

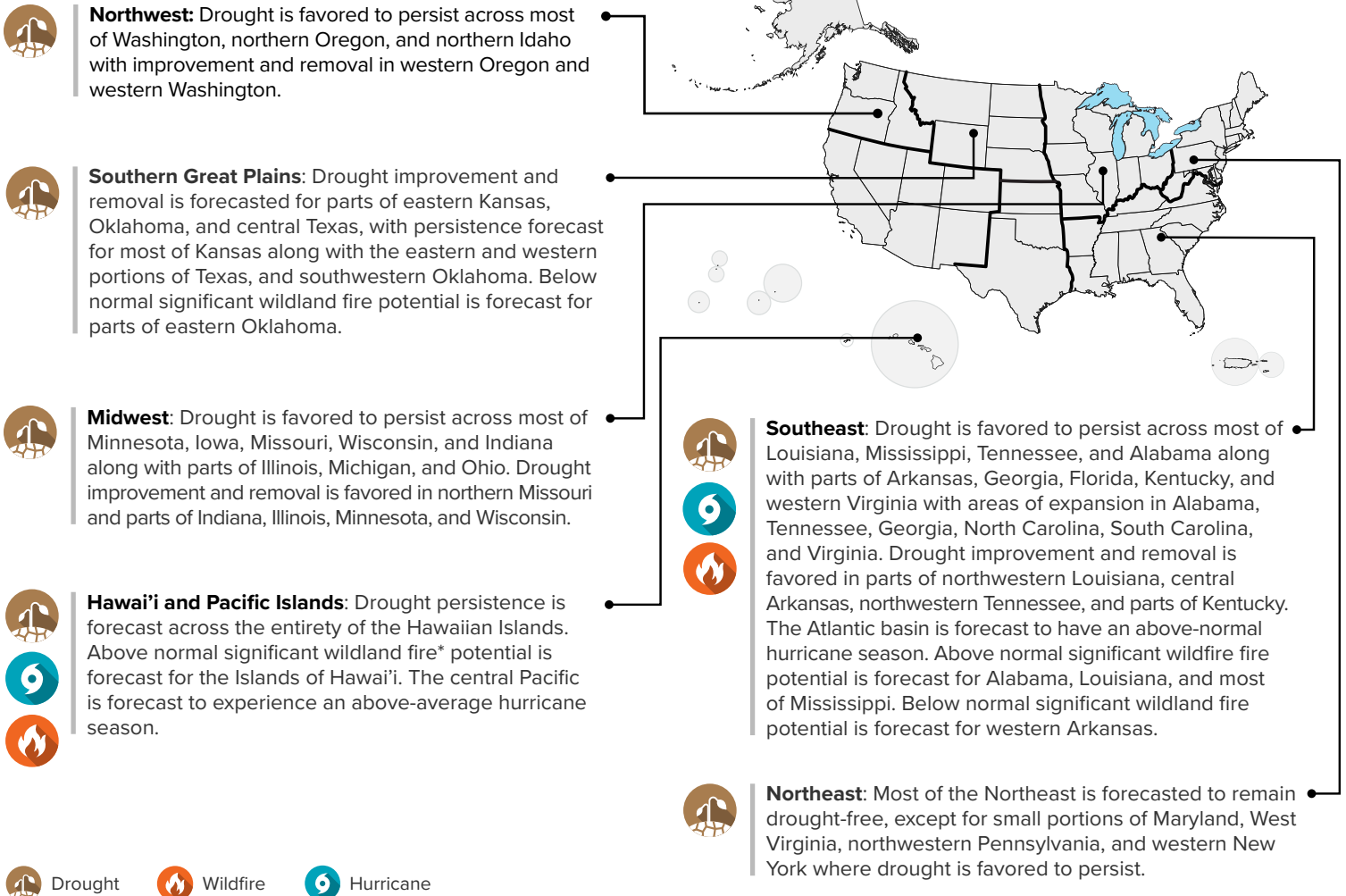
Climate and Health Outlook

ISSUED NOVEMBER 2023

The Climate and Health Outlook is an effort to inform health professionals and the public on how our health may be affected in the coming months by climate events and to provide resources for proactive action. Visit the [associated webpage](#) for additional resources and information.

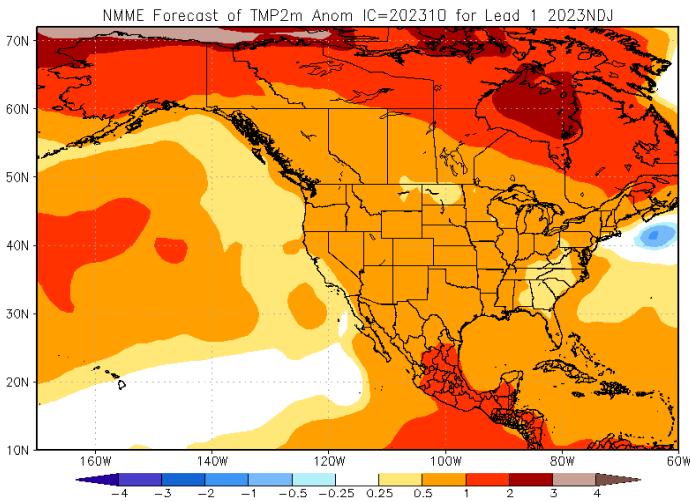
New Resource: Climate and Health Outlook Portal

OCCHE and the HHS Administration for Strategic Preparedness and Response (ASPR) launched the [Climate and Health Outlook Portal](#) to accompany this Climate and Health Outlook publication series. This new tool features interactive maps with county-level heat, wildfire, and drought 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. Policymakers, health care providers, and the public can use the tool to better understand and plan for the health impacts of climate-related hazards in their communities. OCCHE plans to update the tool with new features including additional climate-related hazard and risk factor data and **welcomes user feedback on how it can be improved—please email us at OCCHE@hhs.gov** to let us know what you think.



*Smoke from wildfires can impact health hundreds of miles from site of the fire. Developed with data from the Centers for Disease Control and Prevention, the National Oceanic and Atmospheric Administration, and the National Interagency Fire Center.

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

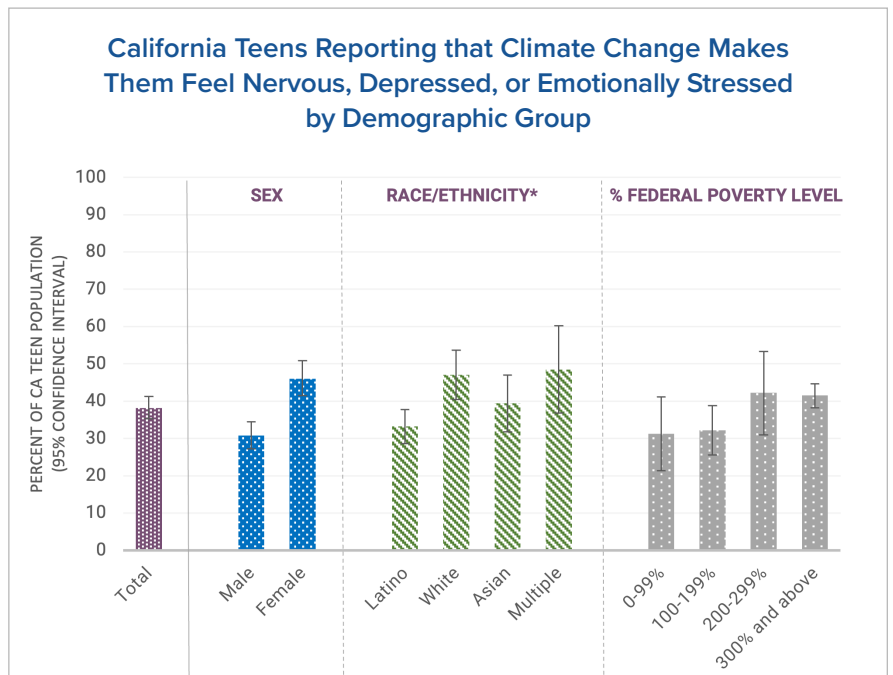


For November–January, the North American Multi-Model Ensemble (NMME) predicts that the average temperature will be 0.45 to 1.8°F (0.25 to 1°C) above normal for most of the continental U.S. However, most of Alaska is expected to experience a higher 90-day average that is 1.8 to 3.6°F (1 to 2°C) above the normal average temperature for this period. The NMME integrates multiple forecasts of the next 90 days to build the best estimate of temperatures over that time frame. Note that although many regions across the continental U.S. may expect a warmer 90-day average temperature, this is not the same as your local weather forecast, in which large fluctuations in temperature may be predicted from day to day.

Figure: The North American Multi-Model Ensemble’s (NMME) forecast for temperature in November 2023–January 2024 compared to climatological average (from 1991–2020) based on combining forecast information from state-of-the-art computer climate models currently running in the U.S. and Canada, including from the National Aeronautics and Space Administration (NASA), two groups from the National Oceanic and Atmospheric Administration (NOAA), and from the National Center for Atmospheric Research (NCAR). For more information about this model or prediction, please refer to the [NMME website](#).

Californians Report on Their Health Impacts from Climate Change

The 2021 [California Health Interview Survey](#) asked a representative sample of Californians about their health impacts from climate change. Forty-five percent of **California adults** reported experiencing a hazardous weather-related event in the past two years (i.e., heat wave, flooding, wildfire, smoke from wildfire, or public safety power shutoff). Of those, 17 percent said their physical health was harmed by these events and **22 percent said their mental health was harmed**. The survey also asked **teens (age 12-17)** about the impact of climate change on their mental health, and **38 percent, said the issue of climate change makes them feel nervous, depressed, or emotionally stressed** (figure to the right shows percentages by demographic groups). This effect was **more commonly reported among female teens** than male teens. Learn [here](#) about how the California Department of Public Health’s Climate Change and Health Equity Section is working to advance health equity through climate action.



*Other race/ethnicity categories’ data were statistically unstable and could not be reported. Characteristics were self-identified. Teen population includes Californians 12-17 years old. Data are from the 2021 California Health Interview Survey, administered to a representative sample for California (n = 2,177 teens with strategic oversampling of households predicted to have certain attributes; additional design and methods information available [here](#)).

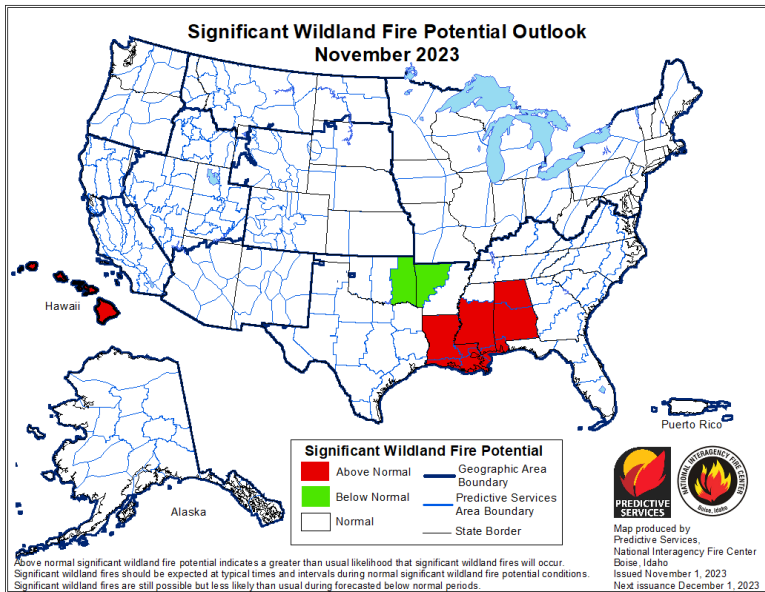


Figure: The [National Significant Wildland Fire Potential Outlook](#) identifies areas with above, below, and near normal significant fire potential using the most recent weather, climate, and fuels data available. These outlooks are designed to inform decision makers for proactive wildland fire management.

Significant fire activity generally decreased through October. Early and late October precipitation events in the northwestern U.S. continued to slow significant fire activity, with most large fires now contained. Extreme and exceptional drought expanded and intensified across east Texas through the Lower Mississippi Valley, with continued warmer and drier-than-normal conditions. Above normal significant fire potential is forecast across Hawai'i, Louisiana, much of Mississippi, and all of Alabama during November. Normal potential is forecast across the contiguous U.S. in December.

Why is wildfire smoke a public health concern?

Wildfire smoke is a complex mixture of water vapor, gases, and particles. These particles, also called particulate matter (PM), consist of a mixture of solid particles and liquid droplets that are suspended in the air. Particles may be either directly emitted by a wildfire or formed through complex atmospheric reactions of other chemicals emitted by wildfires, including sulfur dioxide or nitrogen dioxide. Of the pollutants in wildfire smoke, fine particulate matter (PM_{2.5}), or particles with an aerodynamic diameter less than or equal to 2.5 μm, is of greatest health concern. These particles can be inhaled into the body and travel to the lungs. Some particles can even enter the blood, where they can travel throughout the body and affect other organs.

Decades of research on ambient PM_{2.5} concentrations (i.e., air quality people experience during a typical day), and more recent studies of wildfire smoke when PM_{2.5} concentrations are elevated, show that short-term (or daily) PM_{2.5} exposure is associated with health effects. These range from eye and respiratory tract irritation to reduced lung function, bronchitis, exacerbation of asthma, heart failure, and even death. The health effects of long-term smoke exposure (i.e., weeks or months of exposure or repeated exposure over multiple years) currently remain unclear, but there is some initial evidence for changes in lung function, increased risk of respiratory infection, and adverse birth outcomes. Most healthy adults and children will recover quickly from short-term smoke exposure, but [people at some life stages and some populations may be at greater risk of experiencing health effects.](#)

Resources to Reduce Health Risks Associated with Wildfires

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

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

U.S. Monthly Drought Outlook
Drought Tendency During the Valid Period

Valid for November 2023
Released October 31, 2023

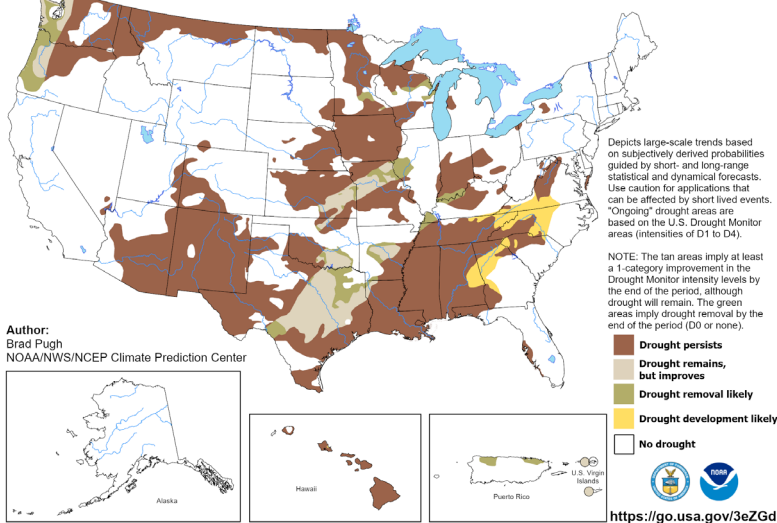


Figure: The National Weather Service Climate Prediction Center’s Monthly Drought Outlook is issued at the end of each calendar month and is valid for the upcoming month. The outlook predicts whether drought will persist, develop, improve, or be removed over the next 30 days or so. For more information,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

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

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


As indicated in the map to the left, **1,634 counties** across **40 states** are projected to have persistent/remaining drought or drought development in November. In these counties, the total population at risk is **121,861,008 people** and, of those, **1,237,680 people** work in agriculture. Of these counties:


- 403 (29%)** have a high number* of people aged 65 or over, living alone.
- 420 (30%)** have a high number of people living in rural areas.
- 445 (32%)** have a high number of people living in poverty.
- 478 (34%)** have a high number of people with frequent mental distress.
- 332 (24%)** have a higher number of adults with asthma.
- 434 (31%)** have a high number of people without health insurance.
- 391 (28%)** have a high number of uninsured children.
- 418 (30%)** have a high number of Black or African American persons.
- 335 (24%)** have a high number of people with severe housing cost burden.
- 460 (33%)** have a high number of people in mobile homes.
- 469 (34%)** have a high number of people with one or more disabilities.
- 445 (32%)** are identified as highly vulnerable by CDC’s Social Vulnerability Index.


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


Drought Affects Health in Many Ways

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


 Low crop yields can result in rising food prices and shortages, potentially leading to **malnutrition**.

 Dry soil can increase the number of particulates such as **dust and pollen** that are suspended in the air, which can irritate the bronchial passages and lungs.

 Dust storms can spread the fungus that causes coccidioidomycosis (**Valley Fever**).

 If there isn’t enough water to flow, waterways may become stagnant breeding grounds for **disease vectors** such as mosquitoes as well as viruses and bacteria.

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

 Long-term droughts can cause **poor-quality drinking water** and leave inadequate water for hygiene and sanitation.

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

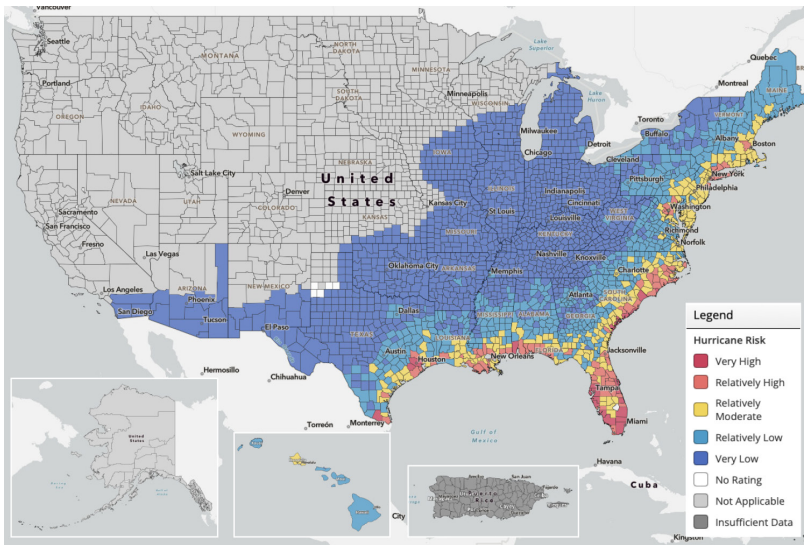


Figure: This map of the U.S. is colored by the National Risk Index rating for the Hurricane hazard. The characterization of risk across these counties are based on historical records on hurricane paths and intensity.

Outlook for the 2023 Hurricane season

During this hurricane season, which began June 1 and ends on November 30, the National Oceanic and Atmospheric Administration (NOAA) forecasts an above-normal hurricane season for the Atlantic (with a range of 14–21 named storms, with 6–11 of those becoming hurricanes, and 2–5 becoming major hurricanes). NOAA also forecasts an above-normal season for the central Pacific, which includes Hawaii (with a range of 4–7 tropical cyclones including tropical depressions, tropical storms, and hurricanes). Please note that these ranges include storms that have already formed this season (as of November 1, 2023, there have been 20 named storms, 7 hurricanes, and 3 hurricanes in the Atlantic, and 4 tropical cyclones in the central Pacific). For updated forecasts, please visit [NOAA's website](#).

Hurricanes Affect Health in Many Ways

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



Open wounds and rashes **exposed to flood waters** can become infected.



Post-flooding mold presents risks for people with **asthma, allergies, or other breathing conditions**.



Power failure during or after hurricanes can **harm patients** who critically depend on electricity-dependent medical equipment.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Alpha-gal Syndrome

Alpha-gal syndrome (AGS) is a serious, potentially life-threatening allergic condition associated with tick bites. AGS is also called alpha-gal allergy, red meat allergy, or tick bite meat allergy. AGS is not caused by an infection. Evidence suggests that AGS is primarily associated with the bite of a lone star tick (*Amblyomma americanum*) in the U.S., but other kinds of ticks have not been ruled out. More research is needed to understand the role ticks play in triggering AGS and why certain people develop AGS.

People with AGS have delayed allergic reactions to a sugar molecule called alpha-gal (galactose- α -1,3-galactose), which is found in the tissues of most mammals. Alpha-gal can be found in meat such as pork, beef, rabbit, lamb, and venison, and in products made from mammals, including gelatin, cow's milk, and milk products. Alpha-gal is **not** found in fish, reptiles, birds, or people.

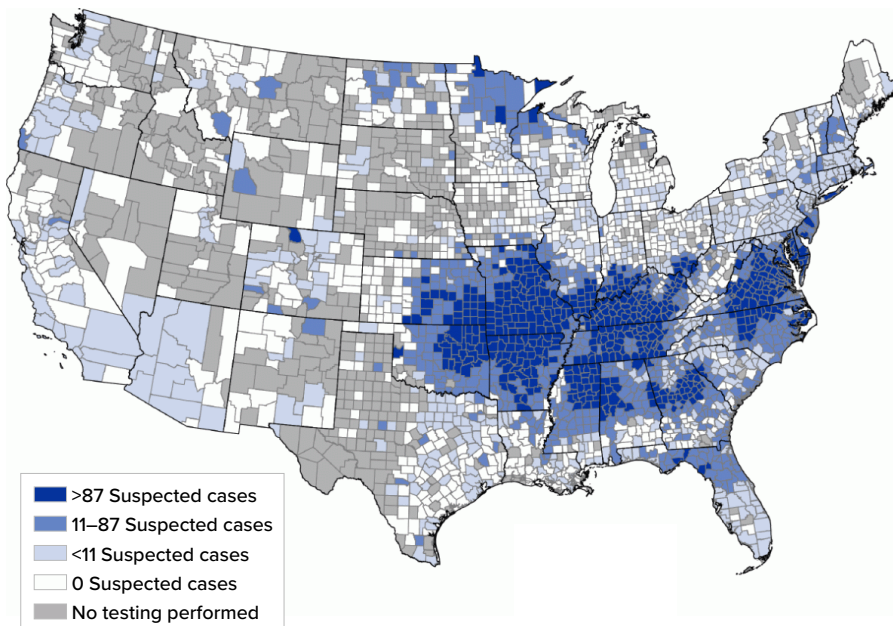
AGS symptoms, such as hives or itchy rash, nausea or vomiting, or heartburn or indigestion, can occur 2 to 10 hours after ingestion of red meat or other products containing alpha-gal. Patients with AGS have varying tolerance and sensitivity to products containing the alpha-gal sugar, and AGS reactions can differ from person to person, ranging from mild to life-threatening. Patients with AGS who experience anaphylaxis (a potentially life-threatening reaction involving multiple organ systems) may need urgent medical care.



Figure: A picture of an adult female lone star tick. Source: <https://phil.cdc.gov/Details.aspx?pid=8676>

Distribution of Alpha-gal Syndrome

In the U.S., **the majority of patients are adults living in the southern, mid-Atlantic, and midwestern regions.** [A 2023 CDC report](#) investigating testing data showed that there were more than 110,000 suspected cases of AGS between 2010 and 2022. Additionally, suspected cases are on the rise—from 2017 to 2021, there were approximately 15,000 new



positive test results for AGS in the U.S. per year. This is likely an underestimate because the diagnosis of AGS requires a clinical exam and a positive diagnostic test, and some people may not get tested. This underestimate may also be due to a lack of healthcare provider awareness of AGS. [A 2022 CDC survey](#) of 1,500 health care providers found that only 5% felt “very confident” in their ability to diagnose or manage cases of AGS. It is possible that as many as 450,000 people might have been affected by AGS in the U.S. since 2010, but additional research and surveillance are needed to better understand how many people are affected by this condition.

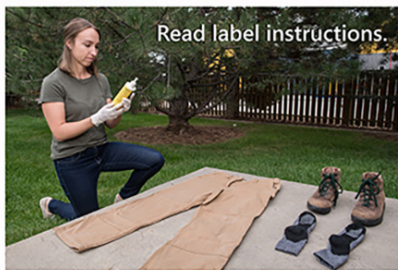
Figure: Geographic distribution of suspected alpha-gal syndrome cases per 1 million population per year in the U.S. from 2017-2022. Source: <https://www.cdc.gov/mmwr/volumes/72/wr/mm7230a2.htm>

Climate Change and Alpha-gal Syndrome

Climate change is one of several factors that affect when and where tickborne diseases and tick-associated conditions like AGS can occur. Increasing temperatures from climate change can influence tick life cycles by increasing a tick's ability to reproduce, leading to larger tick populations and greater risk of disease transmission. Additionally, milder winters and warmer early spring temperatures expand the seasons when ticks are active, resulting in more weeks of the year that people in the U.S. are at risk of tick bites.

Climate change can also impact the distribution and density of the wildlife ticks feed on (e.g., deer and small mammals) and, subsequently, lead to an expanded geographic distribution (e.g., latitude, altitude) of the diseases and conditions associated with these ticks. Expanding tick ranges and increasing disease incidence are also linked to changes in land use patterns, such as reforestation, forest fragmentation, and suburban development, which can lead to increased opportunities for humans to be exposed to ticks.

TREAT CLOTHING WITH PERMETHRIN



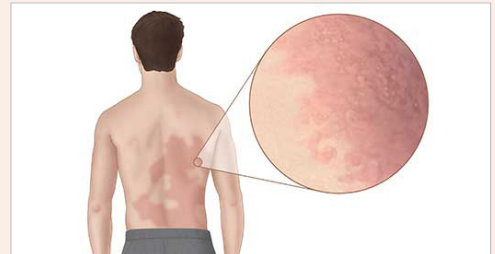
Preventing Alpha-gal Syndrome

The best way to prevent AGS is to [protect yourself from tick bites](#). If you have AGS, new tick bites may reactivate allergic reactions to products that contain alpha-gal, such as red meat. When outdoors, avoid grassy, brushy, and wooded areas where ticks may be found, and walk in the center of trails. Use [EPA-registered insect repellents](#) designated for protection from ticks and treat clothing and gear with 0.5% permethrin or buy pre-treated items. After time outside, check your clothing and gear for ticks; perform a thorough tick check on yourself, pets, and children; and take a shower. If you see an attached tick, [remove it immediately](#).

Source: https://www.cdc.gov/ticks/avoid/on_people.html

Resources to Reduce Health Risks Associated with Alpha-gal Syndrome

Visit CDC's websites to find more information:



[Alpha-gal Syndrome](#): Learn about common symptoms, products that may contain alpha-gal, and prevention measures



[Fight the Bite](#): Prevent bites from both ticks and mosquitoes



[Avoiding Ticks](#): Take steps to avoid ticks on yourself, [on your pets](#), and [in your yard](#)

[Tick Bite Data Tracker](#): Explore the new tick bite data tracker, which shows Emergency Department visits for tick bites on a weekly and regional basis to help the public know when they may be most at risk of tick bites and give healthcare providers and public health personnel timely data to improve tick bite prevention efforts

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

