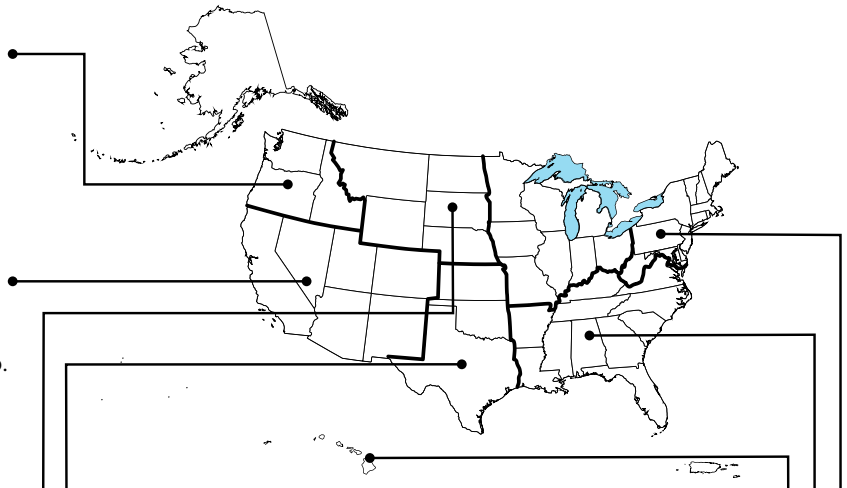
OASH | Office of Climate Change and Health Equity

Climate and Health Outlook

ISSUED MAY 2024

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 and the new Climate and Health Outlook Portal for interactive maps with county-level forecasts for the current month along with county-level data on individual risk factors that may make people more vulnerable to negative health outcomes from these climate hazards. This edition provides forecasts for heat, flooding, drought, and wildfire in May 2024, plus a look at how climate change is influencing Valley fever and pollen along with seasonal allergies.



Northwest: Drought is favored to persist across small portions of Washington, central Oregon, and Idaho. Drought improvement and removal is likely in central Washington and northern Idaho. Above normal snowpack in southern Idaho will lead to the potential for minor flooding* on tributaries in areas south of the Snake River Plain this spring.

Southwest: Drought is favored to persist across parts of New Mexico, Arizona, Colorado, southern Nevada, and eastern Utah. Drought development is forecast in parts of east New Mexico and southeastern Colorado. Above normal significant wildland fire** potential is forecast for parts of southeast Arizona and parts of New Mexico. Below normal significant wildfire potential is forecast for parts of southern California.

Northern Great Plains: Drought persistence is favored in portions of Montana, northern Wyoming, North Dakota, and South Dakota. Drought development is forecast in eastern Montana. Drought improvement and removal is favored in southeastern Nebraska, northeastern North Dakota, and portions of Montana.

Southern Great Plains: 12 counties in Texas are expected to have five or more extremely hot days*** in May. Drought persistence is forecast in western Texas, western Oklahoma, and western Kansas. Drought development is likely in northwestern Texas and northwestern Oklahoma. Drought improvement and removal is favored in Kansas, Oklahoma, and central Texas. Above normal significant wildland fire potential is forecast for west Texas. Isolated moderate flooding is expected over tributaries to the Lower Missouri River in Kansas, as well as tributaries to the Lower Arkansas River in southeast Kansas and eastern Oklahoma along portions of the Neosho and Poteau Rivers. Minor flooding is projected over much of eastern Kansas, eastern Oklahoma, and eastern Texas this spring.

Hawai'i and Pacific Islands: Drought persistence and development is forecast across portions of Hawai'i. Above normal significant wildland fire potential is forecast for Hawai'i.

Southeast: Drought persistence is forecast in a small portion of southeastern Tennessee and western Kentucky. Drought development is likely in across central Florida. Minor flooding is possible throughout most of the Southeast, with isolated areas of moderate potential. Flooding in this region is driven by springtime thunderstorm activity and spring flooding is typical in this area. Above normal significant wildland fire potential is forecast for central Florida.

Northeast: The Northeast is forecast to remain drought-free. Minor flooding is possible across portions of Maryland, New Jersey, southern New York and New England this spring. Areas including the Adirondack Mountains in northern New York, Vermont, New Hampshire, and the mountains of western Maine will be vulnerable to flooding from steady snowmelt through the spring, particularly if heavy rainfall occurs in the next few weeks. The potential for flooding due to ice jams is above normal across the northern portion of Maine.

Drought Wildfire Flooding Heat

* It is important to remember that heavy and intense rainfall at any time can cause flooding conditions in excess of the Spring Outlook. Communities are encouraged to monitor their flood risk at water.noaa.gov.

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

*** An "extremely hot day" is defined by having an expected temperature above the 95th percentile value of the historical temperature distribution for the month and county. For more information, check out CDC's National Environmental Public Health Tracking Network documentation.

Developed with data from 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.

Extreme Heat

Where are extremely hot days expected in May?

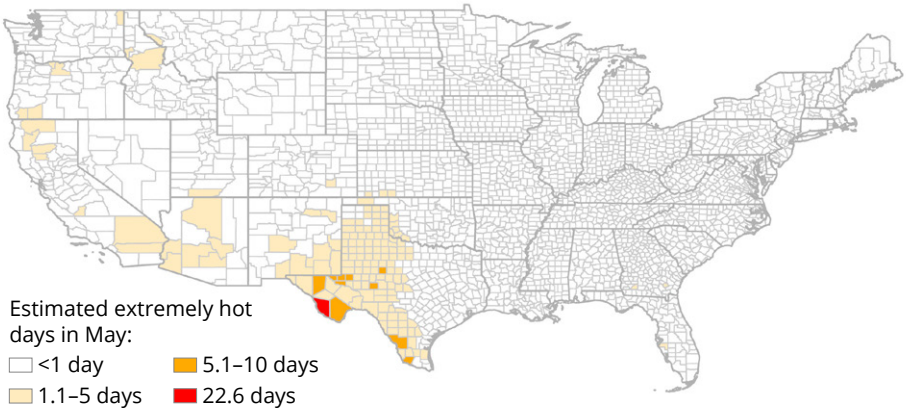


Figure: This map shows the expected number of extremely hot days in May in each county in the contiguous U.S. The forecast is based on the NOAA Climate Prediction Center's probabilistic outlook of temperatures being above, below, or near normal in May. A county's 'normal' temperature is based on the 30-year average from 1991–2020. An 'extremely hot day' is when the daily maximum temperature is above the 95th percentile value of the historical temperature distribution in that county. For more information on your county, please refer to the Centers for Disease Control and Prevention (CDC) Heat and Health Tracker.

In May, **12 counties** in **Texas** are expected to have five or more extremely hot days. In these counties, the total population at risk is **615,328**. Extreme summer heat is already increasing in the U.S. and climate projections indicate that extreme heat events will become more frequent and intense in coming decades. Heat-related deaths have been increasing in the U.S., with approximately 1,602 occurring in 2021, 1,722 in 2022, and 2,302 in 2023.

Heat Affects Health in Many Ways

Warmer temperatures increase the risk for a diverse range of health risks. For example:

- An increased risk of **hospitalization for heart disease**.
- **Heat exhaustion,** which can lead to **heat stroke** which, if not treated, can cause critical illness, brain injury, and even death.
- Worsening **asthma** and **chronic obstructive pulmonary disease (COPD)** as heat increases the production of ground-level ozone.
- Dehydration, which can lead to **kidney injury** and blood pressure problems. Some kidney damage can become irreversible with repeated or untreated injury.
- **Violence, crime,** and **suicide** may increase with temperature, adding to the rates of depression and anxiety already associated with climate change.

Who Is at High Risk in the Counties With the Most Extreme Heat Days?

Some communities face greater health risks from extreme heat given various risk factors they face. These communities include people who: are elderly and live alone, have existing health conditions such as cardiovascular disease, have poor access to healthcare, live in rural areas, have disabilities, work outdoors (or indoors with insufficient ventilation or mechanical cooling), make a low income, face difficulty paying utility bills, live in poor quality housing, and live in urban areas without adequate tree cover.

Extreme Heat Resources

- HEAT.gov is a NIHHIS collaboration that serves as a national source of science-based information on heat and health.
- CDC's new clinical guidance advises how clinicians can keep at-risk individuals safe when temperatures rise.
- The NWS HeatRisk, created in partnership with NOAA and CDC, is a color-numeric-based index that provides a seven-day forecast of risk for heat-related impacts occurring over a 24-hour period.
- The Heat-Related EMS Activation Surveillance Dashboard (EMS HeatTracker) reports retrospective data on EMS responses to people experiencing heat-related emergencies.
- The OSHA-NIOSH Heat Safety Tool is an application that shows the real-time heat index and hourly forecasts based on your location.
- The Low-Income Home Energy Assistance Program (LIHEAP) provides federally funded assistance to reduce the costs associated with home heating and cooling bills. Find out if you qualify for assistance using the LIHEAP Eligibility Tool.
- The CDC Heat & Health Tracker provides local heat and health information so communities can better prepare for and respond to extreme heat events.

How Hot Will It Be, and Where, Over the Next 3 Months?

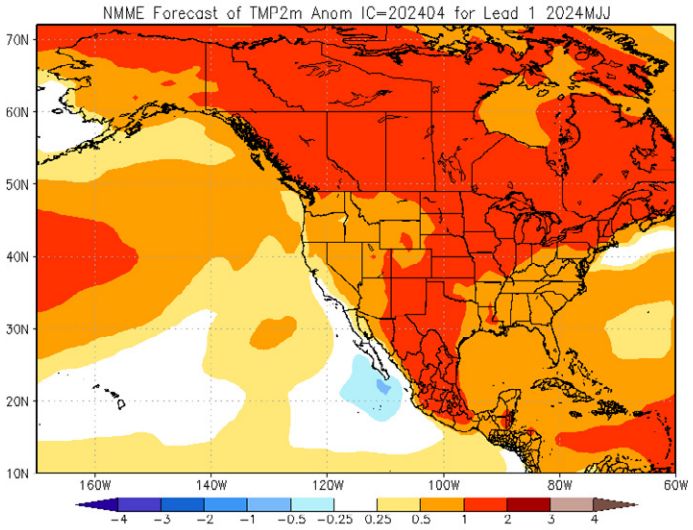


Figure: The North American Multi-Model Ensemble (NMME) predicts the average temperature over the next 3 months (May–July) will be 0.9–1.8°F (0.5–1°C) hotter than average across almost all of the contiguous U.S. For more information about this model or prediction, please refer to the NMME website.

For May–July, the North American Multi-Model Ensemble (NMME) predicts that the average temperature will be 0.9–1.8°F (0.5–1°C) above normal across the entirety of the contiguous U.S., except along the coast of California and the southern coast of Oregon. However, large portions of the northern Great Plains, the Midwest, New Mexico, southern Colorado, Kansas, western Oklahoma, most of Texas, the Northeast, and northern Alaska, may experience a higher 90-day average that is 1.8–3.6°F (1–2°C) above the normal average temperature for this period. 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 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.

Agricultural Workers: A Priority Population for Preventing Heat-related Illness

Extreme heat exposure can cause heat-related illnesses including heat stroke, heat exhaustion, cramps, fainting, and rashes. Outdoor workers, as well as indoor workers with insufficient ventilation or mechanical cooling, are at elevated risk for heat-related illness. One group of particular concern is agricultural workers, who often have physically demanding work outdoors through the hottest months and even during extreme heat waves. Recent studies have found that the average agricultural worker experiences 21 days (out of the average 153 day summer) of unsafe working days per year (i.e., days over 83.4°F) and the risk of heat-related death was more than 35 times higher for people working in agriculture compared to other occupations. The risks associated with unsafe working days are further compounded if nighttime temperatures are elevated or many excess heat days occur in a row.

There are an estimated 2.9 million agricultural workers in the U.S., of which a recent survey found that 78% self-identify as Hispanic and 70% as born outside of the U.S. Without protective measures, these workers are likely to experience even more heat-related illnesses as heat seasons become longer, hotter, and more intense. Important preventative measures for agricultural workers as well as all outdoor workers include providing water, shade, and breaks during the working day. The creation of culturally and linguistically appropriate training and resources related to heat protection and symptom identification can help migrant and seasonal agricultural workers protect themselves from the dangers of extreme heat. The OSHA field sanitation standard requires agricultural employers with 11 or more workers to provide drinking water. For more information on how to prevent, recognize, and treat heat-related illness, check out the Farmworker Justice and Migrant Clinicians Network Heat-Related Illness Clinicians guide. Migrant workers can also find helpful resources and more information about their employment-related rights in the U.S. at MigrantWorker.gov or TrabajadorMigrante.gov.

Image: Farmworkers exposed to sun and heat working in a strawberry field in Salinas, CA, wearing protective clothing including hats and long sleeve shirts.

Source: iStock/rightdx

Drought

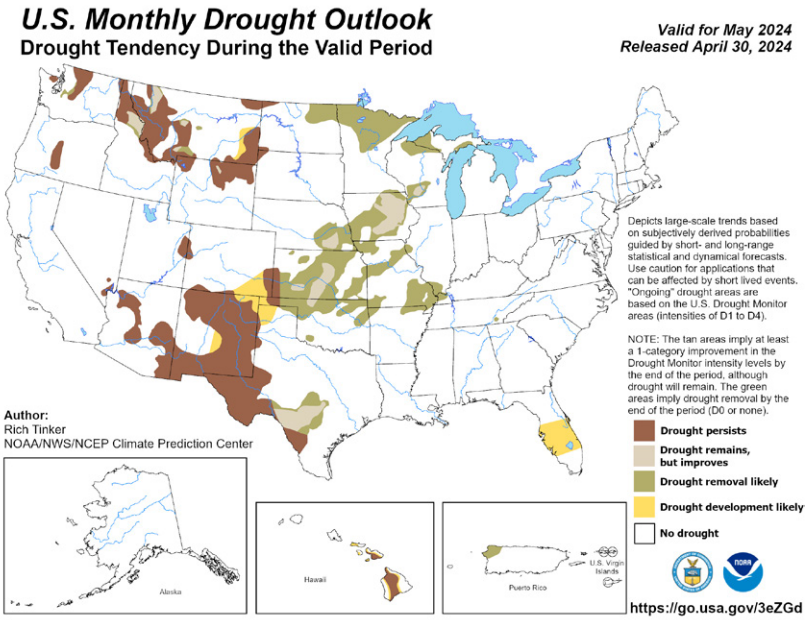


Figure: The National Weather Service Climate Prediction Center's Monthly Drought Outlook is issued at the end of each calendar month and is valid for the upcoming month. The outlook predicts whether drought will persist, develop, improve, or be removed over the next 30 days or so. For more information,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

During May, drought improvement and removal is favored in parts of the Southeast, Northern Great Plains, Southern Great Plains, the Northwest, Puerto Rico, and all drought areas of the Midwest. Drought development is likely in the Southeast, Northern Great Plains, Southern Great Plains, Southwest, and Hawai'i. Drought persistence is forecast across drought areas of the Southwest, Northwest, Northern Great Plains, Southern Great Plains, and in parts of 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.

Drought Affects Health in Many Ways

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

- Long-term droughts can cause **poor-quality drinking water** and leave inadequate water for hygiene and sanitation.
- 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.
- Drought's complex economic consequences can increase **mood disorders, domestic violence,** and **suicide**.

Who Is at High Risk in the Counties Projected to Have Drought in May?

As indicated in the map to the left, **237 counties** across **16 states** are projected to have persistent/remaining drought or drought development in November. In these counties, the total population at risk is **32,341,681 people** and, of those, **331,509 people** work in agriculture. Of these counties:

77 (32%) have a high number* of people aged 65 or over, living alone.

65 (27%) have a high number of people living in rural areas.

64 (27%) have a high number of people living in poverty.

44 (19%) have a high number of people with frequent mental distress.

25 (11%) have a higher number of adults with asthma.

100 (42%) have a high number of people without health insurance.

124 (52%) have a high number of uninsured children.

13 (5%) have a high number of Black or African American persons.

74 (31%) have a high number of people with severe housing cost burden.

80 (34%) have a high number of people in mobile homes.

58 (24%) have a high number of people with one or more disabilities.

78 (33%) 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.

Resources to Reduce Health Risks Associated with Drought

- The CDC Drought and Health site and Ready.gov Drought site have information on the health implications of drought and how to prepare.
- CDC's When Every Drop Counts guide and supplement provide information about how drought affects public health, recommends steps to help mitigate the health effects of drought, and provides a list of helpful resources.
- Call or text 1-800-985-5990 to get help and support for any distress that you or someone you care about may be feeling related to any disaster. This SAMHSA Helpline and Text Service is available 24/7, free, and staffed by trained crisis counselors.

Valley Fever

Valley fever, also called coccidioidomycosis, is a fungal disease that can affect people who breathe in the microscopic fungal spores in areas where the fungus lives in the environment. Roughly 15,000–20,000 Valley fever cases are reported each year to the CDC, but it is thought that the true number of infections is much higher. Some people who are exposed to the fungus never get sick, but others may develop symptoms similar to other lung infections (e.g., cough, fever, shortness of breath). In some cases, the infection may spread to other parts of the body, which often results in hospitalization and prolonged antifungal treatment. In endemic areas, Valley fever can cause up to a third of community-acquired pneumonia cases.

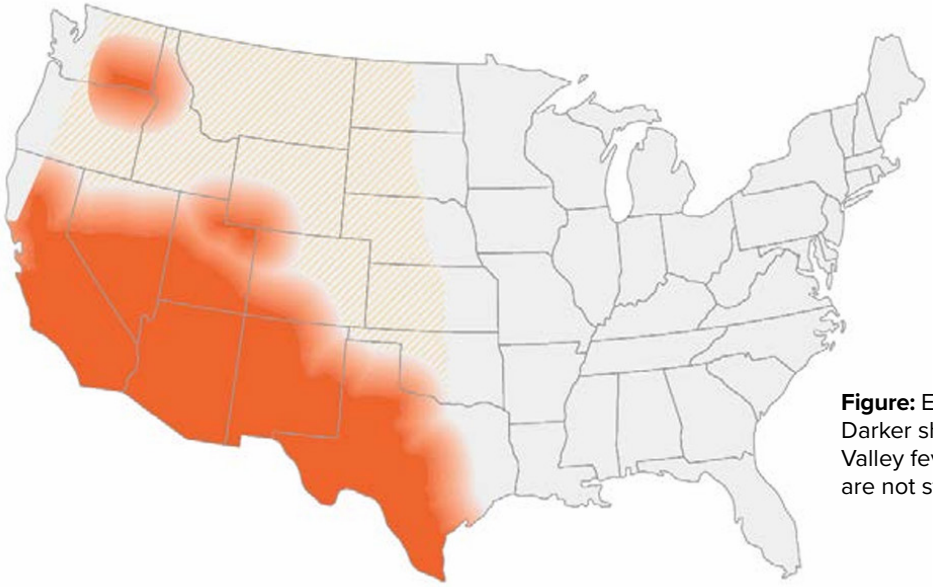


Figure: Estimated areas with Valley fever in the U.S. from CDC. Darker shading shows areas where the fungus that causes Valley fever is more likely to live but geographic boundaries are not strictly defined and may change over time.

Climate Change

Coccidioides, the fungus that causes Valley fever, lives in soil in hot, dry regions, and its geographic range may be expanding because of climate change. Traditionally, the fungus has predominantly been found in the southwestern U.S., but more recently, in 2015, it was detected as far north as Washington state. As temperatures increase, more areas may offer conditions favorable to the growth and dispersal of the fungus. Experts predict that *Coccidioides'* endemic range in the U.S. could more than double by the year 2100. Valley fever rates are also affected by rainfall and drought cycles; in California, researchers found that incidence increased after long periods of drought followed by wet winters. These patterns are expected to become more common and widespread, and to intensify with the changing climate. Severe weather events such as dust storms and wildfires are becoming more frequent and have also been linked to Valley fever, although the exact nature and extent of the associations is unclear.

Health Equity

Anyone can get Valley fever if they live in or travel to an area where the fungus lives, but certain populations, such as those with weakened immune systems, are at greater risk for developing severe illness. Some racial and ethnic minorities also appear to be at greater risk of Valley fever in the U.S.: American Indian and Alaska Native and Hispanic populations have more than twice the rate of Valley fever compared with White populations. Although the reasons for these health disparities are unclear, they are likely influenced by social determinants of health, such as housing conditions and access to healthcare. People with certain occupations, particularly outdoor jobs, also have higher rates of severe Valley fever. A survey of Hispanic farm workers found that self-reported exposures to dust and root and bulb crops were linked to increased incidence of Valley fever, though the relative impact of occupation compared with ethnicity on infection was unclear. Outbreaks among firefighters have also been reported, particularly among those that use hand tools and work in dusty conditions in areas where *Coccidioides* lives.

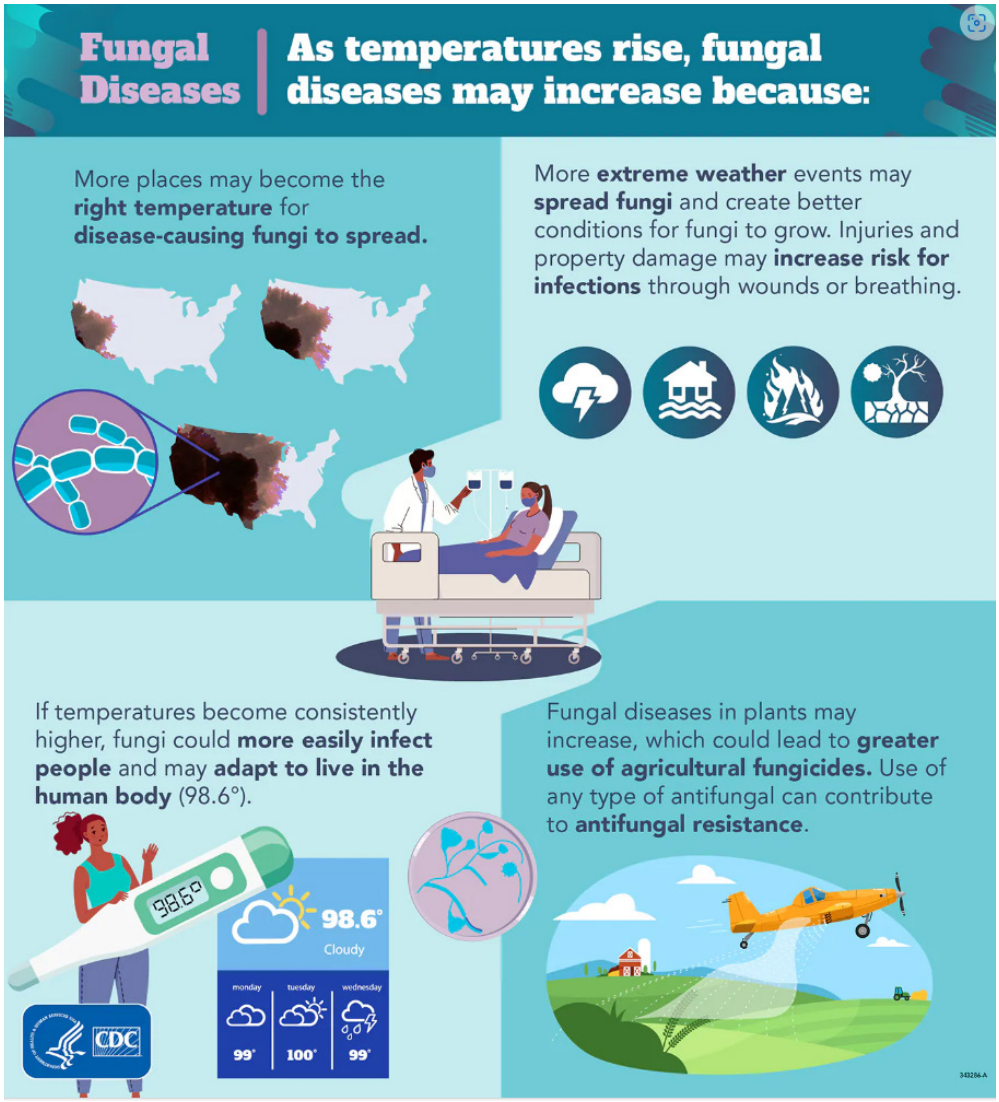


Figure: Fungal diseases may increase through a variety of mechanisms as temperatures rise worldwide (infographic by CDC). Valley fever is impacted by some, but not all, of these mechanisms as temperatures rise and its geographical range expands.

Prevention

Valley fever is difficult to prevent in areas where the fungus lives since the disease is acquired directly from the environment. There are currently no feasible methods to remove the fungus from the environment. To help prevent Valley fever, people can avoid spending time in dusty places and avoid participating in activities that disturb dust in areas where the fungus is endemic. If these activities are unavoidable, an N95 mask should be worn; in occupational settings, appropriate training and personal protective equipment should be provided to workers to help prevent illness and monitor for symptoms. Staying inside and closing windows during dusty days and using air filtration indoors may also prevent Valley fever. Cleaning injuries exposed to dust or dirt well with soap and water is also useful to inhibit cutaneous infection.

Prompt diagnosis and treatment can prevent severe disease. Unfortunately, Valley fever awareness is low, even in areas where the fungus lives. It is important to increase awareness so that people understand when to seek healthcare. Healthcare providers can use CDC's clinical diagnostic algorithm to assist in recognizing who and when to test for Valley fever.

Pollen

Spring 2024 has now arrived in all but the most northern and highest elevation parts of the U.S. Spring spread quickly in the central and eastern parts of the U.S., arriving up to three weeks early in some states, before it has slowed once again in the Midwest. Currently, spring is 3 days early in Duluth, MN, 7 days early in Marquette, MI, and 3 days early in Caribou, ME compared to a long-term average of 1991–2020. The Sacramento Valley, coastal areas of Northern California, Oregon, Washington, parts of the Great Plains, and southern Midwest are seeing the earliest start to spring on record.

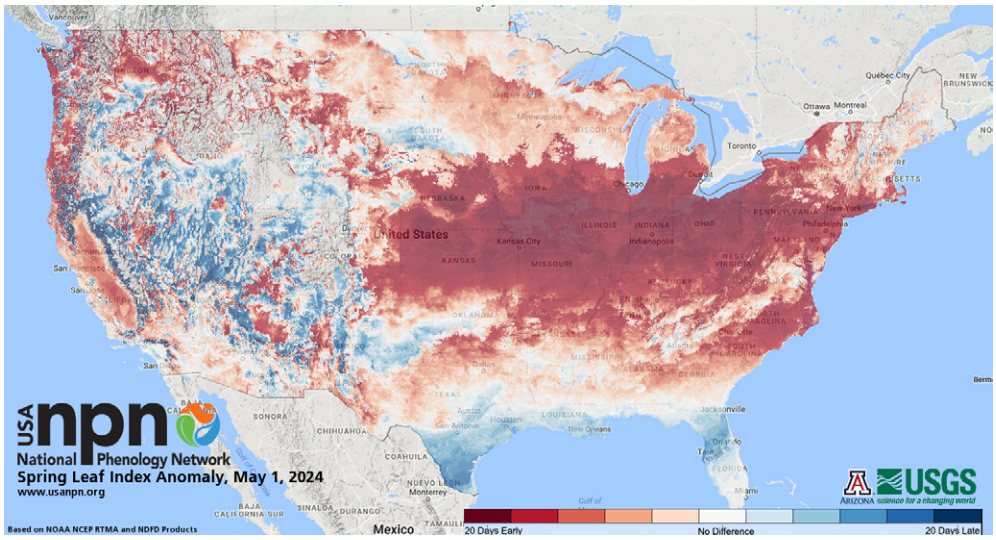


Figure: This map depicts where springtime biological activity has begun earlier than average (in red tones) and later than average (blue tones). Accordingly, we can expect an earlier start to the pollen season in these regions. For more information, visit the USA-NPN Status of Spring page.

Springtime pollen release is heavily shaped by winter and spring temperatures. Plants must be exposed to sufficient warmth to emerge from dormancy, open their flowers, and release pollen. Our changing climate has caused shifts in precipitation patterns, more frost-free days, warmer seasonal air temperatures, and more carbon dioxide (CO_2) in the atmosphere. These changes may lead to both **higher pollen concentrations and earlier and longer pollen seasons**. Overall, data from the USA National Phenology Network indicate that on average, the start of spring has occurred earlier in the contiguous U.S. since 1984. Some of these changes in pollen due to climate change could have impacts on human health such as **increasing individuals' exposure to pollen and their risk of having allergy and/or asthma symptoms**.

Pollen Affects Health in Many Ways

Pollen is an airborne allergen that can affect our health. Pollen exposure can trigger various allergic reactions, including:

- sneezing, runny nose, and congestion
- red, watery, or itchy eyes
- asthma or other respiratory illness exacerbation

These symptoms have been linked to negative impacts on sleep, daily activities, productivity, concentration, and quality of life. Allergic asthma and seasonal allergies affect approximately 40% of the U.S. population.

Resources to Reduce Health Risks Associated with Pollen

- CDC provides guidance on protecting those with allergies from pollen.
- The FDA provides information on allergy medications and shots for children and how to avoid pollen as well as allergy medications for all ages.
- The NIH National Center for Complementary and Integrative Health has helpful tips on additional approaches you can take to manage your allergy symptoms alongside medications and other therapies.

Spring Flooding

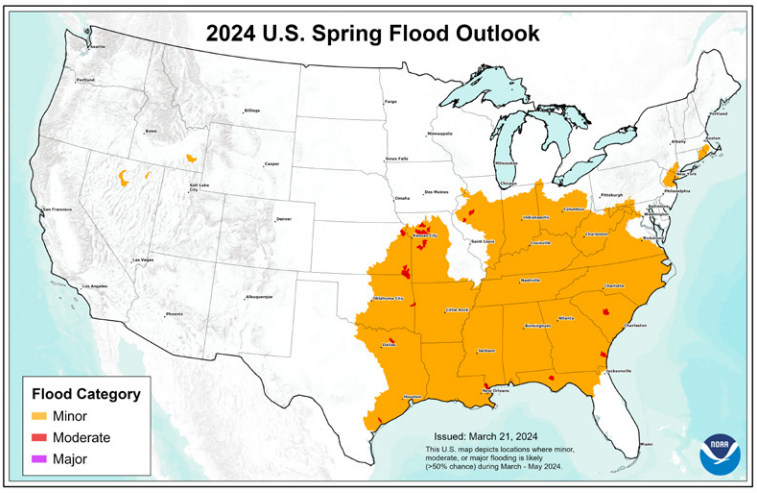


Figure: This map was developed by the National Weather Service – Office of Water Prediction and is reflective of forecast conditions on March 21,2024. The map focuses on spring flood potential, using evaluation methods analyzed on the timescale of weeks to months, not days or hours. Heavy rainfall at any time can lead to flooding, even in areas where overall risk is considered low. For detailed hydrologic conditions and forecasts, go to National Water Center Products and Services.

This spring season, approximately **133 million people** are at risk for flooding in their communities, with roughly 400,000 at risk for moderate flooding. No major flooding is expected this spring. The overall threat of significant flooding this spring is low due to above-normal temperatures and historically low snowpack. Moderate flooding is expected over tributaries to the Lower Missouri River in Kansas and Missouri, as well as tributaries to the Lower Arkansas River in Kansas and Oklahoma. Minor to moderate flooding will be possible over much of the southern U.S. due to typical spring rainfall. Above-normal snowpack in northern Nevada and southern Idaho will lead to the potential for minor flooding for higher elevation basins in those areas. In Alaska, spring ice breakup and snowmelt flood potential is forecast to be normal for the majority of the state, with the exception of portions of the Copper River Basin due to above normal snowpack.

Floods Affect Health in Many Ways

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

Floodwaters pose **drowning risks** for everyone, including those driving in floodwaters.

Objects in floodwaters can cause injuries such as **broken bones**, **cuts**, and **electrocution**.

Exposure to floodwater contaminated with chemicals, sewage, animal waste, and various pathogens can cause **burns**, **rashes**, **skin and eye infections**, and **gastrointestinal and respiratory illnesses**.

Who Is at High Risk from Spring Flooding in the Counties with Elevated Potential for Moderate Flooding?

As indicated in the map to the left, **51** counties across **11** states are projected to have above-normal moderate flooding risk this spring. Of these counties:

7 (14%) have a high number* of people aged 65 or over, living alone.

15 (29%) have a high number of people without health insurance.

10 (20%) have a high number of uninsured children.

10 (20%) have a high number of adults with coronary heart disease.

5 (10%) have a high number of people living in rural areas.

13 (25%) have a high number of Black or African American people.

13 (25%) have a high number of people living in poverty.

12 (24%) have a high number of people with electricity-dependent medical equipment and enrolled in the HHS emPOWER program.

16 (31%) have a high number of people with disabilities.

6 (12%) have a high number of people in mobile homes.

13 (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.

Resources to Stay Safe During & After Floods

- The CDC's Floods site provides resources to help individuals prepare for floods, protect themselves from floodwaters, and safely return home after a flood. The CDC also has information about What You Need to Know When the Power Goes Out Unexpectedly.
- The Ready.gov Floods site includes information on preparing for a flood and staying safe during and after a flood.
- If you do not have health insurance and are in a federally identified disaster, ASPR's Emergency Prescription Assistance Program can help you get the prescription drugs, vaccinations, medical supplies, and equipment you need.

Wildfire

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.

Fire activity slowly increased across western geographic areas in the US in April, while fire activity in the eastern and southern US decreased. In May, above normal significant fire potential is forecast for central Florida and parts of Arizona and New Mexico. A slow beginning to the peak fire season is forecast for California, with below normal potential forecast for portions of southern California. Above normal potential is forecast for the lee sides of Hawai'i, especially for Maui and the Big Island.

Who Is at High Risk in the Counties with Above Normal Wildland Fire Potential in May?

Some communities face greater health risks from wildfire smoke given various risk factors they face. These communities include people who: are elderly and live alone, have asthma or coronary heart disease, have poor access to health care, have disabilities, work outdoors, have low income, rely on electricity-dependent medical equipment, and live in poor quality housing.

Resources to Reduce Health Risks Associated with Wildfire

- The Ready.gov Wildfires site, CDC Wildfires site, and 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.
- Download the FEMA App to receive real-time weather and emergency alerts from the National Weather Service. The App can also help you find a nearby shelter if you need to evacuate to a safe space.
- The EPA and CDC continuing education program Wildfire Smoke and Your Patients' Health teaches the health effects of wildfire smoke and highlights actions to reduce exposure.
- If you have children, these resources may help: CDC's Ready Wrigley Prepares for Wildfires & Smoke, Helping Children Cope with Emergencies, and Helping Teens Cope After a Natural Disaster.

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.

Climate and Health Outlook

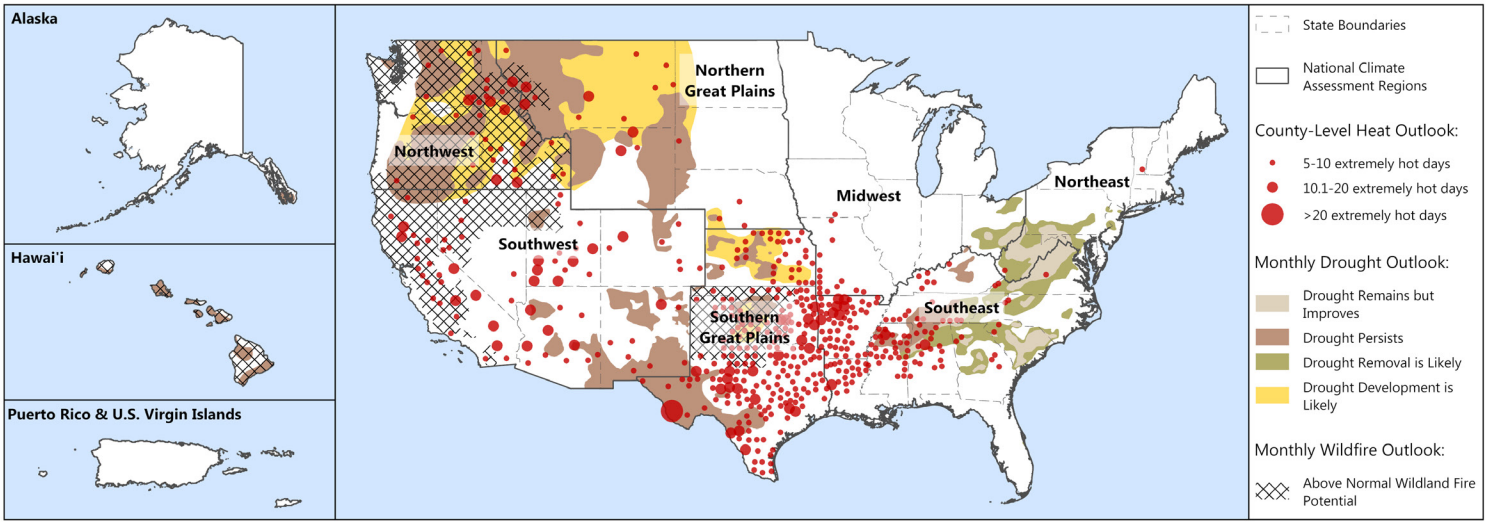
Your monthly climate forecast for health | **August 2024**

OASH | Office of Climate Change and Health Equity

Highlights for this edition:

- Forecasts for heat, drought, and wildfire along with discussion of populations at elevated risk for health impacts
- Guidance on protecting health from these climate hazards plus tornadoes, flooding, hurricanes, and *vibrio*
- A look at how the rate of heat-related illness is higher this year than last, how to protect farmworkers from increasing pesticide exposure, and new heat & health resources

August Regional Climate Hazard Forecasts:



Northwest: 18 counties in ID, eight counties in WA, and six counties in OR are expected to have five or more extremely hot days* in August. Drought persistence and development and above normal significant wildfire potential** are forecast across most of ID, WA, and OR.

Southwest: 25 counties in CA, 14 counties in UT, 11 counties in AZ, eight counties in NV, eight counties in NM, and seven counties in CO are expected to have five or more extremely hot days in August. Drought persistence is forecast to persist in existing drought regions of CA, NV, AZ, UT, CO, and NM. Above normal significant wildfire potential is forecast for much of northern and central CA and parts of southern CA, northern NV, and northwestern UT.

Northern Great Plains: 12 counties in MT, three counties in WY, three counties in NE, and one county in SD are expected to have five or more extremely hot days in August. Drought persistence is forecast for the ongoing drought areas in MT, NE, ND, SD, and WY with development most likely for areas of rapidly drying topsoil including across MT, southwestern NE, and western ND and SD. Above normal wildfire potential is forecast for parts of western MT.

Southern Great Plains: 143 counties in TX, 50 counties in OK, and 32 counties in KS are expected to have five or more extremely hot days in August. Drought persistence is forecast for the existing drought areas with development most likely for northwestern TX, southwestern to central OK, and parts of KS. Above normal wildfire potential is forecast for parts of northern TX and all of western OK.

Southeast: 48 counties in AR, 30 counties in MS, 21 counties in LA, 18 counties in AL, 12 counties in TN, six counties in KY, five counties in GA, three counties in VA, two counties in SC, and two counties in NC are expected to have five or more extremely hot days in August. Drought removal and improvement is forecast for VA, NC, SC, and GA with different areas of drought removal, improvement, or persistence forecast in TN, AL, and MS, and persistence predicted for the existing drought area in KY. The Southeast is forecast to have normal wildfire potential. The Atlantic basin is highly likely to have an above-normal hurricane season.

Hawai'i and Pacific Islands: All of the Hawai'ian islands are expected to experience equal chances of below, near, and above-normal temperatures in August. Drought persistence is forecast for ongoing drought areas of HI. Above normal wildfire potential is forecast for all of HI. The central Pacific is most likely to experience a below-normal hurricane season.

Heat Drought Wildfire Hurricane

Check out additional forecasts on our webpage.

*An "extremely hot day" is defined by having an expected temperature above the 95th percentile value of the historical temperature distribution for the month and county. For more information, check out the Centers for Disease Control and Prevention's (CDC's) National Environmental Public Health Tracking Network documentation.

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

Heat forecasts are derived from CDC's Heat & Health Tracker, wildfire forecasts from the National Interagency Coordination Center's National Outlook, drought forecasts from the National Oceanic and Atmospheric Administration's (NOAA's) Official Drought Outlook, and hurricane forecasts from NOAA's 2024 Hurricane Season Outlook.

Spotlight on Counties with Compounding Hazards Forecast for August 2024

The Secretary of Health and Human Services (HHS) declared a Public Health Emergency for Texas in July after Hurricane Beryl left more than one million residents without electricity and air conditioning amid extreme heat. In August, Montgomery County, a particularly hard-hit county north of Houston with a relatively high national risk index for hurricanes, is forecast to experience around 8 days of extreme heat (i.e., days where the maximum daily temperature is expected to exceed a dangerous level for health).

Much of OR, WA, ID, along with northern CA and western MT have extreme heat, above normal wildfire potential, and drought forecast for August. Mineral County, MT is forecast to experience all three climate hazards including nearly 16 days of extreme heat.

Find your county's forecast hazards along with its population's risk factors on our portal.

Additional Climate Hazards Without Specific Forecasts for August 2024

Tornadoes

Tornadoes can happen anywhere in the U.S., but the highest tornado threat shifts from the Southeast in the cooler months of the year, toward the southern and central Plains in May and June, and the northern Plains and Midwest during early summer. Tornadoes can also occur at any time of day or night, but most tornadoes occur between 4–9 p.m. About 1,200 tornadoes hit the U.S. yearly, and storms are generally increasing in frequency and intensity with climate change.

During a tornado, people risk being struck by flying objects. After a tornado, the damage left behind poses additional **injury risks**.

Due to their unpredictable nature, it is common to experience **emotional distress**, especially for tornado survivors, and first responders and recovery workers.

Stay informed by paying attention to emergency alerts plus real-time alerts from the Federal Emergency Management Agency (FEMA) App. Learn how to take protective actions and recover after events with guidance from CDC, Ready.gov, and FEMA. Learn more about warning signs for emotional distress and call or text 1-800-985-5990 if you need support for distress related to any disaster. This Substance Abuse and Mental Health Services Administration (SAMHSA) Helpline and Text Service is available 24/7, free, and staffed by trained crisis counselors.

Hurricanes, Severe Inland Storms, and Flooding

Climate change is leading to more intense hurricane seasons and more frequent and severe inland storms.

- NOAA has forecast that the Atlantic hurricane region, which typically includes the southern and eastern coastal U.S., will have an above-normal hurricane season in 2024. The Central Pacific hurricane region, which typically includes Hawai'i and other Pacific islands, is predicted to have a below-normal season in 2024.
- In recent years, a higher percentage of precipitation in the U.S. has come in the form of intense single-day events.

As a result of these interrelated climate hazards, coupled with drier soils, sinking land, the loss of natural barriers, and sea level rise, more U.S. communities (both coastal and inland) are experiencing flooding. These events disproportionately affect racial minorities and low-income households.

Flooding poses **drowning risks**. Floods are the second leading cause of weather-related deaths in the U.S. (after heat).

Homes damaged by floodwaters may experience the growth of mold and other microbes that can harm respiratory health and worsen **allergies** and **asthma**.

Contaminated floodwaters pose risks of **injuries**, **infections**, and more.

Loss of power during severe storms can lead to many health harms. For example, using home generators improperly can cause carbon monoxide exposure, which can lead to **loss of consciousness** and **death**.

Minimize your risk by learning more about how to stay safe during and after a flood, how to clean mold safely, and how to protect yourself from floodwaters. Learn how to stay safe from lightning and how to prepare for a hurricane with resources from CDC and FEMA. Check out specific recommendations for people with access and functional needs, with disabilities, with diabetes, and people experiencing homelessness. After a hurricane has passed, use CDC resources to safely return home and protect yourself from power outages (and use a generator properly).

Pesticides & *Vibrio* →

Pesticide Exposure: Another Growing Hazard for Farmworkers in a Changing Climate

Climate change is altering many pest populations in the U.S., including via northern expansion of blacklegged tick populations, accelerated geographic spread and population growth of the spotted lanternfly, and increased duration of active periods of the codling moth, peach twig borer, and oriental fruit moth in California. This spread of agricultural pests, along with increased susceptibility of plants to invasive pests due to elevated CO_2 and reductions in pesticide efficacy predicted with climate change, is **increasing the use of pesticides**—chemicals that are commonly used to manage pest populations.

Farmworkers, due to approximately 75% of pesticide use in the U.S. occurring in agricultural settings, and on the front lines of this increasing hazard. An estimated 10,000 to 20,000 pesticide poisonings among farmworkers are diagnosed in the U.S. annually. Workers applying pesticides face the highest exposure with their greatest exposure occurring during the mixing and loading processes (i.e., when the pesticides are in a concentrated state and there is a higher chance of spilling). Farmworkers working in sprayed fields are also at risk of high pesticide exposure and are less likely to use personal protective equipment (PPE) to protect themselves compared to those directly involved in the application process.

Acute health effects vary by pesticide type but can range from headache and dizziness to tremor and seizure. Acute occupational illnesses are tracked by the CDC-NIOSH Sentinel Event Notification System for Occupational Risk (SENSOR), a state-based surveillance program. In 2007–2011, 2,606 cases of acute occupational pesticide-related illness and injury were reported across 12 states. Of these cases, the **rate of illness and injury among agricultural workers was 37 times greater** than the rate for nonagricultural workers.

Source: USDA NIFA

What Can We Do?

The hierarchy of controls provides a method of prioritizing safeguards to protect workers from hazards. Primary exposure control methods are hazard elimination or substitution by a less toxic substance. For pesticides, this could entail substituting insecticides most commonly identified in cases of injury and illness and utilizing **integrated pest management practices** on farms to reduce the need for chemical pesticides. Methods with lower effectiveness include providing and encouraging the **use of PPE**. PPE can be effective, but only when workers use it correctly and consistently, including when using during hot weather (a time when there may be concern about the heat burden of the PPE wearer).

Currently, there is an **Agricultural Worker Protection Standard** (WPS), which requires that employers of pesticide handlers and agricultural workers receive annual pesticide safety trainings. The Pesticide Education Resource Collaborative provides a library of Environmental Protection Agency (EPA)-certified educational resources to help the agricultural industry comply with the WPS. EPA is working on other ways to protect workers from pesticide risk.

Healthcare providers can help by learning to identify symptoms and treat patients with pesticide exposure from EPA's Recognition and Management of Pesticide Poisonings manual. Unfortunately, pesticide poisoning symptoms can often be confused with symptoms of heat exhaustion, so also check out EPA's comparison chart.

Check out our stories in the May 2024 and June 2024 editions of the Climate and Health Outlook on other climate hazards that farmworkers are disproportionately exposed to.

Increasing Vibrio Threat With Warming Waters: Be Careful With Open Wounds

Source: USDA ERS

Vibrio vulnificus (*V. vulnificus*) are bacteria that live in coastal waters. They can get into an open wound of any size through salt water or brackish water (i.e., a mixture of fresh and salt water often found where rivers meet the ocean), or through drippings from raw seafood. *Vibrio vulnificus* wound infections are rare but serious. Treating these infections can require intensive care or limb amputations. About 1 in 5 people die from the infection.

V. vulnificus bacteria thrive in warmer waters—especially during the summer months (May to October)—and in moderately salty environments like estuaries. Increasing water temperatures and extreme weather events (such as heat waves, flooding, and severe storms) associated with climate change create more favorable conditions for *V. vulnificus*. **People at increased risk for V. vulnificus infection should take steps to prevent an infection when enjoying coastal activities**. CDC's *Vibrio* website provides additional information about Vibrio bacteria and the infections they cause.

Heat and Health Index

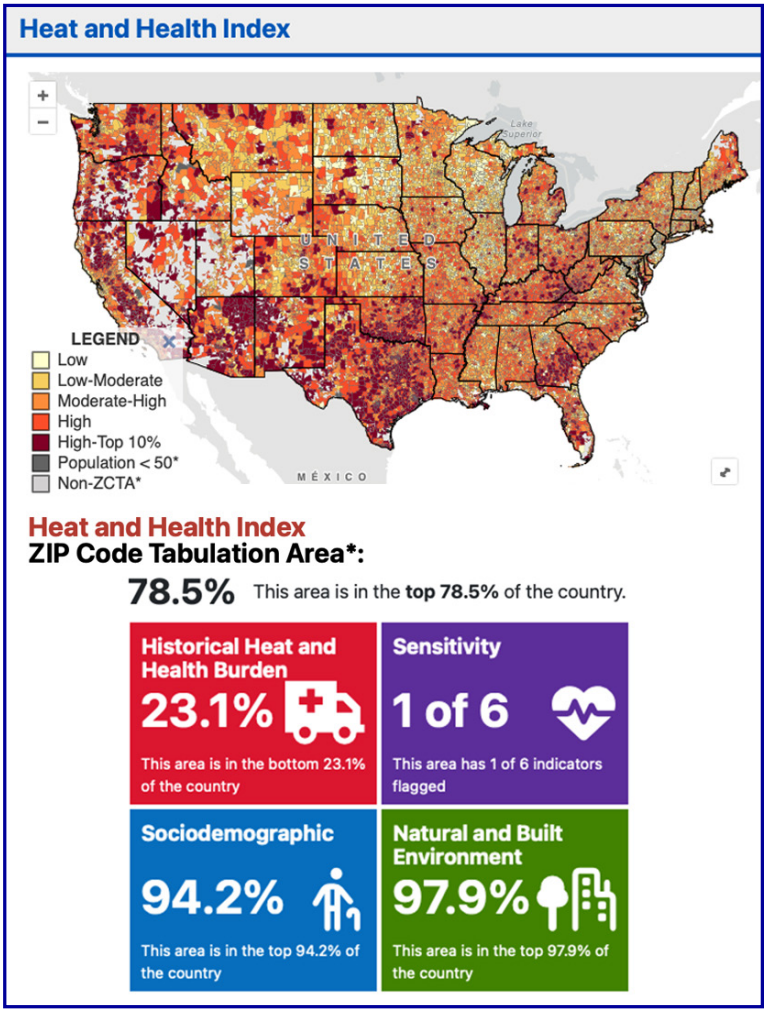
OCCHE and CDC have launched the Heat and Health Index (HHI), the first national tool to provide ZIP code-level heat-related illness and community characteristics data to measure vulnerability to heat. The HHI delivers a percentile ranking for each ZIP code so that public health officials, city planners, policymakers, and community members can identify areas that may be at increased risk of negative health outcomes from heat. It also details local factors that may be driving this risk, which can help inform interventions to protect public health and build a more heat-resilient future.

The HHI is comprised of four modules, made up of a total of 25 indicators. These modules are related to: vulnerability to heat (which provides information on historical temperatures and heat-related illness in a community); pre-existing health conditions that may increase sensitivity to negative health outcomes from heat; plus sociodemographic as well as natural and built environment characteristics that increase exposure or sensitivity to heat (or lessen one's ability to cope with heat).

The HHI can be used to:

- Educate and inform the public about heat risk in their community;
- Identify and prioritize areas that may require special attention or additional action during the heat season to reduce heat-related illness; and
- Analyze the unique, local factors driving heat-related illness to help inform interventions to reduce heat risk over time.

Check out the Heat and Health Index to learn more about how different factors influence the way heat affects your community to learn more about how different factors influence the way heat affects your community.



Source: CDC

Extreme Heat

Heat Affects Health in Many Ways

Warmer temperatures increase the risk for a diverse range of health risks. For example:

- An increased risk of **heart disease hospitalization**.
- **Heat exhaustion,** which can lead to **heat stroke** that, if not treated, can cause critical illness, brain injury, and even death.
- Worsening **asthma** and **chronic obstructive pulmonary disease (COPD)** as heat increases the production of ground-level ozone.
- Dehydration, which can lead to **kidney injury** and blood pressure problems.
- Risk of **violence**, **crime**, and **suicide**, adding to the mental health burden of depression and anxiety already associated with climate change.

People at Elevated Health Risk From Extreme Heat Exposure

According to HEAT.gov and CDC include those who:

- Have increased exposure (e.g., are experiencing homelessness; are emergency responders; are athletes; and/or work outdoors, or indoors with insufficient cooling);
- Have increased biologic sensitivity (e.g., are under age 5; are age 65 or over; are pregnant; and/or have chronic health conditions such as a mental illness, diabetes, or cardiovascular condition); and/or
- Face high socioeconomic burden and/or barriers to accessing cooling or healthcare (e.g., live in a low-income community, and/or have one or more disabilities).

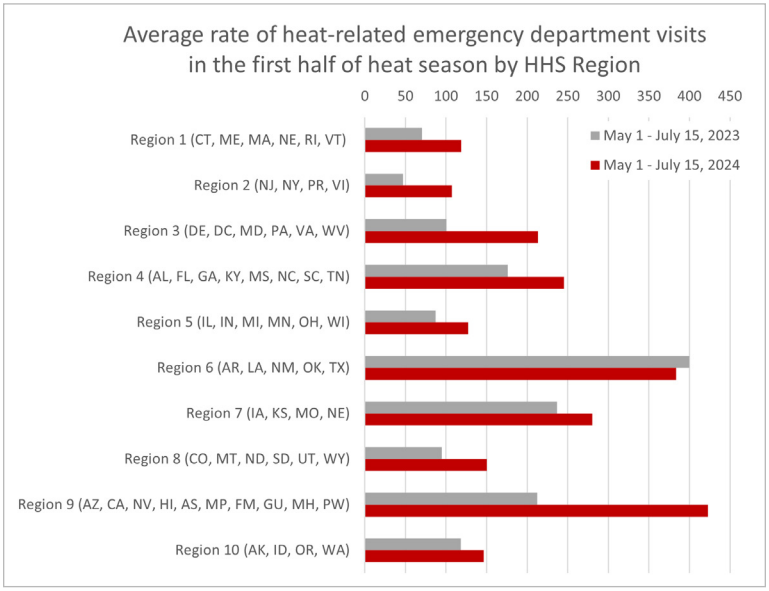
Check out your heat forecast for August along with top risk factors of concern in your county with our portal and learn how to protect people at elevated risk.

Resources to Reduce Health Risks Associated With Extreme Heat

- Check out HEAT.gov, the premier source of heat and health information for the nation to reduce the health, economic, and infrastructural impacts of extreme heat.
- Visit the CDC-National Weather Service HeatRisk Forecast Tool for a nationwide seven-day heat forecast that identifies when temperatures may reach potentially harmful levels.
- Learn the steps needed to reduce the risk of heat stress for workers from National Institute of Environmental Health Sciences' new Building Blocks for a Heat Stress Prevention Training Program.
- Discover recent actions taken to protect workers and communities from extreme weather.

For more, please review our 2-pager with curated HHS Resources on Heat and Health in 2024.

2024 Heat-related Emergency Department Visit Rates Are Higher Than Last Year



The graphic to the left compares the average rate of heat-related illnesses (HRI) per 100,000 emergency department (ED) visits from May 1 to July 15 in 2024 (red), with the average rate observed in 2023 (grey) for the same timeframe. The average HRI ED rates in 2024 are higher in 9 out of 10 HHS regions when compared to 2023. Notably, HHS region 9 (which includes most of the Southwest and Hawai'i) is at nearly twice its already high 2023 rate, and the rates for HHS regions 2 and 3 (which include the mid-Atlantic region and Caribbean) are more than twice what they were this time last year.

Figure. The CDC National Syndromic Surveillance Program (NSSP) provides daily rates of heat-related illness by HHS Regions. NSSP is a network comprising CDC representatives, state and local health departments, and academic and private sector health partners jointly collecting and sharing electronic patient encounter data. NSSP includes emergency department visit data from approximately 80% of U.S. emergency departments covering 50 states, DC, and Guam.

Drought

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 respiratory system.

If there isn't enough water to flow, waterways may become stagnant breeding grounds for **disease vectors** such as mosquitoes.

Drought's complex economic consequences can increase **mood disorders, domestic violence,** and **suicide**.

People at Elevated Health Risk From Drought Exposure

According to NOAA & CDC, include those who:

- Have increased exposure to dust (e.g., are experiencing homelessness, work outdoors, or live/work in agricultural communities);
- Rely on water from private wells or small or poorly maintained municipal systems, the quality of which is more susceptible to environmental changes; and/or
- Have increased biologic sensitivity (e.g. are under age 5, are age 65 or over, are pregnant, have chronic health conditions, and/or have special needs in the event of a public health emergency).

Check out your drought forecast for August, along with top risk factors of concern in your county with our Climate and Health Outlook Portal and learn more about health impacts and how to prevent them.

Resources to Reduce Health Risks Associated With Drought

- Learn about the health implications of drought and how to prepare from the CDC Drought and Health site and Ready.gov Drought site.
- Call or text 1-800-985-5990 to get help and support for any distress that you or someone you care about may be feeling related to any disaster. This SAMHSA Helpline and Text Service is available 24/7, free, and staffed by trained crisis counselors.

Wildfire

People at Elevated Health Risk From Wildfire Smoke Exposure

According to EPA include those who:

- Have increased biologic sensitivity (e.g., are under age 5, are age 65 or over, are pregnant, and/or have chronic health conditions such as asthma or another lung disease or a cardiovascular disease); and/or
- Face economic, social, environmental, and/or other burdens that may limit their ability to reduce exposure (e.g., identify as a racial or ethnic minority, have low-income, have one or more disabilities, and/or work outdoors).

Check out your wildfire forecast for August, along with top risk factors of concern in your county with our Climate and Health Outlook Portal and learn how to protect people at elevated risk.

Resources to Reduce Health Risks Associated With Wildfire

- Learn about how to prepare for wildfires, stay safe during a fire, and return home after a fire with resources form FEMA's Ready.gov, CDC, and EPA.
- Download the FEMA App to receive real-time weather and emergency alerts from the National Weather Service and help you find a nearby shelter in case of evacuation.
- Check out EPA & CDC's Wildfire Smoke and Your Patients' Health course for actions to help patients reduce exposure.
- Discover specific recommendations for older adults, people experiencing homelessness, people with access and functional needs, and people with disabilities.

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.

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**.

Smoke from wildfires can travel downwind and affect air quality hundreds of miles away from the fire.

Climate and Health Outlook

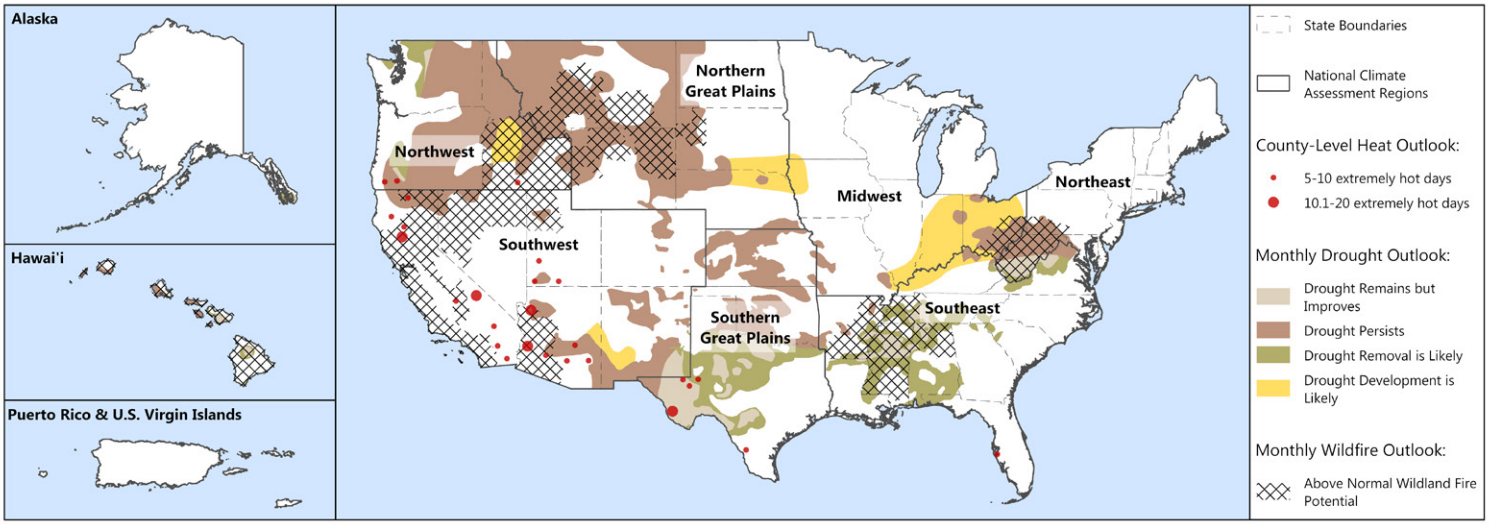
Your monthly climate forecast for health | **September 2024**

OASH | Office of Climate Change and Health Equity

Highlights for this edition:

- Find your area's forecasted climate hazards for September including extreme heat, drought, wildfire, and hurricanes.
- Learn about health impacts and vulnerable populations for these climate hazards plus severe inland storms and flooding.
- Discover resources to help protect your health, including special features on *Vibrio* and mosquito-borne diseases.

September Regional Climate Hazard Forecasts:



Northwest: Two counties in OR and one county in ID are expected to have five or more extremely hot days* in September. Drought persistence is forecast for much of WA, OR, and ID with drought improvement and removal forecast for the western fringes of the drought areas. Above normal significant wildfire** potential is forecast across southern ID.

Southwest: Nine counties in CA, six counties in AZ, and three counties in UT are expected to have five or more extremely hot days in September. Drought persistence is forecast for existing drought areas in northernmost CA into northwestern NV and in scattered areas of AZ, CO, NM, and UT with additional development forecast in a portion of AZ into NM. Above normal significant wildfire potential is forecast for western AZ, much of CA, northern NV, and northwestern UT.

Southeast: One county in FL is expected to have five or more extremely hot days in September. Drought persistence is forecast for portions of existing drought areas in AR and northern VA, with drought improvement forecast across most of the rest of the Southeast. Above normal significant wildfire potential is forecast for most of AR and MS, western TN, and northern MS; below normal significant wildfire potential is forecast for southwestern LA. The Atlantic basin is highly likely to have an above-normal hurricane season.

Hawai'i: Drought persistence is forecast across central and western HI, while drought removal and improvement are forecast across eastern HI. Above normal significant wildfire potential is forecast for the lee sides of HI. The central Pacific is most likely to experience a below-normal hurricane season.

Northeast: Drought persistence is forecast across the northern half of WV into western MD and southwestern PA; drought improvement and removal is forecast for the southern half of WV. Above normal significant wildfire potential is forecast for most of WV into western MD and southwestern PA.

Southern Great Plains: Five counties in TX are expected to have five or more extremely hot days in September. Drought persistence is forecast for existing drought areas in KS plus most in OK, and portions of northern and far western TX; improvement and removal are forecast across a small southern portion of OK plus most of TX. Below normal significant wildfire potential is forecast for southeastern TX.

Midwest: Drought persistence is forecast for existing drought areas in OH, IN, and MO, with additional drought development forecast across most of OH and IN into southern IL and southeastern MO plus northwestern IA into the southwestern tip of MN. Above normal significant wildfire potential is forecast for southeastern OH.

Heat Drought Wildfire Hurricane

Check out additional forecasts on our webpage.

*An "extremely hot day" is defined by having an expected temperature above the 95th percentile value of the historical temperature distribution for the month and county. For more information, check out the Centers for Disease Control and Prevention's (CDC's) National Environmental Public Health Tracking Network documentation.

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

Heat forecasts are derived from CDC's Heat & Health Tracker, wildfire forecasts from the National Interagency Coordination Center's National Outlook, drought forecasts from the National Oceanic and Atmospheric Administration's (NOAA's) Official Drought Outlook, and hurricane forecasts from NOAA's 2024 Hurricane Season Outlook.

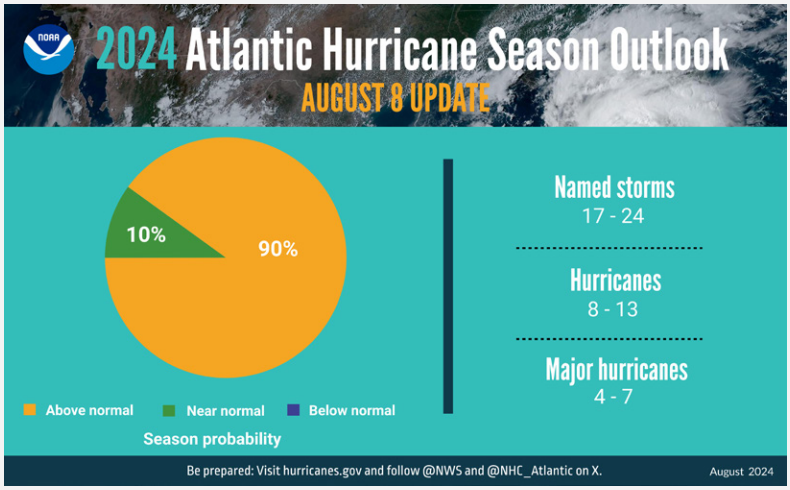
Discover your county's forecasted climate hazards this month:

1. Navigate to the All Hazards map from the Climate & Health Outlook Portal and click "Okay".
2. Zoom in on your county, either directly or by clicking the search icon on the top left, typing in your location, and hitting "Enter".
3. Click on your county on the map and a box will pop up with climate hazards for the current month and relevant risk factors.

Hurricanes, Severe Inland Storms, and Flooding

NOAA has updated its 2024 Atlantic hurricane season outlook, predicting a continuation of the above-normal season due to near-record sea surface temperatures and potential development of La Niña. The season has already seen early and severe activity, including Hurricane Beryl, which was the earliest category-5 Atlantic hurricane on record and has a preliminary death toll of about 25 people in Texas, Louisiana, and Vermont. Peak hurricane activity is expected during September.

NOAA also forecast a below-normal season for the Central Pacific hurricane region, which typically includes Hawai'i and other Pacific islands, in 2024. As a result of hurricanes, along with a higher percentage of precipitation in the U.S. falling in the form of intense single-day events, drier soils, sinking land, the loss of natural barriers, and sea level rise, more U.S. communities (both coastal and inland) are experiencing flooding. These events disproportionately affect racial minorities and low-income households.



Source: NOAA

Flooding poses **drowning risks**. Floods are the second leading cause of weather-related deaths in the U.S. (after heat).

Homes damaged by floodwaters may experience the growth of mold and other microbes that can harm respiratory health and worsen **allergies** and **asthma**.

It is common to experience **emotional distress** in response to hurricanes, especially for people who have struggled with recovery from past storms, children and teens, older adults, and first responders and recovery workers.

Contaminated floodwaters pose risks of **injuries**, **infections**, and more.

Loss of power during severe storms can lead to many health harms. For example, using home generators improperly can cause carbon monoxide exposure, which can lead to **loss of consciousness** and **death**.

Extreme rain, along with compounding risks such as rising sea levels and more frequent wildfires, is also making landslides more likely. Rapidly moving water and debris can lead to **injuries** and **disrupt access to health care**.

- Explore your area's flood maps and risk assessments from FEMA. Minimize your risk from flooding by learning more about how to stay safe during and after a flood, how to clean mold safely, and how to protect yourself from floodwaters.
- Discover how to stay safe from lightning and how to prepare for a hurricane with resources from ASPR TRACIE, CDC, and FEMA.
- Check out specific recommendations for people with access and functional needs, with disabilities, with diabetes, and people experiencing homelessness.
- After a hurricane has passed, use CDC resources to safely return home and protect yourself from power outages (and use a generator properly).
- Learn more about warning signs for emotional distress and call or text 1-800-985-5990 if you need support for distress related to any disaster. This SAMHSA Helpline and Text Service is available 24/7, free, and staffed by trained crisis counselors.

Extreme Heat

Heat Affects Health in Many Ways

Warmer temperatures increase the risk for a diverse range of health risks. For example:

- An increased risk of **heart disease hospitalization**.
- **Heat exhaustion,** which can lead to **heat stroke** that, if not treated, can cause critical illness, brain injury, and even death.
- Worsening **asthma** and **chronic obstructive pulmonary disease (COPD)** as heat increases the production of ground-level ozone.
- Dehydration, which can lead to **kidney injury** and blood pressure problems.
- Risk of **violence**, **crime**, and **suicide**, adding to the mental health burden of depression and anxiety already associated with climate change.

People at Elevated Health Risk From Extreme Heat Exposure

According to HEAT.gov and CDC include those who:

- Have increased exposure (e.g., are experiencing homelessness; are emergency responders; are athletes; and/or work outdoors, or indoors with insufficient cooling);
- Have increased biologic sensitivity (e.g., are under age 5; are age 65 or over; are pregnant; and/or have chronic health conditions such as a mental illness, diabetes, or cardiovascular condition); and/or
- Face high socioeconomic burden and/or barriers to accessing cooling or healthcare (e.g., live in a low-income community, and/or have one or more disabilities).

Check out your heat forecast for September along with top risk factors of concern in your county with our Climate and Health Outlook Portal and learn how to protect people at elevated risk.

Resources to Reduce Health Risks Associated With Extreme Heat

- Read the National Heat Strategy for 2024–2030, which aims to promote proactive coordination related to heat planning, response, and resilience.
- Visit HEAT.gov, the premier source of heat and health information for the nation.
- Explore the Heat and Health Index, the first national tool to provide ZIP code-level heat-related illness and community characteristics data to measure vulnerability to heat.
- Check out the nation's first health-based heat forecast, the CDC-NWS HeatRisk Forecast Tool, for a forecast of when temperatures are expected to reach potentially harmful levels for health in the next seven days.
- Discover recent actions taken to protect workers and communities from extreme weather.

For more, please review our 2-pager with curated HHS Resources on Heat and Health in 2024.

Everyone Can Help Prevent Hot Car Deaths

Pediatric vehicular heatstroke is one of the leading causes of non-crash, vehicle-related deaths for children 14 and younger. Since 1998, vehicular heatstroke has killed nearly 1,000 children. These deaths are preventable. Cars heat up fast, and when a child is left in a vehicle, their body temperature can rise to dangerous levels quickly.

Source: NHTSA

These tips to prevent pediatric vehicular heatstroke could save a child's life:

- NEVER leave a child alone in a vehicle, not even for a minute.
- Make it a habit to look in the back seat EVERY time you exit the car.
- Ask your childcare provider to call if your child doesn't show up for care as expected.
- Place a personal item like a purse or briefcase in the back seat, as a reminder to look before you lock.
- ALWAYS lock the car and put the keys out of reach.
- If you see a child alone in a locked car, act immediately and call 911.

For communication resources to prevent hot car deaths, visit the National Highway Traffic Safety Administration's (NHTSA) Vehicular Heatstroke Prevention page.

Drought

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 respiratory system.

If there isn't enough water to flow, waterways may become stagnant breeding grounds for **disease vectors** such as mosquitoes.

Drought's complex economic consequences can increase **mood disorders, domestic violence,** and **suicide**.

People at Elevated Health Risk From Drought Exposure

According to NOAA & CDC, include those who:

- Have increased exposure to dust (e.g., are experiencing homelessness, work outdoors, or live/work in agricultural communities);
- Rely on water from private wells or small or poorly maintained municipal systems, the quality of which is more susceptible to environmental changes; and/or
- Have increased biologic sensitivity (e.g. are under age 5, are age 65 or over, are pregnant, have chronic health conditions, and/or have special needs in the event of a public health emergency).

Check out your drought forecast for September, along with top risk factors of concern in your county with our Climate and Health Outlook Portal and learn more about health impacts and how to prevent them.

Resources to Reduce Health Risks Associated With Drought

- Learn about the health implications of drought and how to prepare from the CDC Drought and Health site and Ready.gov Drought site.
- Call or text 1-800-985-5990 to get help and support for any distress that you or someone you care about may be feeling related to any disaster. This SAMHSA Helpline and Text Service is available 24/7, free, and staffed by trained crisis counselors.

Wildfire

People at Elevated Health Risk From Wildfire Smoke Exposure

According to EPA include those who:

- Have increased biologic sensitivity (e.g., are under age 5, are age 65 or over, are pregnant, and/or have chronic health conditions such as asthma or another lung disease or a cardiovascular disease); and/or
- Face economic, social, environmental, and/or other burdens that may limit their ability to reduce exposure (e.g., identify as a racial or ethnic minority, have low-income, have one or more disabilities, and/or work outdoors).

Check out your wildfire forecast for September, along with top risk factors of concern in your county with our Climate and Health Outlook Portal and learn how to protect people at elevated risk.

Resources to Reduce Health Risks Associated With Wildfire

- Learn about how to prepare for wildfires, stay safe during a fire, and return home after a fire with resources form FEMA's Ready.gov, CDC, and EPA.
- Download the FEMA App to receive real-time weather and emergency alerts from the National Weather Service and help you find a nearby shelter in case of evacuation.
- Check out EPA & CDC's Wildfire Smoke and Your Patients' Health course for actions to help patients reduce exposure.
- Discover specific recommendations for older adults, people experiencing homelessness, people with access and functional needs, and people with disabilities.

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.

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**.

Smoke from wildfires can travel downwind and affect air quality hundreds of miles away from the fire.

Vibrio

Vibrio are bacteria that naturally live in coastal waters. About a dozen *Vibrio* species can cause a human illness called vibriosis. Most people get vibriosis by eating raw or undercooked shellfish, particularly oysters. Some people get vibriosis after an open wound comes in contact with coastal waters or drippings from raw seafood.

Common symptoms of vibriosis include watery diarrhea, stomach cramps, nausea, vomiting, fever, and chills. One *Vibrio* species, *Vibrio vulnificus*, can cause severe and life-threatening wound infections. Many people with *V. vulnificus* infection need intensive care or limb amputation, and about 1 in 5 people with this infection die.

Around 1,400 culture-confirmed *Vibrio* illnesses are reported to CDC each year. Among these, 150–200 are *V. vulnificus* infections.

Climate Change and *Vibrio*

Vibrio thrive in warmer waters, especially during summer months (May to October) and in moderately salty environments, such as estuaries. Warmer water temperatures along with more frequent and intense extreme weather events associated with climate change create favorable conditions for *Vibrio* bacteria to multiply and spread, which increases the risk for infection.

Warming Coastal Waters

In the U.S., *V. vulnificus* infections have been most commonly reported by Gulf Coast states (Texas, Louisiana, Mississippi, Alabama, and Florida). However, the geographic range of *V. vulnificus* has been expanding northward along the Atlantic Seaboard by 48 kilometers per year, resulting in an eightfold increase in *V. vulnificus* infections in East Coast states from 1988 through 2018. These findings are likely explained in large part by climate conditions, such as water temperatures and salinity, becoming more favorable to *Vibrio* growth. During July and August 2023, the U.S. experienced above-average coastal sea surface temperatures and widespread heat waves. During the same period, several East Coast states reported severe and fatal *V. vulnificus* infections.

Extreme Weather Events

Extreme weather events also contribute to the spread of *Vibrio*. Coastal floods and hurricanes can force coastal waters into inland areas, putting people that are exposed to these waters at increased risk for *Vibrio* wound infections. This effect was observed in Florida after Hurricane Ian in 2022.

Predictive Models

NOAA and partners have developed predictive models for *Vibrio* that can provide early warning signs of potential coastal hazards. Several experimental models predict the presence of *V. parahaemolyticus* and *V. vulnificus* in the Chesapeake Bay based on data from the Chesapeake Bay Operational Forecast System. Although these models cannot determine individuals' risk for infection, they demonstrate the association between environmental conditions like water temperature, salinity, and chlorophyll and presence of *Vibrio*.

People at Risk

Anyone can get a *Vibrio* infection, but some medical conditions and treatments can increase a person's risk for infection and severe complications. These include:

- Having liver disease, cancer, diabetes, HIV, or thalassemia
- Receiving immune-suppressing treatments
- Taking medicine to decrease stomach acid levels
- Having had recent stomach surgery

Prevention

People who enjoy seafood and coastal activities —including swimming, fishing, or wading—can take steps to prevent a *Vibrio* infection.

Cook seafood before eating

- Do not eat raw or undercooked oysters or other seafood. Cook them before eating.
- Do not let raw seafood, its drippings, or its juices contaminate other foods.
- Always wash hands with soap and water after handling raw shellfish.
- If you are at increased risk for infection, wear protective gloves when handling raw seafood.

Protect wounds from coastal waters

- If you have an open wound, stay out of coastal waters, if possible. This includes wading at the beach.
- Cover your wound with a waterproof bandage if it could come in contact with coastal waters or drippings from raw seafood.
- Immediately wash wounds and cuts thoroughly with soap and clean running water after contact with coastal waters or drippings from raw seafood.
- If you are at increased risk for infection, wear clothes and shoes that protect you from cuts and scrapes when around coastal waters.

The Role of Healthcare Providers

Healthcare providers can prevent infections from becoming more severe by considering *V. vulnificus* as a possible cause of infected wounds that were exposed to coastal waters, particularly near the Gulf of Mexico or East Coast, and during periods with warmer coastal sea surface temperatures. Early antibiotic therapy and early surgical intervention improve survival. Clinical guidance is provided on CDC's *Vibrio* website.

Mosquito-Borne Diseases

Mosquito-borne diseases—when a person has been bitten by a mosquito and gets sick—increasingly threaten the health of people in the U.S. Mosquito-borne diseases include West Nile virus (West Nile), dengue, malaria, Cache Valley, chikungunya, eastern equine encephalitis, Jamestown Canyon, La Crosse encephalitis, Rift Valley fever, St. Louis encephalitis, and Zika. **Climate change is one of several factors that can influence when and where mosquito-borne diseases can occur**. Climate factors could potentially affect mosquito-borne disease transmission through various mechanisms including:

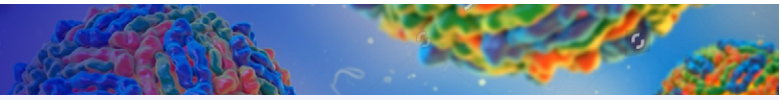
- Increased temperatures and altered humidity, which is leading to:
  - **expanding geographic range** of where mosquitoes live and transmit disease, including to higher latitudes and elevations;
  - **accelerating the rate that mosquitoes bite**;
  - **accelerating mosquito development and reproduction rates**, potentially leading to higher mosquito populations; and
  - **accelerating virus replication and parasite development** within mosquitoes, allowing them to become infectious more quickly and transmit diseases faster.
- Altered precipitation patterns and more extreme storms. Both flooding (creating standing water) and drought (leading to water storage practices) can **increase the number of sites where mosquitoes lay eggs**. Mosquitoes generally do not survive the high winds and flooding that hurricanes bring, but mosquito eggs can survive. Therefore, it is common for mosquito populations to decrease during and immediately after a hurricane, and then grow rapidly. Water accumulation is critical for immature mosquito development, and humidity is important for adult survival.
- Milder winters, earlier springs, and longer and warmer summers, **expanding the season** for mosquito-borne disease transmission.

Photo: Female *Aedes aegypti* mosquito (CDC)

These climate impacts could also interact with human activities, such as spending more time outdoors, urbanization, deforestation, and increased global travel, to further amplify disease transmission risks.

The two mosquito-borne diseases with the highest public health burden in the U.S. are West Nile virus (WNV) and dengue virus.

West Nile Virus



WNV**,** primarily spread to people through bites of infected *Culex* mosquitoes**,** is the most common mosquito-borne disease in the continental U.S. Many U.S. counties now report West Nile cases, but the Great Plains and western states are more likely to have high incidence. Approximately 80% of people infected with WNV will not have any symptoms, 20% will experience flu-like symptoms, and less than 1% will develop severe West Nile neuroinvasive disease (WNND), a condition that can lead to death or long-term disability. Older adults and those with compromised immune systems are at higher risk for WNND. Currently, no medicines or vaccines are available for West Nile.

This year marks the 25th anniversary of the first detection of WNV in people in the U.S. WNV has caused 59,000 infections and 2,900 deaths between 1999 and 2023 (and likely more because many people don't have symptoms).

West Nile prevention depends on community-level mosquito control programs to reduce mosquito vector densities, personal protective measures to decrease exposure to infected mosquitoes, and screening of blood and organ donors. Despite progress in the fight against WNV, current prevention methods are not enough to reduce the burden. It is normal for West Nile cases to vary in number and location by year in the U.S., making it difficult to predict or identify any one reason for a higher-than-average year. Public health needs more ways to detect outbreaks early, control mosquitoes, and treat and prevent the disease to effectively protect people from WNV.

The two mosquito-borne diseases with the highest public health burden in the U.S. are West Nile virus (WNV) and dengue virus, continued.

Dengue virus

Dengue virus, spread to people through bites of infected *Aedes* species mosquitoes *(Ae. aegypti* or *Ae. albopictus*), is common in six U.S. territories and freely associated states, and outbreaks have recently occurred in Florida, Hawai'i, Texas, Arizona, and California. About 25% of people infected develop symptoms, including fever with aches and pains, nausea and vomiting, or rash. Less than 5% of dengue infections progress to severe disease, which can lead to hospitalization and death. Early diagnosis and supportive medical care are essential in severe cases, though no specific treatments are available. A vaccine is being implemented in Puerto Rico for children 9–16 years old who have laboratory-confirmed evidence of previous dengue infection.

- In 2024, there have been over 10 million dengue cases across the Americas, significantly surpassing the 4.6 million cases reported for the entirety of 2023—already a **record year for dengue**. After a decade of almost no dengue transmission, Puerto Rico is now facing an outbreak ahead of the typical dengue season (starting in August). The Puerto Rico population has limited immunity to the strains of dengue currently circulating, and repeat infections raise the risk for hospitalization and severe disease. The observed limited immunity, combined with a prolonged period of low transmission, could lead to an outbreak with greater magnitude and severity.
- As of July 2024, more than 50% of dengue cases in Puerto Rico have required hospitalization, with over 1,100 hospitalizations reported. The U.S. Virgin Islands have also reported dengue cases, and travel-associated cases in the continental U.S. are higher than previous years, increasing the risk of local transmission in areas with *Aedes* mosquitoes and conducive climatic conditions.

The best way to prevent any mosquito-borne disease is to protect yourself from mosquito bites. When outside, use an Environmental Protection Agency-registered insect repellent (follow these tips for applying insect repellent on children from the American Academy of Pediatrics) and wear loose-fitting, long-sleeved shirts and pants when possible. Control mosquitoes in and around your home by installing screens on windows and doors and using air conditioning when available plus eliminating standing water (such as in outdoor buckets, planters, or bird baths) where mosquitoes lay eggs. Children aged 9–16 years old who live in dengue-endemic areas and have laboratory confirmation of a previous dengue infection should get a dengue vaccine. Check out CDC's vector-borne disease site with information on preventing bites from both ticks and mosquitoes, additional recommendations if you'll be traveling to a place where a mosquito-borne disease is endemic, and recommendations for workers.

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