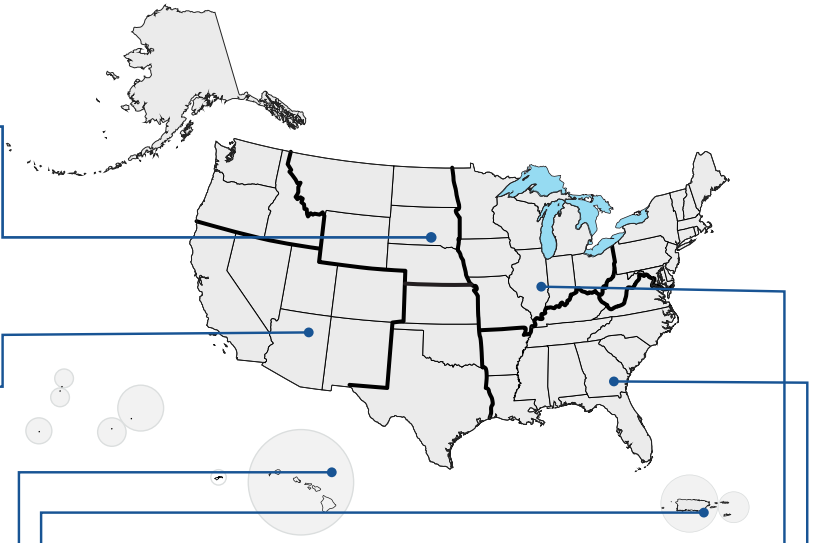
OASH | Office of Climate Change and Health Equity

Climate and Health Outlook

ISSUED OCTOBER 2023

The Climate and Health Outlook is an effort to inform health professionals and the public on how our health may be affected in the coming months by climate events and to provide resources for proactive action. Visit the associated webpage for additional resources and information or the associated portal to interact with maps of county-level data on climate hazards and individual-level risk factors.



Northern Great Plains: Drought persistence is favored across northern Montana, North Dakota, and eastern South Dakota and Nebraska with improvement and removal forecast for northeastern North Dakota and central Nebraska.

Southwest: Drought is favored to persist across most of New Mexico and Arizona into parts of Colorado, Nevada, and Utah, with improvement and removal forecasted for eastern New Mexico. Below normal significant wildland fire* potential is forecast across the southern and central California coast.

Hawai'i and Pacific Islands: The central Pacific is forecast to experience an above-average hurricane season. Drought persistence and expansion is forecast across the entirety of the Hawaiian Islands. Above normal significant wildland fire is forecast for the Islands of Hawai'i.

Caribbean: The Atlantic basin is forecast to have an above-normal hurricane season. Drought removal is likely in Puerto Rico and improvement/removal is likely for the U.S. Virgin Islands.

Midwest: Drought is favored to persist across most of Minnesota, Iowa, Missouri, Wisconsin, and Indiana along with parts of Illinois, Michigan, and Ohio. Drought improvement and removal is favored for northwestern Minnesota.

Southeast: The Atlantic basin is forecast to have an above-normal hurricane season. Drought is favored to persist across most of Louisiana and Mississippi along with parts of Arkansas, Kentucky, Tennessee, Alabama, Georgia, Florida, and northern Virginia with areas of expansion in Arkansas, Mississippi, Tennessee, Alabama, Georgia, Florida, and North Carolina. Drought improvement/removal is likely for parts of the western Florida Peninsula. Above normal significant wildland fire potential is forecast for Alabama, Kentucky, Louisiana, Mississippi, much of Tennessee, and parts of eastern Arkansas and western Virginia.

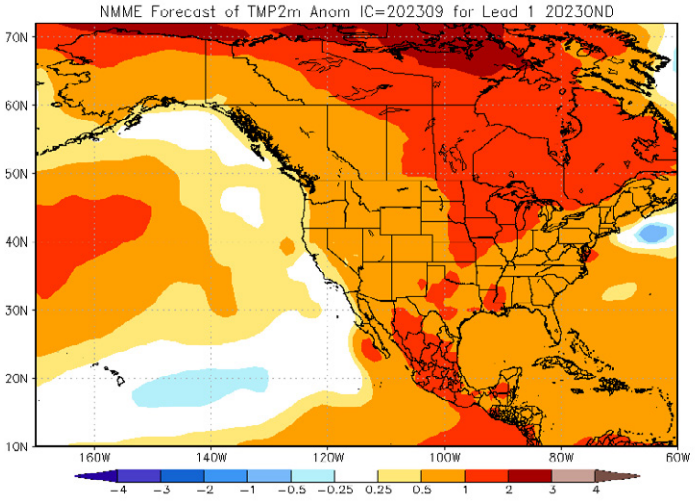
Drought Wildfire Hurricane

*Smoke from wildfires can impact health hundreds of miles from site of the fire.

Developed with data from the Centers for Disease Control and Prevention, the National Oceanic and Atmospheric Administration, and the National Interagency Fire Center.

We want to hear from you! Please send your feedback on ways to improve the Climate and Health Outlook to ocche@hhs.gov.

How hot will it be, and where, over the next 3 months?



For October–December, the North American Multi-Model Ensemble (NMME) predicts that the average temperature will be 0.45 to 3.6°F (0.25 to 2°C) above normal for most of the continental United States, with the western portion of the Midwest into the eastern portion of the Northern Great Plains experiencing the highest 90-day average and the coast of California and Oregon experiencing the lowest. The NMME integrates multiple forecasts of the next 90 days to build the best estimate of temperatures and precipitation over that time frame. Note that although many regions across the continental United States may expect a warmer 90-day average temperature, this is not the same as your local weather forecast, in which large fluctuations in temperature may be predicted from day to day.

Figure: The North American Multi-Model Ensemble's (NMME) forecast for temperature in October–December 2023 compared to climatological average (from 1991-2020) based on combining forecast information from state-of-the-art computer climate models currently running in the U.S. and Canada, including from the National Aeronautics and Space Administration (NASA), two groups from the National Oceanic and Atmospheric Administration (NOAA), and from the National Center for Atmospheric Research (NCAR). For more information about this model or prediction, please refer to the NMME website.

Heat-Related Illness Increasing Among Veterans

A recent publication from the U.S. Department of Veterans Affairs, Stanford University, University of Iowa, and CDC found that Veterans have been diagnosed with heat-related illnesses (HRIs), such as heat exhaustion and heat stroke, in all 50 states and that the rate of diagnosis has increased over time. The assessment utilized the Veterans Health Administration's national electronic health record database to identify HRIs diagnosed from January 1, 2002, through December 31, 2019, and found that there were **33,114 documented cases of HRIs**, which impacted **28,039 unique patients**. The Veterans Health Administration is the largest integrated healthcare system in the United States, with 1,298 facilities serving over 9 million enrolled Veterans.

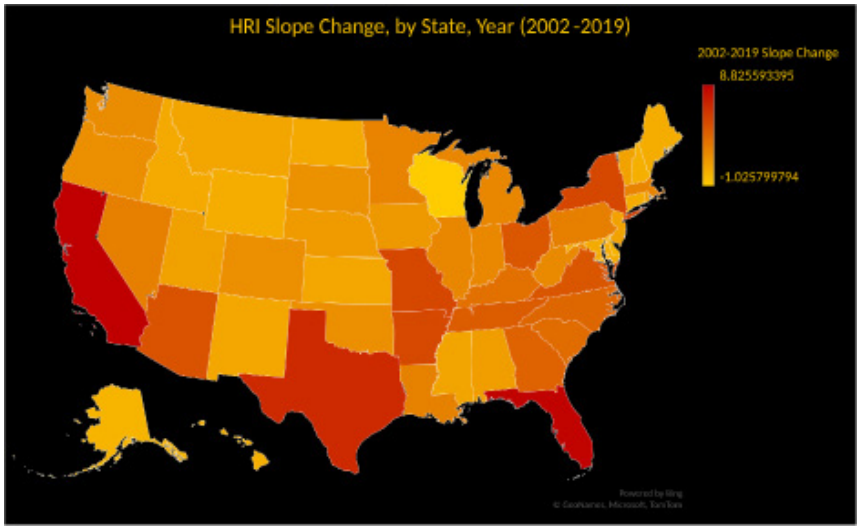


Figure: Heat map of all 50 U.S. states and District of Columbia. States with the largest increase in heat-related illness diagnoses over the assessment period are red, with less dramatic increases represented in shades of orange.

In addition to a statistically significant increase in the incidence of HRIs over time, the results raised important **health equity concerns**. Of note, Black and American Indian/Alaska Native Veterans were more likely to be diagnosed with HRIs. Veterans with existing medical conditions, including common comorbidities, also saw a greater increase in HRIs over time. For example, in 2002, ~50% of HRI diagnoses impacted Veterans with hypertension, but this increased to ~70% in 2019. The results demonstrated that there has been an increase in diagnosed HRIs among Veterans for **nearly all U.S. states** with a disproportionate increase of HRIs in California, Florida, and Texas. There were also notable increases in HRI diagnoses in other states such as Missouri, Arkansas, Virginia, Ohio, and New York. However, the rates for the Veteran homeless population were increasing in the first half of the assessment period, but then decreased in the second half of the assessment. This change in the trend occurred alongside the development and expansion of Veteran homeless programs, which suggests specific interventions can decrease the extent of heat related illnesses.

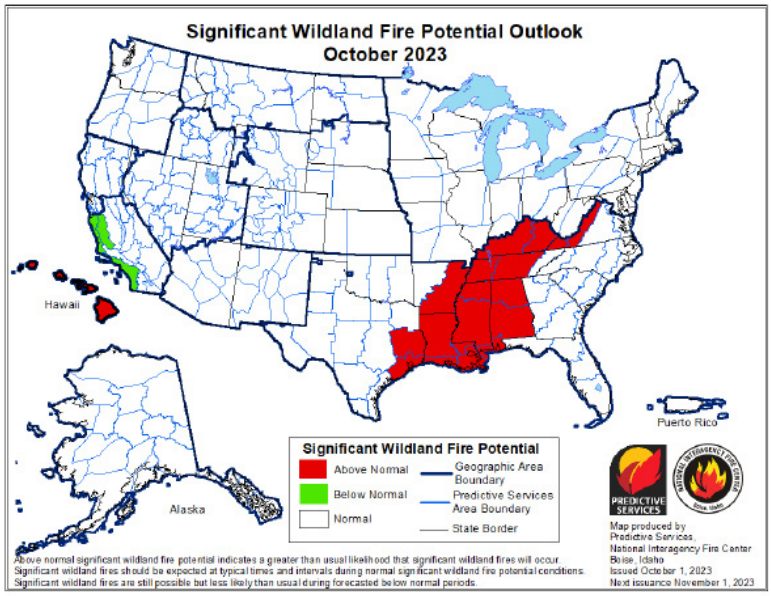


Figure: The National Significant Wildland Fire Potential Outlook identifies areas with above, below, and near normal significant fire potential using the most recent weather, climate, and fuels data available. These outlooks are designed to inform decision makers for proactive wildland fire management.

Significant fire activity generally decreased during September. Rainfall across northern California and the northern Intermountain West caused a decrease in fire activity, and a season-ending rain event along and west of the Cascades from northwest California through western Washington occurred the last week in September. Above normal significant fire potential is forecast from southeast Texas through the Lower Mississippi, Ohio and Tennessee Valleys into Alabama and western Virginia during October. Above normal potential will continue across the Hawai'ian Islands, especially lee sides through January, as drought is likely to expand and intensify with stronger than normal trade winds. Below normal significant fire potential is forecast for coastal southern and central California in October before returning to normal in November.

Who is at high risk in the counties with above normal wildland fire potential in October?

Wildland fires are occurring more frequently in the United States and present a health hazard for populations living close to a fire. As indicated in the map to the left, **526 counties** across **8 states** are projected to have above normal wildfire potential in October. In these counties, the total population at risk is **33,092,741 people**. Of these counties:

81 (15%) have a high number* of people aged 65 or over, living alone.

103 (20%) have a high number of people without health insurance.

35 (7%) have a high number of uninsured children.

347 (66%) have a high number of people with frequent mental distress.

189 (36%) have a higher number of adults with asthma.

237 (45%) have a high number of adults with coronary heart disease.

268 (51%) have a high number of people living in poverty.

107 (20%) have a high number of people with electricity-dependent medical equipment and enrolled in the HHS emPOWER program.

276 (52%) have a high number of people in mobile homes.

273 (52%) have a high number of people with one or more disabilities.

244 (46%) are identified as highly vulnerable by CDC's Social Vulnerability Index.

*"A high number" indicates that these counties are in the top quartile for this indicator compared to other counties.

Wildfires Affect Health in Many Ways

Wildland fire increases the risk for a diverse range of health outcomes from both the fire itself and smoke. For example:

- Due to the nature of their work, firefighters are at risk of developing severe heat-related illness (such as **heat stroke**) and rhabdomyolysis (**muscle breakdown**).
- Wildfire can cause **burns** through contact with flames and hot surfaces as well as chemical and electrical burns.
- Wildfire smoke can lead to disorders including **reduced lung function**, **bronchitis**, exacerbation of **asthma**, and cardiovascular effects like **heart failure**.
- For pregnant people, smoke exposure may increase the risk of **reduced birth weight** and **preterm birth**.
- Wildfire smoke may affect the immune system, potentially leading to increased vulnerability to **lung infections** like COVID-19.
- Smoke from wildfires can travel downwind and affect air quality hundreds of miles away from the fire.

Peat Bog Wildfire Smoke Associated with Cardiopulmonary ED Visits

In June 2008, smoke from a peat bog wildfire billowed into the atmosphere and fouled the air in rural parts of eastern North Carolina, impacting the daily lives and health of over a million people. A peat bog is a wetland with decomposing plant remains. In drought conditions, peat bogs are exceptionally susceptible to wildfires that are difficult to extinguish and produce large amounts of smoke. The rising temperatures and more frequent drought associated with climate change coupled with damage from exploitation of peat bogs for energy increase the risk of peat fires.

U.S. EPA researchers, along with state and academic collaborators, evaluated air quality impacts from the North Carolina 2008 peat bog wildfire and found that wildfire-impacted counties experienced significant increases in Emergency Department (ED) visits for cardiopulmonary outcomes including chest pain, asthma, chronic obstructive pulmonary disease, pneumonia, heart failure, and acute bronchitis. The counties most highly exposed to wildfire smoke were largely rural with a higher percentage of African Americans and people of lower socioeconomic status (SES) than in other North Carolina counties. Another analysis using County Health Ranking data reported a difference in the risk of ED visits between bottom and top ranked counties by SES factors for asthma and congestive heart failure.

Complimentary EPA toxicological studies analyzed smoke samples from this peat bog wildfire during two burn phases: actively smoldering versus nearly extinguished. Researchers found that coarse particulate matter (PM) from the two burn phases had similar chemical composition while the composition of fine and ultrafine PM differed between phases. In a mouse study , researchers found that ultrafine particles affected the heart, whereas coarse particles affected the lung, with more pronounced effects for particles from the smoldering phase. Together, these studies suggest that different size particles from the same air shed could adversely affect the cardiovascular and respiratory systems..

Resources to Reduce Health Risks Associated with Wildfires

The Ready.gov Wildfires site, Centers for Disease Control and Prevention (CDC) Wildfires site, and Environmental Protection Agency (EPA) Smoke-Ready Toolbox for Wildfires include information about how to prepare for wildfires, stay safe during a fire, and return home after a fire.

The AirNow Fire and Smoke Map, a joint project of EPA and the U.S. Forest Service, provides information on fire locations, smoke plumes, and air quality, using the color-coding of the Air Quality Index (AQI), along with recommended actions to take to reduce smoke exposure. The AirNow Wildfires site provides additional information on steps to protect your health. The Map is also available in the AirNow app.

Wildfire events can be stressful. Do what you can to take care of yourself, connect with others, spend time in cleaner community air spaces such as the library, and ask for help from professionals if needed. If you are experiencing emotional distress related to any natural or human-caused disaster, call or text SAMSHA's Disaster Distress Helpline at 1-800-985-5990 for free 24/7 crisis counseling for people. Deaf and hard of hearing ASL callers can use a videophone or ASL Now.

If you have children, these resources may help: Ready Wrigley Prepares for Wildfires & Smoke (cdc.gov), Helping Children Cope with Emergencies | CDC, Helping Teens Cope After a Natural Disaster | CDC.

The EPA and CDC continuing education program Wildfire Smoke and Your Patients' Health can help educate healthcare professionals about the health effects of wildfire smoke and highlights actions that individuals can take to reduce exposure. This printable card contains additional information about the course.

If you do not have health insurance and are in a federally-identified disaster, the Emergency Prescription Assistance Program can help you get the prescription drugs, vaccinations, medical supplies, and equipment that you need. If you have Medicare and your medical device is damaged or lost due to an emergency or disaster, Medicare may cover the cost to repair or replace your equipment or supplies. You can locate and access your electronic health records from a variety of sources by using the HHS' online tool.

Smoke Sense is a crowdsourcing, participatory science research project developed by EPA researchers focused on increasing public awareness and engagement related to wildfire smoke health risks.

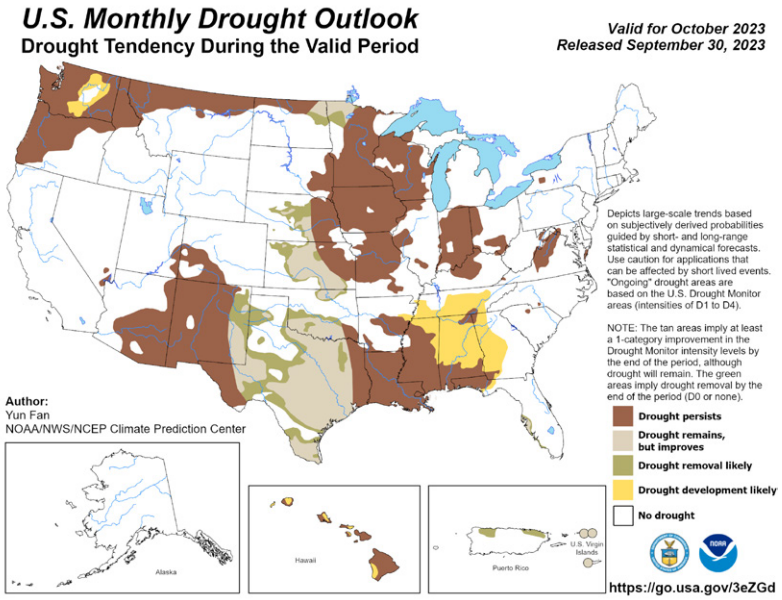


Figure: The National Weather Service Climate Prediction Center's Monthly Drought Outlook is issued at the end of each calendar month and is valid for the upcoming month. The outlook predicts whether drought will persist, develop, improve, or be removed over the next 30 days or so. For more information, please refer to drought.gov.

During October, drought improvement is favored for parts of the Southern Great Plains and northern Minnesota and North Dakota along with drought areas of the Virgin Islands and Puerto Rico. In contrast, drought persistence or intensification is forecast for a vast majority of the drought areas affecting the contiguous United States and Hawai'i. Drought development is forecasted by the end of the month in the Southeast and parts of the Northwest and Hawai'i. Drought persistence is also forecasted across the Northwest, Southwest, Midwest, parts of the Southeast, and Hawai'i. Drought can have direct and indirect impacts on health—increasing incidence of illness among those living in the affected area and worsening mental health outcomes as livelihoods are challenged.

Who is at high risk in the counties projected to have drought in October?

As indicated in the map to the left, **1392 counties** across **39 states** are projected to have persistent/remaining drought or drought development in October. In these counties, the total population at risk is **102,266,696 people** and, of those, **1,158,574 people** work in agriculture. Of these counties:

332 (24%) have a high number* of people aged 65 or over, living alone.

327 (23%) have a high number of people living in rural areas.

357 (26%) have a high number of people living in poverty.

414 (30%) have a high number of people with frequent mental distress.

288 (21%) have a higher number of adults with asthma.

262 (19%) have a high number of people without health insurance.

222 (16%) have a high number of uninsured children.

388 (28%) have a high number of Black or African American persons.

299 (21%) have a high number of people with severe housing cost burden.

360 (26%) have a high number of people in mobile homes.

360 (26%) have a high number of people with one or more disabilities.

351 (25%) are identified as highly vulnerable by CDC's Social Vulnerability Index.

*"A high number" indicates that these counties are in the top quartile for this indicator compared to other counties.

Drought Affects Health in Many Ways

Drought increases the risk for a diverse range of health outcomes. For example:

- Low crop yields can result in rising food prices and shortages, potentially leading to **malnutrition**.
- Dry soil can increase the number of particulates such as **dust and pollen** that are suspended in the air, which can irritate the bronchial passages and lungs.
- Dust storms can spread the fungus that causes coccidioidomycosis (**Valley Fever**).
- If there isn't enough water to flow, waterways may become stagnant breeding grounds for **disease vectors** such as mosquitoes as well as viruses and bacteria.
- Drought's complex economic consequences can increase **mood disorders, domestic violence,** and **suicide**.
- Long-term droughts can cause **poor-quality drinking water** and leave inadequate water for hygiene and sanitation.

Which parts of the country are at high risk from hurricanes?

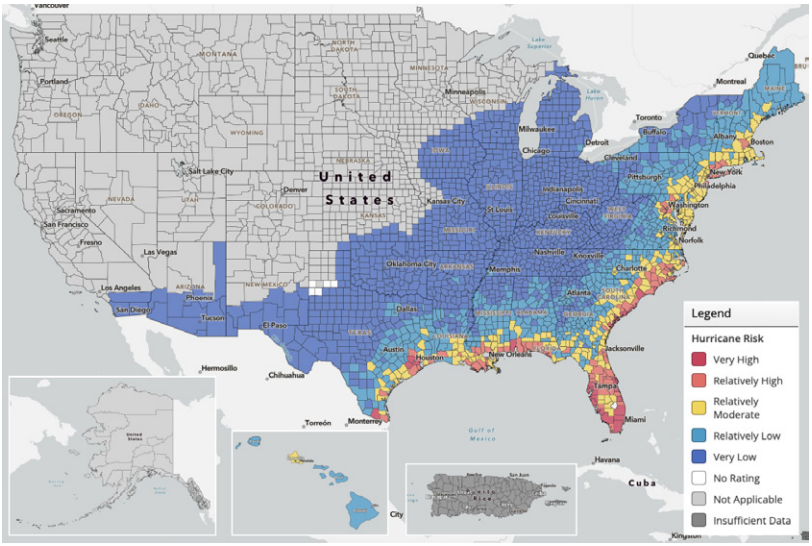


Figure: This map of the United States is colored by the National Risk Index rating for the Hurricane hazard. The characterization of risk across these counties are based on historical records on hurricane paths and intensity.

Outlook for the 2023 Hurricane season

During this hurricane season, which began June 1 and ends on November 30, the National Oceanic and Atmospheric Administration (NOAA) forecasts an above-normal hurricane season for the Atlantic (with a range of 14–21 named storms, with 6–11 of those becoming hurricanes, and 2–5 becoming major hurricanes). NOAA also forecasts an above-normal season for the central Pacific, which includes Hawaii (with a range of 4–7 tropical cyclones including tropical depressions, tropical storms, and hurricanes). Please note that these ranges include storms that have already formed this season. For updated forecasts, please visit NOAA's website.

Hurricanes Affect Health in Many Ways

Hurricanes increase the risk for a diverse range of health outcomes. For example:

Flood water poses **drowning risks** for everyone, including those driving in flood waters. Storm surge historically is the leading cause of hurricane-related deaths in the United States.

Winds can blow debris—like pieces of broken glass and other objects—at high speeds. Flying debris is the most common cause of **injury** during a hurricane.

Using generators improperly can cause carbon monoxide (CO) exposure, which can lead to **loss of consciousness** and **death**. Over 400 people die each year from accidental CO poisoning.

The Federal Emergency Management Agency (FEMA) provides information on the risk of different climate hazards across the 50 states and Washington, D.C., through the National Risk Index (NRI) platform. The Risk Index leverages available data for natural hazard and community risk factors to develop a baseline relative risk measurement for each United States county and census tract.

318 counties across **20 states and D.C.** are estimated to have "very high," "relatively high," or "relatively moderate" hurricane risk. In these counties, the total population at risk is **100,504,829 people**.

Risk factors vary across the 318 counties identified by FEMA. Of these counties:

46 (14%) have a high number* of people aged 65 or over, living alone.

109 (34%) have a high number of people without health insurance.

62 (19%) have a high number of uninsured children.

11 (3%) have a high number of people living in rural areas.

225 (71%) have a high number of Black or African American persons.

81 (25%) have a high number of people with frequent mental distress.

109 (34%) have a high number of people living in poverty.

53 (17%) have a high number of people spending a large proportion of their income on home energy.

195 (61%) have a high number of people with severe housing cost burden.

187 (59%) have a high number of people with electricity-dependent medical equipment and enrolled in the HHS emPOWER program.

97 (31%) have a high number of people in mobile homes.

53 (17%) have a high number of people with one or more disabilities.

138 (43%) are identified as highly vulnerable by CDC's Social Vulnerability Index.

*"A high number" indicates that these counties are in the top quartile for this indicator compared to other counties

THANK YOU to the partners who provide invaluable information, expertise, and data for the Climate and Health Outlook series: