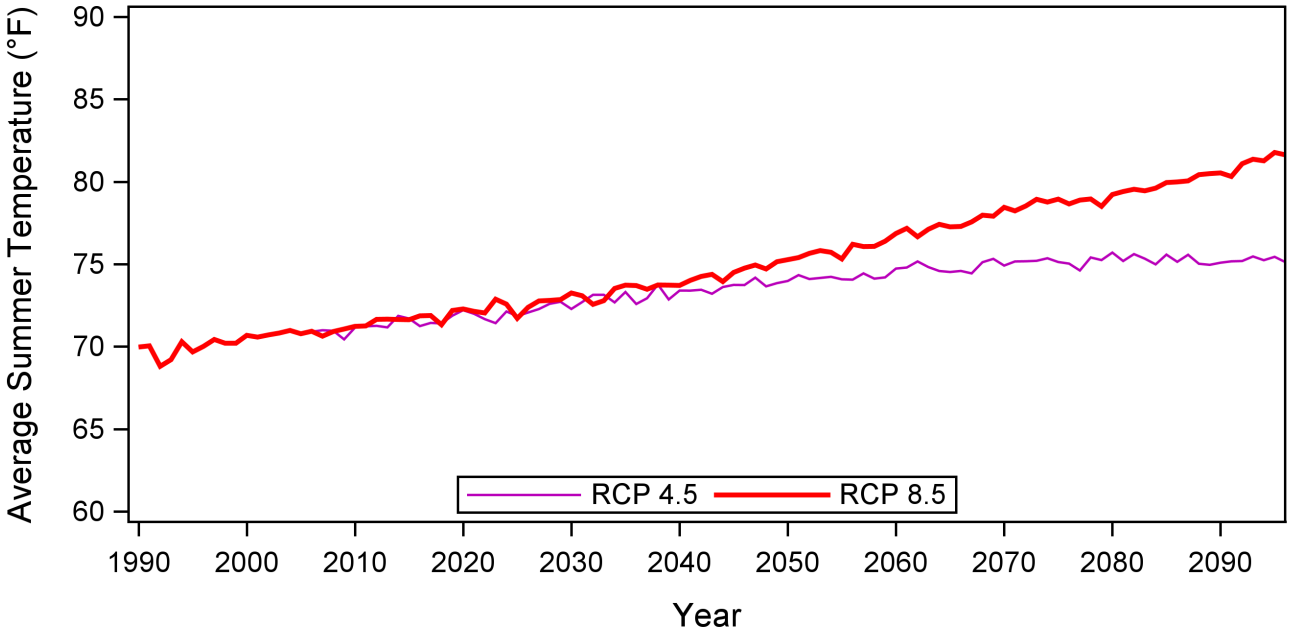
Figure 1b. Summer Temperature Anomalies in Niagara County, 1980 to 2024



A temperature anomaly is a departure from a reference value or long-term average. Reference value used is a 30-year norm (1991 - 2020). A positive anomaly indicates that the observed temperature was warmer than the reference value, while a negative anomaly indicates that the observed temperature was cooler than the reference value

Over the next century, average summertime (June–August) temperatures in NYS are projected to increase by 4 to 11°F. Differences in projected temperatures are related to how much additional greenhouse gases are emitted, as estimated by scenarios called the Representative Concentration Pathways (RCP).[14] RCPs make assumptions about future total greenhouse gas emissions from multiple sources over a hundred-year period (2000 to 2100), taking into account economic growth, energy use, population size, land use, and energy sources. **Figure 1c** shows temperature projections through 2100 for Niagara County based on two different RCP scenarios. RCP 4.5[14] ("Lower Emissions") represents a scenario where implementation of new climate policies, rules, and regulations reduces greenhouse gas emissions over time. RCP 8.5[14] ("Higher Emissions") represents a scenario where higher level of greenhouse gas emissions occur based on high energy demands and an absence of climate change policies. Both scenarios project an increase in average temperatures, but the "Higher Emissions" scenario shows a much greater and faster temperature increase than the "Lower Emissions" scenario.

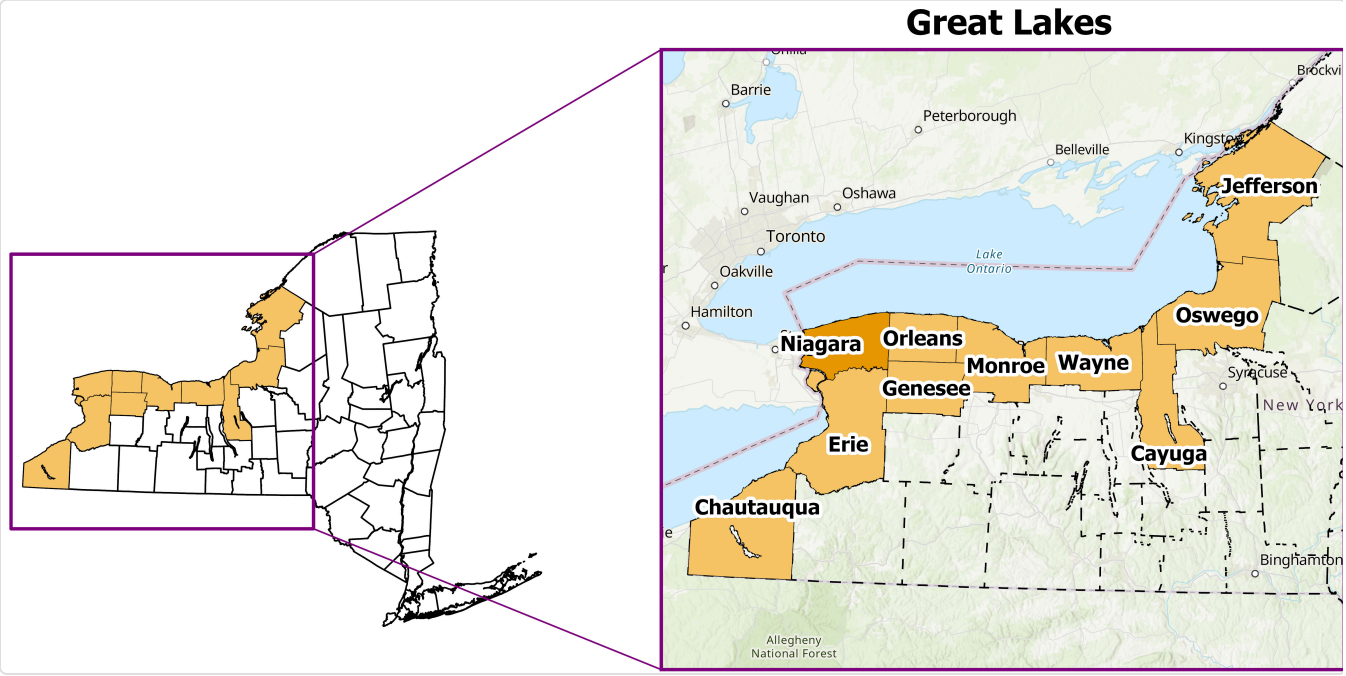
Figure 1c. Niagara County: Temperature Projections with RCP 4.5 and RCP 8.5 Scenarios



RCP 4.5 ("Lower Emissions") scenario represents a lower level of greenhouse gas emissions over time based on new climate policies that target greenhouse gas reduction. RCP 8.5 ("Higher Emissions") scenario represents a higher level of greenhouse gas emissions predicted based on high energy demands and an absence of climate change policies.

SENSITIVITY

Everyone is at some level of risk for heat-related illness, but a person's overall health can play a role in how their body responds to extreme heat. Higher temperatures can cause or worsen symptoms for people with existing health conditions, putting them at greater risk for an emergency department visit or hospitalization.[7] The excess risk threshold refers to the heat index level at which there is a significant rise in emergency department visits and hospitalizations for certain health conditions. In this report, we highlight regional excess risk thresholds for heat-related illness, kidney disease, and cardiovascular disease. While the report focuses on these three health conditions, it is important to note that other health conditions not highlighted in this report may also result in an emergency department visit or hospitalization due to extreme heat.

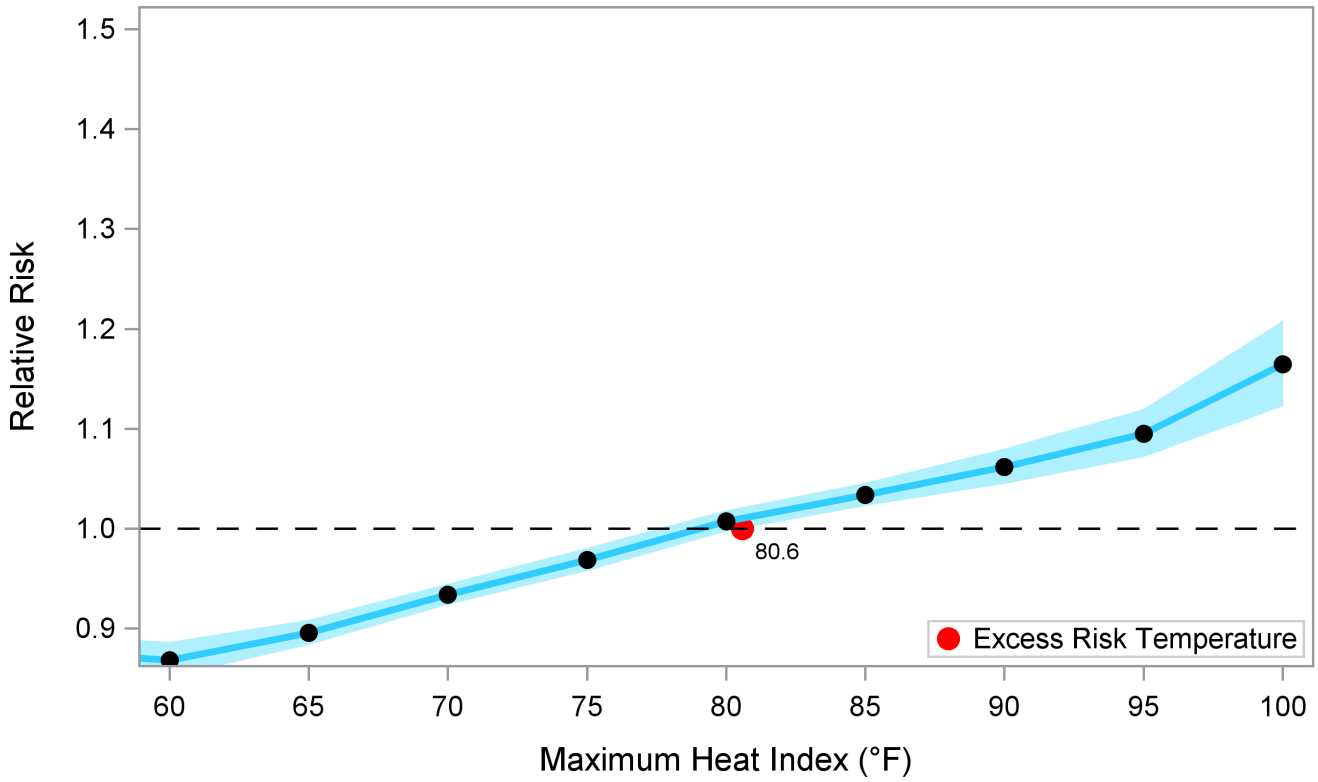


Heat-Related Illness

Heat-related illnesses, which can include heat stroke, heat exhaustion, heat rash, and heat cramps, can arise when the body is unable to cool itself during hot weather or extreme heat events.[5] Factors like high humidity, direct sun exposure, dehydration from fluid and salt loss,

and strenuous physical activity (e.g., outdoor sports or working outside) can cause or worsen these conditions. **Figure 2a** presents the excess risk threshold for heat-related hospital and emergency department (ED) visits in the Great Lakes region between 2015 and 2024.

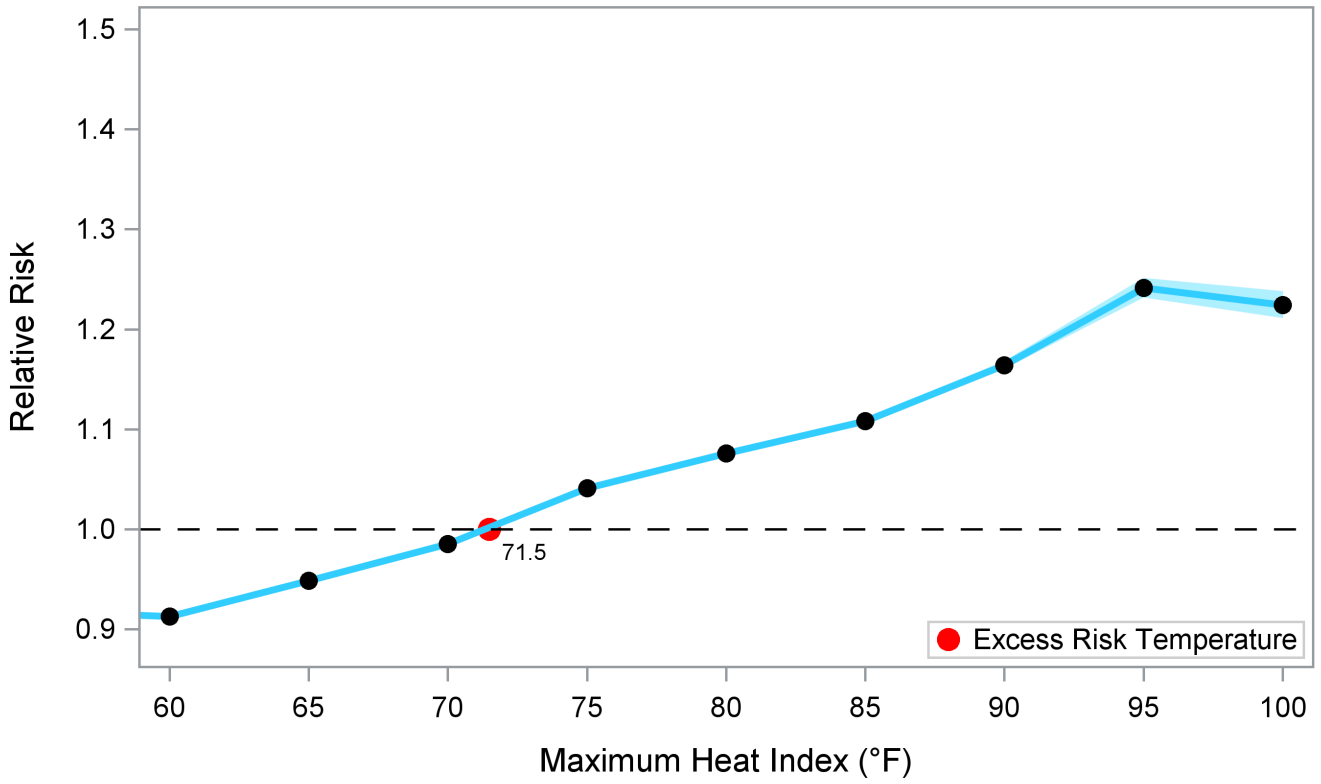
Figure 2a. Great Lakes: Excess Risk Threshold Heat Index for Heat-Related Illness



Renal Disease

Hot temperatures can disrupt the body's fluid balance, reduce renal function and worsen a range of kidney and urinary conditions including acute kidney injury, urinary tract infections, and kidney stones.[15,16] Recurrent episodes of acute kidney injury can lead to chronic kidney disease. **Figure 2b** illustrates the excess risk threshold for acute kidney injury hospital and ED visits in the Great Lakes region from 2015 to 2024.

Figure 2b. Great Lakes: Excess Risk Threshold Heat Index for Acute Kidney Injury

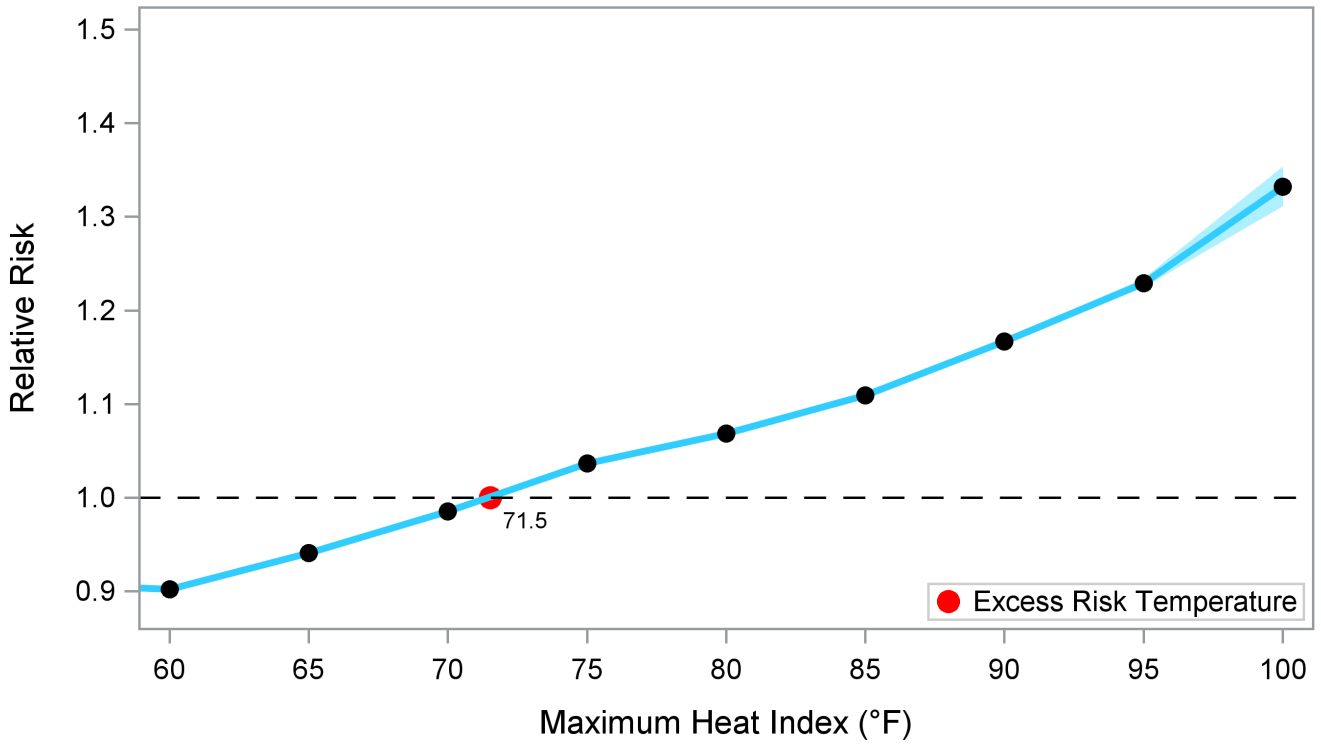


Cardiovascular Disease

Prolonged exposure to extreme heat can trigger chronic cardiovascular diseases such as myocardial infarction (heart attack), congestive heart failure, arrhythmia and stroke.[17,18] **Figure 2c** illustrates the excess risk threshold for cardiovascular disease and ED visits in the Great Lakes region from 2021 to 2024.

More information on links between heat and health in NYS can be found in recently published articles by the NYS Department of Health.[13,19]

Figure 2c. Great Lakes: Excess Risk Threshold Heat Index for Cardiovascular Disease



VULNERABILITY

Heat vulnerability can be influenced by individual characteristics (such as amount of time outside or otherwise exposed to heat and underlying health and socio-economic factors) and certain aspects of the community where one lives (such as location of residence, environmental, and neighborhood socio-economic factors). Originally established by the New York State Department of Health with neighborhood-level heat vulnerability indicators,[9] the Heat Vulnerability Index (HVI) has been refined to include climate data and health indicators linked to heat. The HVI can help identify areas with populations that may be more vulnerable to the effects of heat and inform planning and implementing local adaptations and interventions.

Heat Vulnerability Index (HVI)

The HVI is an interactive online tool designed to assess heat vulnerability across NYS at the census tract level. It integrates three key domains: exposure, adaptability, and sensitivity **(Figure 3a)**, utilizing a range of temperature, environmental, socio-economic, and health

burden factors.

Exposure quantifies the frequency and duration of extreme heat events. This domain is measured by the average maximum daily heat index and the frequency of days exceeding 85°F since 1980, identifying areas experiencing the warmest temperatures and the greatest increases in high-heat days **(Figure 3b)**.[20,21]

Adaptability reflects the population's capacity to cope with and mitigate the effects of elevated temperatures. This is assessed through socio-economic indicators such as the proportion of individuals aged 65 and older living alone, and the percentage of the population without health insurance **(Figure 3c)**.[22]

Sensitivity gauges the population's susceptibility to heat-related health outcomes. It is evaluated using rates of hospitalizations and ED visits for specific conditions within aggregated census tracts, serving as a proxy for heightened vulnerability **(Figure 3d)**.[23]

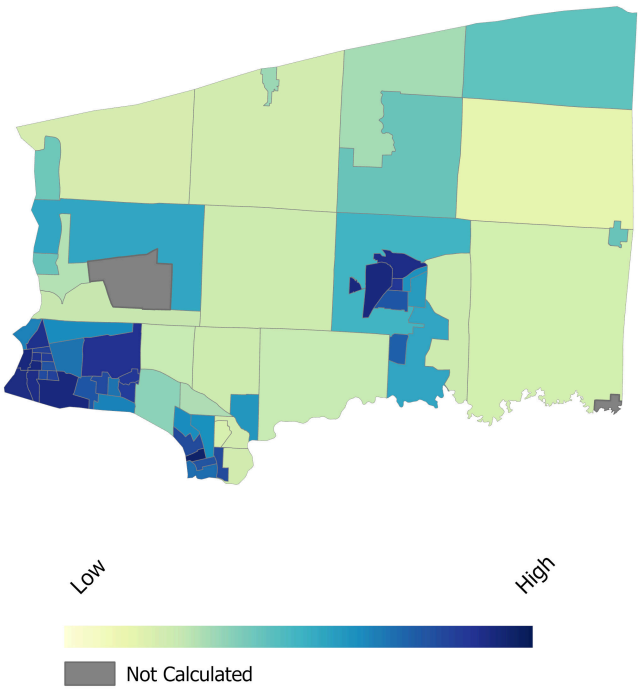
Descriptive statistics for the overall HVI and its individual domains are presented as ranks from 1 to 100 (with 100 indicating the highest vulnerability). These statistics illustrate the spatial variation of vulnerability across NYS excluding New York City both at the county level and in comparison to the state as a whole.

The HVI can be used in long-term community heat adaptation planning. It can support local agencies in making data-driven decisions regarding targeted risk communication, alert messaging strategies, and the establishment of cooling centers, including transportation logistics. Furthermore, the HVI can assist in the allocation of limited resources based on identified community needs. Additional details on the HVI, along with printable state and county-specific maps, are accessible at https://www.health.ny.gov/environmental/weather/vulnerability_index/index.htm .

Heat Vulnerability Index and Domains of Vulnerability Maps for Niagara County

Total Population: 212,230

Figure 3a. Heat Vulnerability Index



Heat Vulnerability Index Percentile Rank Metrics

	Heat Vulnerability Index	Exposure	Adaptability	Sensitivity
Mean	59	48	53	68
Median	63	48	54	70
Min	14	8	2	20
Max	96	72	98	99

The above statistics describe how vulnerable the census tracts in this county are compared with vulnerability levels of all census tracts in the state. A value of 1 indicates the lowest vulnerability level and a value of 100 includes the highest vulnerability level.

Figure 3b. Exposure

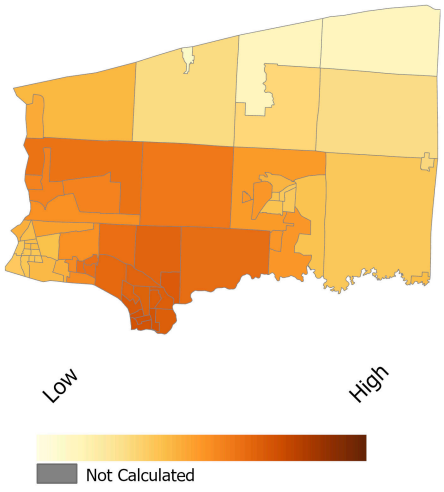


Figure 3c. Adaptability

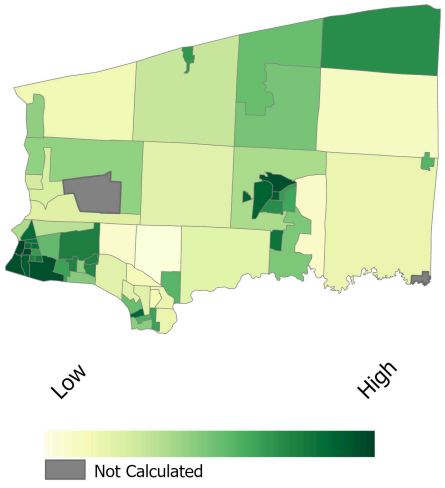
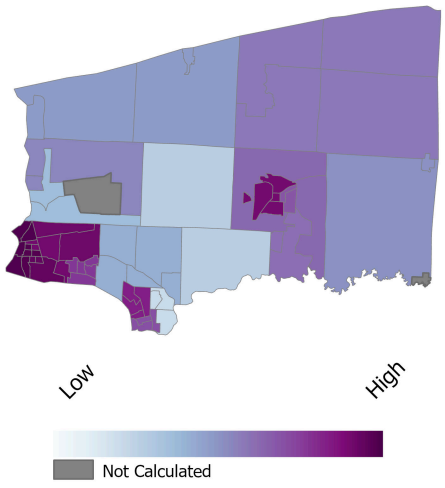


Figure 3d. Sensitivity



BUILDING RESILIENCE

There are many ways New Yorkers can prepare for and stay safe during extreme heat. Using a combination of these methods is the best way to reach the most people, especially those who are more vulnerable. If you don't have air conditioning, cooling centers and programs to help you cool down at home can make a big difference. It's important for everyone to know how extreme heat can affect their health and what to do when it gets dangerously hot. Having a plan for heat emergencies helps make sure we respond in an organized way. The NYS Extreme Heat Action Plan, created in 2024, is a guide that helps the state coordinate its efforts to address extreme heat. The plan includes helpful strategies, such as expanding access to cooling centers and other cooled public spaces; advancing nature-based solutions (e.g., increasing shade, vegetation, cooling landscapes) to reduce urban heat island impacts; supporting municipalities in heat-related planning, climate adaptation, and emergency response capacity; and boosting public communication and preparedness initiatives so communities can respond effectively to heat emergencies.

Cooling Resources

Access to a place to cool off is important in reducing the risk of health outcomes associated with heat. While many people have access to a cool spot in their home, 2018 Behavioral Risk Factor Surveillance System (BRFSS) survey data suggests that 19.4% of New Yorkers outside of New York City do not have air conditioning in their homes. This proportion is higher among the respondents reporting lower income and among certain minority groups. Cooling centers are one strategy emergency management and local health departments can use to prepare for extreme heat and offer New Yorkers a place to cool off during hot weather.

Cooling centers include indoor public places that have air-conditioning. County cooling center locations are voluntarily submitted by local health departments and emergency management offices to the NYS Department of Health. For more information about cooling centers and submitting cooling center information to the NYS Department of Health, contact coolingcenters@health.ny.gov. The Cooling Center Finder helps people locate a cooling center in their area and provides driving, walking, and transit directions. The Finder also includes information on outdoor locations where people can cool off, including public parks, pools and

beaches. Counties are encouraged to identify cooling centers in their community, especially in areas that have a high heat vulnerability score or in a disadvantaged community.[24] These locations should be promoted to the public throughout the summer. For counties interested in setting up a cooling center who need financial support, the Climate Smart Communities grant program can be a potential funding source.

Access to air conditioning at work or home for a few hours a day during an extreme heat event can significantly reduce the risk of heat-related health impacts.[25,26] The Office of Temporary and Disability Assistance's Home Energy Assistance Program (HEAP) allocates funding towards a Cooling Assistance Benefit that provides a free air conditioner (or fan) to people who are eligible. This resource is especially valuable to people with lower income who live in rural areas where cooling centers may not be available and may not have an air conditioner in the home. For more information, county HEAP contacts can be found at https://otda.ny.gov/programs/heap/contacts/.

Education and Outreach

There are several strategies to engage the public in extreme heat education and outreach. A common engagement strategy is using social media. The NYS Department of Health's Extreme Heat Advice page has messaging and resources that can be used when developing social media materials for the general public or for people who may be at greater risk for heat-related illness. Here are some general tips to follow when developing materials for the public:[27]

- Clearly describe the hazard's impact and consequences to one's safety without jargon
- Indicate the connection between the hazard and the factors that put someone at risk
- Include protective action recommendations in all messaging and indicate why a particular behavior is crucial to protect oneself

Other engagement strategies include using public broadcasts and emergency preparedness notification systems. These strategies can be particularly helpful during extreme heat events or at the beginning of the summer. It is also recommended to work with community-based organizations who work with vulnerable populations to promote heat-related illness prevention and health safety tips through their communication channels. Having an Extreme Heat Communications Plan in place before the summer can help health departments and other local

agencies organize and coordinate outreach within their department, with other county departments, and with outside partners. For communication plan templates or further assistance on extreme heat communication, please contact climatehealth@health.ny.gov.

Extreme Heat Emergency Plans

To determine whether a heat emergency plan is needed, review existing plans to assess whether extreme heat events are adequately addressed within previously developed all-hazards emergency preparedness plans. Some all-hazard plans may already incorporate extreme heat considerations, others may require updates to ensure heat-specific risks, actions, and resources are clearly defined.

An extreme heat emergency plan should include the following components:

Local Heat Vulnerability

This involves a description of the geographic coverage and underlying causes of heat vulnerability in the area. Identifying areas where people at greater vulnerability to extreme heat live can help with resource allocation (e.g., determining where cooling centers should be set up).

Extreme Heat Event Response

This requires a detailed outline of actions that need to take place during an extreme heat event. These actions may be tied to specific thresholds. For example, a county could use the HeatRisk forecast provided on the NYS Heat Risk and Illness Dashboard as a reference and plan to open cooling centers if the forecast is predicted to reach category 3 (i.e., Major) or consider opening 24-hr emergency shelters if the forecast is predicted to reach category 4 (i.e., Extreme) for several days in a row.

Communication and Outreach Strategies

This includes communication plans and outreach materials to improve awareness among residents. There should also be messaging and materials tailored to people who are at greater risk of heat-related illness. Please see the section above “Education and Outreach” for more information.

Additional Considerations

Other important elements could include creating a system to check in on people who are at greater risk to heat-related illness, setting up a system to transport people to and from cooling centers, working with utility companies to suspend disruption of services during predicted high-heat events, ensuring residents are signed up for Reverse 911 and NY-ALERT, and translating messages to reach people who do not speak English.

Resources

- **Climate Smart Communities:** A NYS program that helps local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. The program offers grants, leadership recognition, and free technical assistance. https://climatesmart.ny.gov/
- **Cooling Assistance Benefit:** Information on the Cooling Assistance Benefit and who is eligible. https://otda.ny.gov/programs/heap/#cooling-assistance
- **Cooling Center Finder:** Maps and lists of cooling centers available in each county. This resource is updated in real-time to provide New Yorkers with the most up-to-date information on where New Yorkers can get cool during the summer months. https://www.health.ny.gov/environmental/weather/cooling/index.htm
- **Disadvantaged Communities:** Maps of Disadvantaged Communities (DACs) developed by the Climate Justice Working group as part of the NYS Climate Act. https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria
- **Extreme Heat Advice:** Information on extreme heat and heat-related illness, links to NYS Department of Health extreme heat outreach materials, and additional resources that may be helpful to healthcare providers, coaches, and outdoor workers and employers. https://www.health.ny.gov/environmental/emergency/weather/hot/index.htm
- **Heat Vulnerability Index (HVI):** Statewide and county heat vulnerability maps to display the HVI for each census tract. https://www.health.ny.gov/environmental/weather/vulnerability_index/index.htm
- **NYS Extreme Heat Action Plan:** Information on what the state is doing to adapt to extreme heat and resources for local governments. https://dec.ny.gov/environmental-protection/climate-change/effects-impacts/extreme-heat

- **NYS Heat Risk and Illness Dashboard:** View the heat risk forecast and current heat-related illness rates in New York State (excluding New York City). Data are available May 1 – September 30 during hot weather. https://www.health.ny.gov/statistics/environmental/heat_dashboard/index.htm

NYS CLIMATE REGIONS

Catskills: Delaware, Greene, Sullivan, Ulster

Central/Finger Lakes: Cortland, Livingston, Onondaga, Ontario, Schuyler, Seneca, Tompkins, Wyoming, Yates

Great Lakes: Cayuga, Chautauqua, Erie, Genesee, Jefferson, Monroe, Niagara, Orleans, Oswego, Wayne

Long Island: Nassau, Suffolk

Mohawk River Valley: Fulton, Herkimer, Madison, Montgomery, Oneida, Otsego, Schoharie

New York City: Bronx, Kings, New York, Queens, Richmond

North Country: Clinton, Essex, Franklin, Hamilton, Lewis, St. Lawrence, Warren

North Hudson: Albany, Columbia, Rensselaer, Saratoga, Schenectady, Washington

South Hudson: Dutchess, Orange, Putnam, Rockland, Westchester

Southern Tier: Allegany, Broome, Chemung, Chenango, Cattaraugus, Steuben, Tioga

DATA SOURCES

- **Statewide Planning and Research Cooperative System (SPARCS):** Daily summer hospitalizations and ED visits (May – September) between 2015 and 2024 in New York State were acquired from SPARCS. The SPARCS database is created and maintained by the New York State Department of Health and consists of inpatient (hospitalizations) and outpatient (Emergency department, outpatient and ambulatory surgery) visits among NYS residents. More information at https://www.health.ny.gov/statistics/sparcs/
- **US Census Bureau:** Census data was used to develop the Heat Vulnerability Index. Census tract data was obtained from the 2018–2022 American Community Survey 5-year Estimates which contains annually updated estimates on the nation's people from responses to the ongoing American Community Survey. Data can be downloaded at https://data.census.gov.

- **North American Land Data Assimilation System (NLDAS):** Temperature indicators including daily maximum air temperature and maximum heat index were computed across grid cells using model-derived data of NLDAS, available at approximately 12 km by 12 km grid. The grid-level daily temperature data were averaged for summer months and mapped for each county. More information at https://climatedataguide.ucar.edu/climate-data/nldas-north-american-land-data-assimilation-system
- **Downscaled CMIP5 Climate and Hydrology Projections:** Provides monthly average of surface air temperature at the 1/8th degree grid (approximately 12 km by 12 km) from 1950–2099 with coverage of NLDAS domain (contiguous US plus portion of southern Canada and northern Mexico). Data is archived at https://gdo-dcp.ucllnl.org/downscaled_cmip_projections/
- **Parameter-elevation Regressions on Independent Slopes Model (PRISM):** Daily weather data from over 25,000 precipitation and temperature stations processed to create a continuous 4km gridded weather map across the United States of America. Daily maximum temperature and maximum vapor pressure deficits were used to calculate daily maximum heat index and approximated daily maximum wet bulb globe temperatures for New York State from 1981–2021. Data obtained from https://prism.oregonstate.edu/

NASA Temperature Data for Downloading

Daily census tract level temperature data can be made available on request. For more information, contact the NYS Environmental Public Health Tracking Program at epht@health.ny.gov.

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