Climate and Health Outlook

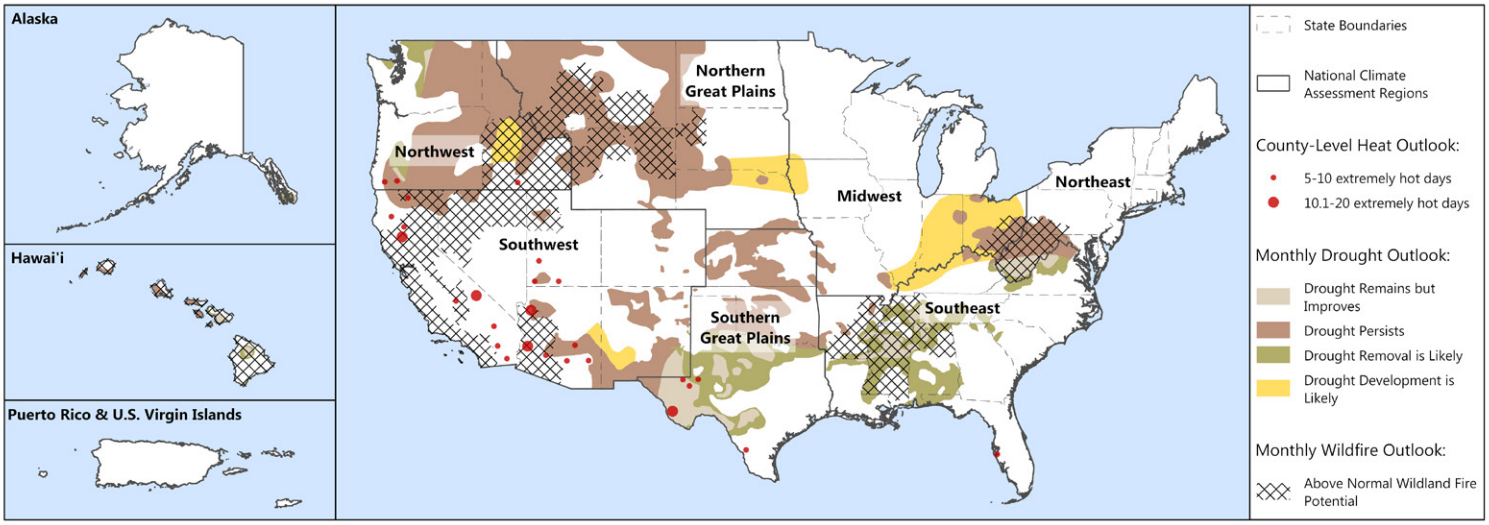
Your monthly climate forecast for health | **September 2024**

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.

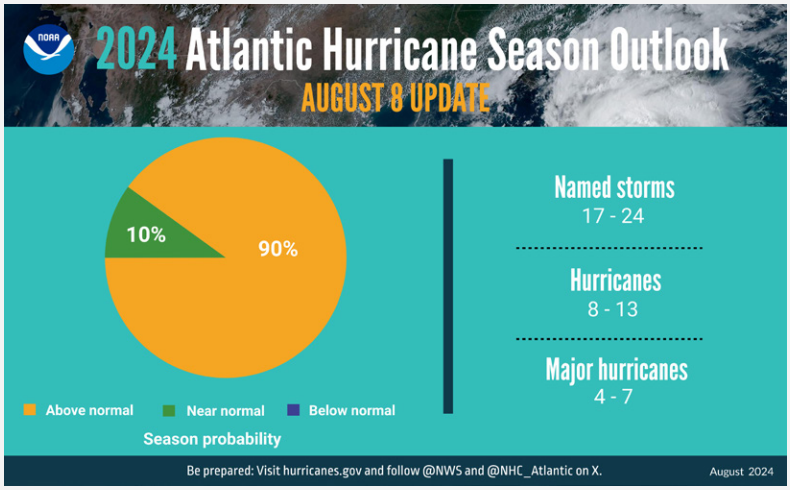
Discover your county's forecasted climate hazards this month:

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: