# Background

Exposure to extreme heat, temperatures above 90 degrees for more than two days, is a serious threat to health and well-being.[[1]](#endnote-2) The number and length of heat waves has increased significantly since the 1960s.[[2]](#endnote-3) The year 2020 was the second-warmest year on record globally,[[3]](#endnote-4) and the warmest year on record for the contiguous United States.[[4]](#endnote-5) These trends are projected to continue and worsen in the coming decades, exposing more people to the harmful consequences of heat.

In 2021, Washington state experienced an unprecedented heat dome event leading to 128 heat-related deaths. The regional temperature was on average 30°F warmer than the mean of the hottest 3 months in the previous decade.[[5]](#endnote-6), Additionally, each week between June 20th – July 31st, 2021 had a higher rate of excess death (205 excess death each week) not directly attributed to heat.[[6]](#endnote-7) Excess heat impacts emergency response systems, significantly increasing emergency visits for acute heat illnesses, increasing 911 call volume, and costing billions of dollars annually.[[7]](#endnote-8) While everyone is susceptible to increased heat, it doesn’t impact everyone in the same ways.

Higher air temperatures increase wildfire likelihood, posing a serious threat to human health, ecosystems, and infrastructure. Wildfire smoke creates unsafe air quality by emitting pollutants, including particulate matter (PM 2.5), carbon monoxide, nitrogen oxides, formaldehyde, benzene and others. Wildfire smoke exposure increases all-cause mortality and impacts respiratory health.[[8]](#endnote-9)[[9]](#endnote-10) As a result of a warming climate, wildfires are becoming larger, more destructive, and more difficult to control.

Certain populations are more vulnerable to both environmental exposures including

* **Ages and life stages** **(*infants and children, pregnant women, older adults*)**
* **People physically active outdoors or in hot indoor spaces (*athletes, outdoor and some indoor workers, emergency responders*)**
* **People disproportionately exposed to heat, sensitive to heat or with limited adaptive capacity (*people experiencing homelessness, people with chronic medical conditions, people with disabilities, people who are incarcerated, people with low income, marginalized communities such as those subjected to redlining*)**

The workgroup organized the following guidelines through the prevention framework and adopted the following definitions related to climate change and health:

* Primary prevention: climate mitigation – “efforts to slow, stabilize or reverse climate change by reducing greenhouse gas emissions”
* Secondary prevention: climate adaptation – “changes in processes, practices and structures to moderate potential damages to human health.”
* Tertiary prevention: climate adaptation – “reducing cascading health burdens once both short- and long-term climate impacts have occurred.”

This report’s main aim is to **reduce morbidity and mortality related to extreme heat and wildfire smoke.** To achieve this aim, healthcare system actors must to work at all levels of prevention. However, the workgroup has decided to focus these guidelines on secondary and tertiary prevention to create tangible actions in the healthcare ecosystem.

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| --- | --- |
| Focus Areas | Elements  |
| Heat and/or smoke vulnerable populations | * Implementing individualized heat and wildfire smoke action plans
* Removal of financial and administrative barriers to care for populations most impacted by heat and wildfire smoke
* Targeted messaging for populations at higher risk
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| Workforce/System Capacity Development & Education  | * Health services professional, clinician & trainee education and training on heat-related illness & exacerbations of illness due to wildfire smoke prevention, identification and treatment.
* Evidence-based protocols for responding to heat and wildfire smoke exacerbations
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| Community Outreach, Education & Partnership | * Universal, consistent and culturally responsive plain-language public education and awareness of the risks of extreme heat and wildfire smoke
* Partnering with communities to communicate and build capacity to protect against health impacts of heat and wildfire smoke.
* Time-sensitive heat and/or smoke protective messaging that leverages diverse communication channels including established community-based messaging streams
* Education for patients working in hot workplaces
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| Emergency Preparedness | * Systematic weather monitoring during warmer months
* Annual preparation for heat and wildfire smoke events
* Heat and wildfire smoke action plans
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| Finance & Infrastructure Improvement | * Funding for sustainable operations of public health level interventions (e.g., cooling centers)
* In home cooling and filtering access, air conditioners and air filters
* Payment structures and quality improvement incentives
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| Data Sharing & Infrastructure | * Data sources and availability for identifying when an extreme event is going to occur and who to target for prevention or intervention.
* Data sharing across sectors for population level management
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## Guidelines

### Direct Care Interdisciplinary Team

* **Ask about and identify risk factors for patients that are more vulnerable to heat and wildfire smoke (see Figure 1).** Use [CHILL’D OUT](https://www.cdc.gov/heat-health/hcp/clinical-guidance/chill-d-out-screening-questionnaire.html) tool to identify access to cooling, their access to housing, isolation and mobility, electricity access, how to use the [HeatRisk tool](https://ephtracking.cdc.gov/Applications/HeatRisk/), medications that make heat riskier, and assess their time spent outside.
* **Teach patients and families how to know when heat or air quality is dangerous to their health.** Teach patients how to use the [HeatRisk](https://ephtracking.cdc.gov/Applications/HeatRisk/) tool and [Air Quality Index](https://www.airnow.gov/aqi/). Explain that poor air quality can worsen heat risk.
* **Counsel patients and families on their higher risk of heat-related illness and negative health impacts of wildfire smoke**
* **Co-develop an individualized patient action plan to reduce their exposure to heat and wildfire smoke, signs and to watch for, and when and how to seek help.**
	+ Consider delegating counseling to non-provider members of the interdisciplinary team, considering individualized needs and preferences. E.g., if available, consider involving community health workers/promotoras for patients who primarily speak Spanish
	+ Example: [PATIENTS-Heat-Heat-Action-Plan-V1.pdf (americares.org)](https://www.americares.org/wp-content/uploads/PATIENTS-Heat-Heat-Action-Plan-V1.pdf)
	+ **For patients who live alone**, consider who can check on the patient remotely during heat or wildfire smoke in their area. Social isolation is also a risk factor for health impacts due to heat or wildfire smoke.
	+ **For patients with electricity dependent DME**, consider if patients utility company might have a power restoration program.
* **Connect patients to assistance programs to support health-related social needs.** Consider resources for energy assistance, transportation, food security, childcare, and others
* **Counsel patients on medication considerations when prescribed and at least annually.** Counsel patients and/or their family on increased risk and, as applicable, symptoms that may indicate drug interaction with heat. See the [CDC Guidance for Clinicians on Heat and Medications](https://www.cdc.gov/heat-health/hcp/clinical-guidance/heat-and-medications-guidance-for-clinicians.html)
	+ Consider adjustments to medication doses for medications most likely to interact with heat, especially for older patients who take multiple medications and patients on diuretics and psychiatric medications. A non-comprehensive list of medications can be found in **Table x: Medications that may increase risk of harm on hot days**
	+ Consider adjustment to fluid restrictions during periods of extreme heat, especially for patients who take medications that may lead to dehydration or affect electrolytes. **See highlighted medications classes for medium to high risk in Table x.**
	+ Counsel patients on storing heat-sensitive medications properly and planning for how heat waves or other climate events may impact storage of medications, like insulin.
* **Document action plan in medical record and make copy easily accessible for patients** (e.g., copy into a portal for patient access, print out at visit) C

### Health Delivery Systems

*All delivery systems should have organizational action plans that involve actions to take year round and actions for before or during an event. These strategies are adopted from the Northwest Healthcare Response Network’s resources for Extreme Heat and Wildfire Smoke.*

Year-Round – Secondary Prevention

* **Review system vulnerabilities ahead of hotter months** (June – September) including HVAC systems, air conditioners, IT servers, communication systems and sensitive medical equipment
* **Ensure an evacuation plan is in place** in case of power loss or HVAC malfunction
* **Identify strategies to reduce heat and wildfire smoke exposure for patients and staff** (e.g., setting up hydration and cooling, air filtering systems, cancelling outdoor activities)
* **Ensure adequate supplies** with expectation of potential surge in visits for heat-related or wildfire smoke-related illnesses and exacerbations.
* **Integrate weather monitoring into facility protocols** for warmer months (June – September)
* **Train healthcare staff**. Healthcare workers should be trained in recognizing, preventing and treating heat-related illness and exacerbations of chronic conditions due to heat or wildfire smoke. Example resources below:
	+ Heat
		- [Clinical Guidance for Heat Health | Heat Health | CDC](https://www.cdc.gov/heat-health/hcp/clinical-guidance/index.html)
	+ Wildfires:
		- [A Story of Health - A Multi-media eBook - Western States PEHSU (ucsf.edu)](https://wspehsu.ucsf.edu/main-resources/training/a-story-of-health-a-multi-media-ebook-2/)
		- [Wildfire Smoke and Your Patients' Health | US EPA](https://www.epa.gov/wildfire-smoke-course)
	+ Both
		- [Climate Resilient Health Clinics | Americares](https://www.americares.org/what-we-do/community-health/climate-resilient-health-clinics/#toolkit)
* **Participate in collaborative planning for heat and wildfires with local health jurisdictions, emergency preparedness organizations and healthcare coalitions**. Look up your regional healthcare coalition [here](https://doh.wa.gov/about-us/executive-offices/resiliency-and-health-security/emergency-preparedness-regions/regional-healthcare-coalition-leads).
* **Offer support in accessing resources to address social needs.** Develop partnerships with community organizations and other healthcare stakeholders to better meet patient social needs (e.g., transportation, housing, air conditioning) Follow the Foundation for Health Care Quality’s report on social need interventions [here](https://www.qualityhealth.org/equity/comm/social-need-interventions/).
* **Communicate clinical trends and conditions (**heat-related illness, wildfire smoke related exacerbations) **to the Department of Health for tracking and to inform iterative adaptation interventions.**

Preparing for or During an Event – Tertiary Prevention

* **Consult facility preparation plans** – planning with facility staff to discuss cooling system capabilities and limitations, HVAC system filtration capabilities and limitations and implement supply conservation strategies. Use a high efficiency filter (MERV 13 or higher)
* **Review evacuation plans and alert staff to upcoming weather hazard** – plan for cooling areas within the facility if able to reduce need to evacuate.
* **Prepare for needs of your staff** – allow to sleep at facility if conditions warrant, and some may need to evacuate their homes. Communicate guidance on how to prepare homes for heat or wildfires and smoke during the summer. Review staff and patient emergency alert protocols.
* **Monitor weather conditions on a regular basi**s using the NW Heat Risk tool, AQI tools and [WA Smoke Blog](https://wasmoke.blogspot.com/).
	+ When temperatures are forecast to be level orange or higher, alert leadership and begin preparation.
	+ When air quality is forecasted to be “Unhealthy” for greater than 24 hours or very unhealthy or hazardous, consider monitoring indoor air quality and PM2.5
	+ **Monitor indoor temperature and air quality** during heat or unhealthy air quality
* **Reiterate messaging from local health jurisdictions and the Department of Health** on how to reduce risk of heat through all public and patient facing communication. Reiteration of the same messaging can help get everyone on the same page.
* **Communicate with local healthcare coalitions** to support other facilities in your area. Check local government sites to know where cooling centers are available to direct patients.
* **Prepare for potential patient surges** by upstaffing and/or expediting discharge when possible. Adjust schedules to avoid peak heat hours and consider switching to telehealth appointments when possible. Consider rescheduling elective procedures as necessary
* **Scheduling.** Adjust schedules to avoid peak heat hours and/or heavy air pollution, and consult with interdisciplinary care teams to switching to telehealth appointments when possible, for patients at higher risk. Consider rescheduling elective procedures as necessary.
* **Consider opening waiting rooms to the public as a temporary center for cooling and purified air.** If opening waiting room, communicate hours of operation to local public health/emergency preparedness coordinators.

#### Outpatient Clinics

* **Create a system of targeted outreach to high-risk patients ahead of and during heat and poor air quality**. Identify at risk individuals using medical record data and flag their charts (demographics, social determinants of health, diagnoses, medications).
	+ Ensure patients have refills of relevant medications prior to heat or smoke (e.g., inhalers, cardiovascular medications, etc)
	+ Reschedule visits or convert to telehealth as appropriate to avoid exposure to heat or smoke.
* **Distribute informational materials (e.g., posters, pamphlets, etc) within clinics on how to stay safe during heat and/or poor air quality due to wildfire smoke.** These materials should include an alert that heat or wildfire smoke is imminent, the signs and symptoms of heat-related illness or smoke related illness and potential actions to reduce exposure. Align educational materials with local public health guidance.

#### Hospitals and Emergency Departments

*In addition to the above guidelines, hospitals should engage in the following activities before or during heat or wildfire smoke events.*

* **Screening and triage.** Implement evidence-based protocols for early identification and triage of heat-related illness and exacerbations of chronic conditions. See example for [Heat Stroke](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7972371/).
	+ **Ensure appropriate equipment is available** on site to treat heat-related illness (cold water, fans, air conditioning, drinking water)
* **Minimize interruptions to patient care resulting from impacts of extreme heat and wildfire events.** Develop contingency plans for power outages or disruptions in transportation or communication networks that could affect facility operations or patient access to care. Implement triage protocols to prioritize urgent and emergent care and reschedule non-essential visits or procedures.
* **Support patients and families in identifying a safe discharge location** with access to cooling and/or air filters during heat and/or poor air quality.

### Long-term care facilities

*Older adults are particularly impacted by heat and wildfire smoke due to the intersection of several factors (age, chronic conditions, reduced mobility, cognitive impairment, social isolation). These factors make older adults more at risk for heat-related illness, exacerbations of chronic conditions such as cardiovascular disease, respiratory disease, and kidney disease, and mental distress. Long-term care facilities are critical to maintaining and improving the health and safety of older adults in Washington state. By planning ahead, implementing evidence-based interventions and coordinating with local partners, long-term care facilities can reduce the risk and impact of heat and wildfire smoke events in their community. Long-term Care Facilities should follow the guidelines under Health Delivery Systems in addition to the guidelines written below:*

* **Prepare facilities for heat and wildfire smoke in the spring.** See most updated Washington state DSHS guidance (e.g., [Preparing for Wildfire and Extreme Heat in LTC Settings](https://www.dshs.wa.gov/sites/default/files/ALTSA/rcs/documents/Extreme%20Heat%20and%20Wildfire%20Prep.pdf#:~:text=Stay%20up%20to%20date%20with%20current%20air%20quality,near%20windows%20and%20doors.%20Use%20highest%20performance%20filters.)) and Americares/Harvard [Climate Resilience Toolkit](https://www.americares.org/what-we-do/community-health/climate-resilient-health-clinics/#toolkit) for resources to support.
	+ **Develop and action plans for heat and wildfire smoke using HeatRisk tool level and Air Quality Index to organize tiered actions.** Include considerations for joint heat and wildfire smoke and the possibility of power outages.
		- **Include evacuation plans and destination.** Engage with local emergency management for mass sheltering locations, and coordinate with local healthcare coalitions to assist with placements. Do not send medically stable patients to the hospital. Have vehicles fueled, equipment packed, and transport coordinated for those requiring Basic Life Support/Advanced Life Support.
		- **Ensure cooling systems are on generator power, and validate reserve fuel levels before heat events.**
	+ **If not already in facility, purchaser air conditioners and high quality (HEPA) filters.**
	+ **Train healthcare staff.** Healthcare workers should be trained in recognizing, preventing and treating heat-related illness and exacerbations of chronic conditions due to heat or wildfire smoke.
	+ **Supplies**. Consider supplies necessary to respond to extreme weather (e.g., **masks, water, air conditioners, air purifiers, equipment to monitor temperature and air quality inside the facility)** Ensure the necessary supply of medications and other equipment needed to treat heat-related illnesses or illnesses related to wildfire smoke.
* **Prevent heat-related illness and wildfire smoke related health impacts for residents.** Follow public health guidance on limiting time outdoors, ensure lightweight clothing, closing windows/doors when air quality is poor, maintaining adequate fluid intake, reducing sources of air pollutants, using N95 respirators and monitoring for signs of heat-related illnesses (see appendix) and or exacerbations of chronic conditions.
* **Monitor temperatures in care areas and residents’ rooms.** Move residents to cooler spaces or spaces with improved air filtration in the facility if necessary.
	+ If unable to move resident or unable to maintain regulated body temperature, use buckets of cold water, towels soaked in cold water or other methods to cool down body temperature
	+ If unable to maintain safe air quality index indoors, consider placing mask on the patient if safe to do so.

### Health Plans

Year-Round

* **Integrate weather monitoring into regular care coordination team operations.**
* **Create a protocol for systematic outreach to patients at higher risk for the negative impacts of heat and wildfire smoke if there are hazards in their area.**
	+ Identify vulnerable populations through claims data to create a list for targeted outreach before an impending event.
* **Ensure educational information, resources and outreach are available to clients and accessible in multiple languages to match the needs of covered members.** Ensure materials are written at a 6th grade reading level.
* **Connect to resources to address social support needs.** Cover cost of preventative items such as air purifiers, N95 masks, air conditioners, as able for members at higher risk.
	+ Connect members to energy assistance programs to support their use of air purifiers or conditioners.
	+ Consider covering the cost of transportation to medical appointments or cooling centers during summer months.
* **Evaluate**. Evaluate efficacy in reaching members, providing support services and reducing heat and wildfire smoke related illness or exacerbations. Use claims data to track instances of heat-related illness visits, wildfire smoke exposure related visits, and visits for exacerbations of chronic conditions.

Before or During and Heat or Wildfire Smoke

* **Monitor heat and air quality using the CDC’s Heat Risk tool and Air Quality Index** and alert healthcare staff about impending or current concerns in temperature or air quality.
* **Provide targeted outreach to patients when an event is identified as imminent.** Assist patients and caregivers to reschedule appointments as necessary. Ensure patients and family have a plan for reducing their exposure to heat and wildfire smoke.
* **Authorize refills on lifesaving medications ahead of heat or wildfire smoke events.** Contact members to let them know to pick up their medications before an incoming heat or wildfire smoke event.
* **Create systematic targeted outreach to patients when an imminent event is identified.** Identify vulnerable populations through using claims data and stratify outreach by most vulnerable populations
* **Implement expedited claims processing** for inpatient members attempting to discharge to facilitate hospital throughput prior to extreme weather.

### Washington HCA

* Using Medicaid data, develop addition to emPOWER map for state and regional emergency planning that includes all data elements of emPOWER dataset
* Use Section 1115 Waiver or other mechanism to cover air conditioning and air filters for patients on Apple Health and/or Medicare at highest risk of morbidity and/or mortality from heat and wildfire smoke (e.g., adults living alone, older adults, those with chronic conditions and those living with disabilities) and living in areas most impacted by heat and [wildfire smoke](https://ecology.wa.gov/air-climate/climate-commitment-act/overburdened-communities). See Oregon’s Air Conditioner and Air Filter Deployment Program [here](https://www.oregon.gov/oha/HSD/OHP/Tools/AC-Air-Filtration-FAQ.pdf).
* Analyze claims data related to heat-related illnesses, exacerbations of chronic conditions to monitor and better predict healthcare response to extreme heat and inform allocation of resources and identification vulnerable populations. Compare trends and patterns of claims across different regions.
* Identify the risk factors and comorbidities that increase the likelihood of heat-related illnesses and hospitalizations, such as age, chronic conditions, mental health issues, homelessness, and social isolation. Use claims data to estimate the prevalence and distribution of these risk factors among Medicaid beneficiaries.
* Communicate and disseminate the findings and recommendations from the claims data analysis and the predictive model to relevant stakeholders, such as state and local public health agencies, healthcare providers, emergency responders, and policymakers. Provide actionable insights and guidance on how to prepare for and respond to extreme heat events, and how to prevent and reduce the adverse effects of heat on health.
* Consider developing data sharing agreement with Department of Health to investigate heat and wildfire smoke-related health outcomes associated with medications at higher risk.

### Local Public Health Jurisdictions

* **Develop heat and wildfire smoke response plans that are integrated with other emergency response plans**. Please see King County’s example for [heat](https://cdn.kingcounty.gov/-/media/king-county/depts/executive/climate-office/documents/finalheatstrategy071724optimized.pdf?rev=3fb7d49bf4d04bebaf2c65f184b01a5d&hash=1AE0DB5F333D790356B78D723F96CEC6) and [wildfire smoke](https://kingcounty.gov/en/-/media/king-county/depts/dph/documents/health-safety/environmental-health/healthy-water-air-soil/wildfire-smoke/wildfire-smoke-response-plan.pdf?rev=e29df5fde79941bd8b4ba531b68984f9&hash=91B9631D55E5EF47FB18E6E0830FCB22) to develop a plan that meets the unique needs and context of your community. Consider that community members may not want to abandon livestock or pets.
* **Use predictive tools to identify threshold for action**, such as NWS HeatRisk and the Air Quality Index (AQI) or more updated tools as they become available.
* **Identify organizations in your area that provide services to vulnerable groups and include them in response planning and activation.** These include long-term care facilities, local shelters, schools, outdoor camps, libraries, community-based and faith-based organizations, local public transportation, etc.
	+ Work with partners to embed guidance for extreme heat and wildfire smoke into processes for human services organizations active in your region.
	+ Include messaging to health care facilities when heat wave or poor air quality to alert of increased risk. Messaging should include signs and symptoms to watch out for, anticipatory guidance to provide patients, and contact information for relevant local public health authorities and healthcare coalitions.
* **Partner with communities to communicate and build capacity to protect against health impacts of heat and wildfire smoke.** Engage representatives from various communities in response planning and implementation.
	+ **Develop public education for heat and wildfire smoke that is tailored to the communities needs.** (e.g., 6th grade reading level, multiple languages reflecting communities they serve)
	+ **Consider coordinating outreach teams to check on neighbors and deliver water to individuals most at risk** (e.g., those living alone, people experiencing homelessness, etc)

### Washington Department of Health

* **Data sharing agreement with the Health Care Authority to use all payors claims database to…**
* **Education.** Promote public awareness and education on signs, symptoms and appropriate response for heat-related illnesses and smoke exposure. Support community-based organizations and local leaders to disseminate culturally and linguistically appropriate messages and materials.
* **Develop state-level heat and wildfire smoke action plans to support LHJs when they activate an IMT response.**
* **Surveillance and Monitoring.** Consider disseminating ED utilization trends to healthcare coalitions to monitor activity in different regions in the state~~.~~
* **.**.

### Washington Department of Social and Human Services

* **Develop or adopt heat and wildfire smoke educational materials or training for home care aides.** The training should include how to identify populations most vulnerable to heat and wildfire smoke, understand the way medicines interact differently during heat, how to prevent heat or wildfire smoke-related illnesses and death, and how to connect clients to social services that can reduce their exposure to heat and smoke, such as electricity assistance programs. See New York City’s [example](https://www.nyc.gov/assets/orr/pdf/Cool_Neighborhoods_NYC_Report.pdf).

### Employers

* **Benefit design.** Incorporate coverage for care coordination services either through fee-for-service or value-based arrangements.
* **Protect outdoor and indoor workers from heat and wildfire smoke exposure.** Use tools such as the NW Heat Risk tool and Air Quality Index to monitor for dangerous levels of heat and air quality. Follow Labor & Industries rules for heat ([Be Heat Smart](https://lni.wa.gov/safety-health/safety-training-materials/workshops-events/beheatsmart)) and [wildfire smoke](https://lni.wa.gov/safety-health/safety-topics/topics/wildfire-smoke) to protect workers, and implement a heat and air quality plans that include the following components:
	+ **Employee and management training.** Train supervisors/managers on how to respond to heat and poor air quality, including heat-related illnesses, first aid measures and emergency protocols.
	+ **Acclimatization protocols.** Ensure new workers gradually increase their workload over a few weeks, and workers returning from extended breaks gradually increase their workload.
	+ **Rest breaks, shade and hydration.** Ensure access to rest breaks, shade and safe drinking water that follow NIOSH and state level regulations, allow workers to drink small amounts of water throughout the day.
	+ **Ventilation and Air Conditioning, including personal cooling devices.** Ensure equipment is available, including air conditioners and filtration devices, to maintain safe temperatures and air quality. Consider utilizing mobile structures to provide cooling space for employees.
	+ **Emergency Response. E**nsure employees and supervisors understand when and where to seek immediate medical attention. If possible, provide on-site medical assistance.

### Pre-hospital Healthcare (EMS)

* **Establish and train relevant staff on protocols for heat-related illness that include recognition, rapid cooling and supportive care.[[10]](#endnote-11)**
	+ Ensure the protocol emphasizes cold water immersion as first line therapy if available, do not stop cold water immersion to transport the patient; **cool first, transport second.**
* **Monitor and protect EMS personnel and patients from exposure to wildfire smoke and poor air quality,** using appropriate personal protective equipment (PPE) such as N95 respirators.
* **Capture impressions of heat-related and/or wildfire smoke exposure related illness and report any cases of heat-related or wildfire smoke-related illness to local health authorities.**

### Washington State Legislature

* Consider funding requiring family homes to acquire and use air conditioners and high-quality air filers and requiring adult family homes Examples [here](https://www.portland.gov/phb/documents/appendix-f-phb-air-conditioning-requirements-1/download) and [here](https://dallascityhall.com/departments/codecompliance/DCH%20documents/docs/Chapter%2027%20Reference%20Manual%20%282%29%20%28003%29.pdf).
* Consider including additional funding to subsidize higher electricity costs from using air conditioners and purifiers in geographies most impacted by heat and wildfire smoke.

The workgroup endorses use of a standardized tool to indicate thresholds for action for heat and wildfire smoke.

 [The National Weather Service’s HeatRisk Tool](https://www.weather.gov/media/safety/NWS-HeatRisk-X3-2024.pdf) is a color-numeric-based index that provides a forecast risk of heat-related impacts to occur over a 24-hour period. HeatRisk takes into consideration not just the flat temperature at a given time, but how unusual the heat is for the time of year, the duration of the heat in both daytime and nighttime temperatures and if those temperatures pose an elevated risk of heat-related impacts based on Centers for Disease Control (CDC) data. The figure below shows the different levels and risk of heat-related impacts by threshold:



The Air Quality Index (AQI) is a tool that provides information on the levels of air pollutants and their health effects. The AQI was developed by the Environmental Protection Agency (EPA) and is based on national air quality standards for six criteria pollutants: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead. The AQI assigns a color and a number from 0 to 500 to each pollutant, with higher numbers indicating higher levels of pollution and greater health risks. The AQI can be used to plan outdoor activities, reduce exposure to unhealthy air, and protect sensitive groups such as people with asthma, heart disease, or lung disease. Air quality can be monitored via [AirNow.gov](https://www.airnow.gov/?city=Seattle&state=WA&country=USA), with detailed information down to zip code about air quality. The figure below describes the health impacts by air quality threshold. 

Heat has a greater impact on some populations more because of exposure, sensitivity, and adaptive capacity. Exposure is the extent to which people are subject to heat stress in their environment, which can vary depending on factors such as living in an urban area, housing quality, access to cooling, and air pollution. Sensitivity refers to the degree to which people are affected by heat stress, which can depend on factors such as age, medical conditions, medication use, and hydration. Adaptive capacity refers to the ability of people to cope with and recover from heat stress, which can be influenced by social drivers of health such as social support, income, education, housing, transportation and access to health care.

More vulnerable populations include:

* **Ages and life stages** **(*infants and children, pregnant women, older adults*):** These groups have higher physiological sensitivity to *heat and wildfire smoke* and may have limited ability to regulate body temperature, seek shelter, or access health care. Infants and children are more likely to experience dehydration, fever, and electrolyte imbalance due to heat, or respiratory symptoms like coughing, wheezing, decreased lung function or pneumonia. Pregnant women are at increased risk of severe maternal morbidity (SMM), preterm birth, and low birth weight due to heat, and wildfire smoke may increase the risk of low birth weight or preterm birth. Older adults are more likely to have chronic medical conditions, reduced mobility, cognitive impairment, or social isolation that can exacerbate the effects of heat and wildfire in addition to a reduced ability to regulate their body temperature.
* **People physically active outdoors or in hot indoor spaces (*athletes, outdoor and some indoor workers, emergency responders*):** These groups have higher exposure to heat and may exert themselves physically, which can increase the risk of heat exhaustion, heat stroke, dehydration, and cardiovascular events. Higher exposure to wildfire smoke for outdoor workers can increase risk of negative impacts especially without adequate protection. Workers in occupations such as agriculture, construction, and utility may also face additional hazards such as heavy equipment, pesticides, or electric shocks that can compound the effects of heat. Emergency responders may encounter situations where they must wear protective gear, work in confined spaces, or assist people in distress, which can increase their heat stress.
* **People disproportionately exposed to heat, sensitive to heat or with limited adaptive capacity (*people experiencing homelessness, people with chronic medical conditions, people with disabilities, people who are incarcerated, people with low income, marginalized communities*):** These groups may face multiple barriers to accessing cooling, hydration, health care, or social support during heat events. People experiencing homelessness may lack shelter, clothing, or personal belongings that can protect them from heat. People with chronic medical conditions such as diabetes, heart disease, kidney disease, or mental illness may have impaired thermoregulation, increased fluid loss, or may have adverse reactions to medications due to heat.[[11]](#endnote-12) For example, cardiovascular disease is a primary cause of increased risk of death during heatwaves, and respiratory disease (particularly COPD) predisposes individuals to experience death by respiratory disease, and a secondary cause of death during higher temperatures. Wildfire smoke exposure increases ischemic events, as well as worsens heart failure and arrythmias. Cerebrovascular disease is the tertiary cause of death during heatwaves mostly caused by heat-related reductions in cerebral blood flow and damage to the blood-brain barrier. Heat can cause dehydration, which can lead to or facilitate kidney fibrosis and potential failure. Chronic kidney disease can predispose individuals to cardiovascular events during heat, and wildfire smoke increases excess same-day mortality for dialysis patients, decreases renal function and hastens progression to end-stage renal disease. Diabetes reduces skin blood flow and sweating during heat waves. Mental health conditions can increase risk of contracting heat-related illness due to physiological thermoregulatory inhibitions from medications or behavioral changes which influence adapted capacity. Patients with asthma, chronic obstructive pulmonary disease and other chronic respiratory conditions are particularly vulnerable to smoke, and can experience increased respiratory symptoms, emergency room visits or hospitalization. Besides chronic conditions, other factors influence adaptive capacity; people with disabilities may have reduced mobility, communication, or self-care abilities that can limit their adaptive capacity to heat. People who are incarcerated may be confined in overcrowded, poorly ventilated, or uncooled facilities that can increase their heat exposure and stress.

### Drivers of Inequitable Impact

While anyone can be impacted by heat and wildfire smoke, certain groups of people experience a higher level of impact. According to the Washington Department of Health, 61% of heat-related deaths from June 26-August 30, 2021 were male, and 47% were between the ages of 65-79. Another 25% were between 45-64 and 20% were 80+ in age. 77% of those who experienced heat-related deaths were Non-Hispanic White, followed by 6% Hispanic and 6% Non-Hispanic Black. The preliminary death counts by county show 21% of deaths occurring in King County, 18% in Pierce, 12% in Spokane and 10% in Snohomish.[[12]](#endnote-13)

Our communities do not experience heat and wildfire smoke in the same way. Social drivers of health compound the impact of climate change for specific groups of people. For example, lack of access to adequate and affordable housing; people who have lower incomes are more likely to live in older, substandard, and overcrowded housing units that lack insulation, ventilation, air conditioning, and other cooling devices. These housing conditions can create indoor heat islands that exacerbate the effects of outdoor heat waves and increase the risk of heat-related illness and death. Redlining, or the discriminatory practice of denying or limiting services to specific neighborhoods based on their racial or ethnic background, pushed marginalized groups to live in neighborhoods with less green space, fewer buildings that could provide cooling centers, and areas with worse housing quality. Studies have shown that redlined neighborhoods experience higher levels of heat stress, heat-related hospitalizations, and mortality than non-redlined areas, as well as greater exposure to PM 2.5 and other air pollutants. Redlining also affects access to health care, social services, transportation, and education, creating multiple barriers for residents to cope with and recover from climate-related health impacts.

People belonging to marginalized racial and ethnic groups are also disproportionately exposed to occupational heat stress. People from BIPOC communities and immigrants are overrepresented in outdoor and indoor occupations that involve high levels of physical exertion, such as agriculture, construction, landscaping, manufacturing, and warehousing. These workers often lack adequate protection, training, and access to water, shade, and rest breaks, increasing their risk of heat exhaustion, heat stroke, and other heat-related illnesses. Furthermore, these workers may face economic and social pressures to continue working despite the heat, such as fear of losing income, job security, or immigration status. Occupational heat stress can also affect the health and well-being of workers' families and communities, as they may suffer from chronic diseases or experience mental stress.

Heat-related illnesses and deaths can be prevented or reduced by implementing evidence-informed, coordinated efforts across sectors, such as early detection and warning systems, preventive education and communication, and standardized clinical protocols for reducing risk related to heat exposure. Furthermore, addressing the underlying social and environmental determinants of health that make certain populations more vulnerable to heat can help reduce health disparities and promote health equity in the face of climate change.

## Wildfires and Wildfire Smoke

Excess heat increases the likelihood of wildfires, which pose serious threats to human health, ecosystems, and infrastructure. Wildfires are driven by a combination of factors, including higher temperatures, drought, accumulation of dry vegetation, and human activities such as land clearing and arson. Climate change exacerbates these factors by creating hotter and drier conditions that make fires more likely to ignite and spread. Furthermore, climate change can alter the patterns of wind and precipitation that affect fire behavior and management. As a result, wildfires are becoming larger, more destructive, and more difficult to control.

Wildfire smoke creates unsafe air quality by emitting pollutants, including particulate matter (PM 2.5), carbon monoxide, nitrogen oxides, formaldehyde, benzene and other unsafe chemicals. The composition of these chemicals’ changes depending on the particular fire, such as vegetation versus buildings or structures. Particulate matter is harmful to human health because it is small enough to be inhaled (0.4-0.7 um diameter).In particular, wildfire smoke exposure has been shown to increase all-cause mortality and impact respiratory health.[[13]](#endnote-14)[[14]](#endnote-15) A health impact assessment of the 2020 wildfire episode found an estimated ~38 cases of all-cause mortality and ~16 cases of respiratory mortality attributable to wildfire smoke, with the largest counties (King, Snohomish, Pierce) experiencing most mortality burden due to large populations. However, the most severe pollution levels were recorded in central and eastern Washington.[[15]](#endnote-16) Counties in these regions experienced the largest per-capita all-cause mortality increases, and have higher populations of outdoor workers, particularly farmworkers, during the summer months when there are more heat and wildfire smoke events. Reducing 40% of PM2.5 exposure by providing HEPA-PACs for the population living below the poverty line could result in a reducing of 4 cases of all-cause mortality during wildfire smoke episodes.[[16]](#endnote-17)

In a separate analysis 2012, wildfire smoke in Chelan, Douglas, Kittitas, Grant and Okanogan counties increased emergency room visits for children with respiratory disease (asthma, respiratory and chest symptoms and acute respiratory infections) excessively during and after wildfire smoke episodes.[[17]](#endnote-18) In 2022, emergency department visits doubled during wildfires for kids with respiratory illnesses, and Hispanic children were 1.7x as likely as non-Hispanic White children to visit the ED during a wildfire smoke episode.

Clinicians play a pivotal role in both mitigating and responding to the health impacts of climate change within the broader context of advocating for structural changes to prevent such disasters. As frontline healthcare providers, clinicians are uniquely positioned to recognize and address the direct health consequences of climate change, including heat-related illnesses, and respiratory ailments exacerbated by air pollution, and exacerbations of other conditions due to heat or wildfire smoke. By integrating climate change considerations into their clinical practice, clinicians can educate patients about the health risks associated with environmental changes, offer guidance on adaptation strategies, and advocate for policies that prioritize public health and environmental sustainability.

## Appendix I. Medications that may increase risk of harm on hot days (Adapted from the CDC)

|  |  |
| --- | --- |
|  | Medications that may increase risk of harm on hot days |
| **Medication Type** | **Drug Class** | **Probability of Risk** | **Examples** | **Mechanisms** |
| **Cardiovascular medications** | **Antihypertensives**  | Diuretics | High | Furosemide Hydrochlorothiazide Acetazolamide | Electrolyte imbalanceVolume depletion, dehydration and increased risk of fainting and fallsReduced thirst sensation.*Notes: Causes increased urine output; may lead to significant fluid and electrolyte loss.* |
| Beta blockers |  | AtenololMetoprololPropranolol | Reduced superficial vasodilationDecreased sweatingReduced blood pressure, increased risk of fainting and falls |
|  | Calcium channel blocker |  | AmlodipineFelodipineNifedipine | Decreased blood pressure, increased risk of fainting and fallsElectrolyte imbalance |
| Angiotensin Converting Enzyme Inhibitor **(ACEi) and**Angiotensin II Receptor blockers **(ARBs)** |  | **ACEi**:EnalaprilLisinoprilRamipril**ARB:**ValsartanLosartan | Decreased blood pressure, increased risk of fainting and fallsReduced thirst sensation |
| Angiotensin Receptor-Neprilysin Inhibitors (**ARNIs),**combination drug including ARB |  | Sacubitril/Valsartan | See ARBs |
|  | **Anti-platelet medications** |    |  | Clopidogrel | Reduced superficial vasodilation |
|  | Aspirin |
|  | **Antianginals** | Nitrates |  | Glyceryl Trinitrate, Isosorbide Mononitrate  | Worsened hypotension |
| **Psychiatric medications** |   | Mood stabilizer | Medium-high | Lithium | Diabetes insipidus induced water loss and risk for fainting, fallsElectrolyte imbalanceRisk for toxicity in setting of dehydration because of narrow therapeutic index; *Notes: affect fluid balance* |
| Antipsychotics | Medium-high | Haloperidol, Olanzapine, Quetiapine, Risperidone | Impaired sweatingImpaired temperature: *Notes: interfere with heat regulation.* |
| Selective Serotonin Reuptake Inhibitors **(SSRI)**and Serotonin and Norepinephrine Reuptake Inhibitors **(SNRI)** |  | **SSRI:**Fluoxetine, Sertraline**SNRI:**DuloxatineVenlafaxine | Increased sweating |
| Tricyclic antidepressants **(TCAs)** |  | Amitriptyline, Clomipramine | Decreased sweating |
| **Antiseizure medications** |  |  |  | Topiramate | Decreased sweating |
|  | Oxcarbazepine | Increased sweatingIncreased urination |
|  | Carbamazepine | Dizziness and weakness, especially after increased dose |
| **Antihistamines with anticholinergic properties** |  |  | Medium-high | Promethazine, Doxylamine, Diphenhydramine | Decreased sweatingImpaired thermoregulation; *Notes: Reduces sweat production, potentially impairing heat dissipation.* |
| **Analgesics**  |  | Nonsteroidal anti-inflammatory drugs (NSAIDS) | Medium |  | Kidney injury with dehydration;*Notes: May affect fluid balance and increase the risk of dehydration* |
| Aspirin |  |  | Increased heat production with overdoseKidney injury with dehydration |
| Acetaminophen |  |  | Heat related liver injury increase risk for acetaminophen hepatoxicity |
| **Antibiotics** |  |  |  | Sulfonamides | Kidney injury risk with dehydration |
| **Antiretrovirals** |  |  |  | Indinavir | Kidney injury risk with dehydration |
| **Thyroid replacement** |  |  |  | Levothyroxine | Excessive sweating  |
| **Stimulants** |  |  |  | Cocaine | Reduced sweatingReduced dilation of skin blood vesselsImpaired heat perception |
|  | Amphetamine, Methylphenidate | Increased body temperature |
| **Hallucinogens** |  |  |  | Methyl​enedioxy​-methamphetamine (**MDMA**) (and alternatives) | Reduced sweatingReduced skin blood vessel dilationImpaired heat perception |
| **Alcohol** |  |  |  |  | Increased sweatingIncreased urinationImpaired heat perception |
| **Opioids** |  |  |  |  | Increased sweating, Decreased blood pressureImpaired heat perception |
| **Insulin** |  |  |  |  | Heat can damage insulin making it less effective [[18]](#endnote-19) |

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## Appendix II Patient-Directed Guidelines

### Patients and Families

* **Know your heat and wildfire smoke risk.** Many people are at increased risk of negative health impacts related to heat and wildfire smoke, including older adults, children, people with chronic conditions like cardiovascular disease, kidney disease, heart failure, asthma, people who are pregnant, and people with certain occupations like agriculture or construction
* Know the signs of heat-related illness and smoke exposure– See [**Appendix X Heat-Related Illness Signs and Symptoms**](#_Appendix_X_Heat-Related) **and** [Wildfire smoke and your health - Canada.ca](https://www.canada.ca/en/health-canada/services/publications/healthy-living/wildfire-smoke-health.html)
* When a period of high temperatures (e.g., heat wave) or wildfire smoke is expected, make a plan with your household members to reduce exposure to heat and smoke. Examples [here](https://www.americares.org/wp-content/uploads/PATIENTS-Heat-Heat-Action-Plan-V1.pdf) and here.
* During high temperatures, heat waves or when the air quality is poor:[[19]](#endnote-20)
	+ **Stay out of the heat and indoors to avoid exposure to wildfire smoke**. Avoid going outside or doing strenuous activity. Stay in the shade, spend 2-3 hours during the day in a cool place.
	+ **Keep your home or building cool**. When air quality is good, use the night air to cool down your home by opening your windows after dark. During the day, close windows and cover them with blinds or shutters to block direct sunlight. Turn off electrical devices if possible and safe. Postpone vacuuming until air quality improves. Use electric fans **when temperatures are below 104F/40C**. If using air conditioning, set the thermostat to 81F and turn on an electric fan.
		- **Smoke and heat can make each other worse**.
	+ **Keep your body cool and hydrated**. Use light, loose-fitting clothing and bed linens, take cool showers or baths. Wet your skin using a damp cloth, spray or wet light clothing. Drink water regularly.
	+ **Regularly check in with neighbors and vulnerable people in your circle** – especially those over 65, those with heart, lung or kidney conditions, mobility concerns or those who live alone.
	+ Protect infants and children. **Never leave children or animals in a parked vehicle for any amount of time.** Avoid direct exposure to the sun during peak hours, seeking shade or staying indoors instead. Never cover an infant stroller or pram with dry fabric – this makes it hotter inside the carriage; instead use a thin wet cloth and rewet as necessary to lower the temperature. Dress children in lightweight loose-fitting clothing that covers the skin, and use wide-brimmed hats, sunglasses and sunscreen to protect them.
* **If you work outside, your employer should protect you from heat and wildfire smoke.**
	+ Review Washington Labor & Industries [Be Heat Smart](https://lni.wa.gov/safety-health/safety-training-materials/workshops-events/beheatsmart) website and [educational pamphlet](https://lni.wa.gov/forms-publications/F417-218-909.pdf) and [Wildfire Smoke](https://lni.wa.gov/safety-health/safety-topics/topics/wildfire-smoke#overview) website and resources

## Appendix III Heat-Related Illness Signs and Symptoms

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| --- | --- | --- |
| **Illness** | **Signs/Symptoms** | **What to Do** |
| **Heat Stroke** | High body temperature (103F or higher)Hot, red, dry or damp skinFast, strong pulseHeadacheDizzinessNauseaConfusionLosing consciousness (passing out) | **Call 911 right away,** heat stroke is a medical emergencyMove the person to a cooler placeHelp lower body temperature with cool cloths or a cool bathDo not give them anything to drink |
| **Heat exhaustion** | Heavy sweatingCold, pale, clammy skinFast, weak pulseNausea or VomitingMuscle crampsTiredness or weakenessDizzinessHeadacheFainting (passing out) | Move to a cool placeLoosen clothesPut cool wet cloths on body or take a cool bathSip water**Get medical help right away if:** vomiting, symptoms get worse or last longer than 1 hour |
| **Heat Cramps** | Heavy sweating during intense exerciseMuscle pains or spasms | Stop physical activity and move to a cool placeDrink water or sports drinksWait for cramps to go away before doing any more physical activity**Get medical help right away if:** cramps last longer than 1 hour, you’re on a low sodium diet or you have heart problems |

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