Exposure to high temperatures can result in increased morbidity and mortality for patients with chronic lung diseases, such as chronic obstructive pulmonary disease (COPD) and asthma.1–3

**Heat Exposure Risks for People with COPD and Asthma**

Exposure to hot air has been shown to markedly increase bronchoconstriction in asthmatic patients.4 Short and long term exposures to heat may impair lung function. A study of >1100 U.S. adults found that a 5°F increase in the three-day moving average temperature was associated with a 0.7% decrease (95%CI: -1.24, -0.20) in FVC and a 5% increase in the 7-day moving average relative humidity was associated with a 0.2% decrease (95%CI: -0.40, -0.02) in FVC and FEV1. These effects were heightened with concurrent exposure to particulate matter.5

Heat promotes ground level ozone pollution which causes oxidative inflammation in the lung. Ground level ozone pollution is formed when sunlight reacts with oxides of nitrogen and volatile organic compounds.

You can learn the air quality for your zip code by going to [airnow.gov](https://airnow.gov). Many smartphone weather apps also have air quality reports included in them.
The screenshot at the right from airnow.gov shows the air quality for Boston, Massachusetts. The Air Quality Index (AQI) is based upon measurements of ozone air pollution and particulate matter air pollution. The AQI is assessed based upon the pollutant that poses greater risks. Above, you can see the recommended precautions based upon AQI values.

When you scroll below the air quality gauge seen at the right, you will see the AQI forecast for the next 2 days, as well as the individual air quality levels for ozone and particulate matter.

The AQI may not reflect local air pollution exposures, especially from traffic. If a patient lives near, and especially downwind from, a highway or industrial facility, their air pollution exposures may be considerably higher.

AQI measures outdoor air quality; air quality indoors may be the same or worse depending on ventilation and indoor sources of air pollution. When the AQI is <50, opening windows is often the best way to maintain indoor air quality. When the AQI is higher, close windows to limit polluted outdoor air from entering the home. Forced air systems that blow hot or cold air into rooms can increase delivery of polluted air from outdoors.

**Comorbidities**

Common comorbidities of COPD in adults, including heart disease, diabetes, hypertension, mental health disorders, and neurological diseases, may increase risk of harm from heat exposure. In a review of heat-related deaths in the United States between 2004-2018, nearly half were attributable to underlying cardiovascular disease.

**Medication Considerations**

Inhalers may not deliver the full dose of medication if left in the heat. Temperatures inside car glove compartments, car trunks and mailboxes, where inhalers may be left for long periods, can often exceed 100°F and result in inhaler malfunction.

Many prevalent COPD comorbidities may result in medication prescriptions that can increase risk of harm with heat exposure. While more research is needed, several studies have found the following classes of medications to increase risk of hospitalization in heat: ACEIs, ARBs, beta blockers, diuretics, antipsychotics, SSRIs. No trials have been conducted to guide clinical decision making in light of these increased risks.

In the event that an individual who has asthma or COPD is prescribed a statin for another indication, limited research has found that statins may be protective against heat exposure.
Temperatures of Concern

The temperatures that increase risk of harm for patients with COPD or asthma may be far lower than those considered dangerous to many people. For most cities in the United States, the minimum mortality temperature (the temperature above which mortality increases) is just below the 80th percentile of the annual temperature range. Temperatures tend to peak in mid to late afternoon. The time of day with the highest temperatures in a geographical area can be found here.

The National Weather Service (NWS) issues heat advisories, excessive heat watches and excessive heat warnings. To see if a heat alert has been issued for your location, check the weather app on your smartphone, or go to weather.gov and either click your county or type in your zip code. For more details on how to access NWS alerts for heat (and other weather extremes), as well as the differences between heat watches and warnings, see the accompanying toolkit document titled “Accessing Weather Alerts from the National Weather Service”.

Built Environment

The forecast temperature available to patients may not accurately represent the temperature they are exposed to in their home or community. The upper levels of multi-story buildings, especially those without air conditioning, may be much warmer than lower levels.

Urban heat islands can result in temperatures more than 4°F higher than reported due to factors such as fewer trees and parks, more asphalt and concrete, and more traffic. Black American, Hispanic, and lower-wealth communities often live in neighborhoods with greater urban heat island effects. Homeless individuals are at particularly high risk of heat exposure.

Heat Action Plans for Patients with COPD and Asthma

Appropriate guidance for patients with COPD or asthma should be based upon an assessment of the severity of their disease, comorbidities, AQI, occupation (especially if outdoors), access to air conditioning at home, and excess heat exposure from an urban heat island or the home environment. Prior to a heat event, you can work with at-risk patients to develop a plan. For guidance, see the accompanying toolkit document titled “Establishing a Heat Action Plan for Patients”.

Anticipatory Guidance for Providers to Give to Patients

Anticipatory guidance for hot days may contribute to improved health outcomes. These points are covered in the accompanying toolkit document titled “Tip Sheet for Patients with COPD and Asthma: Staying Safe When It’s Hot Outside”, which we encourage you to review with patients.

1. Before going outside, check the weather forecast on your phone, TV, radio, or internet (e.g., at weather.gov or weather.com).
2. Before going outside, check the AQI on your phone’s weather app or at airnow.gov. When the AQI is below 50, it is safe to be outdoors. When the AQI is over 50, avoid burning anything inside, such as gas for cooking, wood in fireplaces and stoves, or incense. Refer to your heat action plan for guidance on what to do.
3. If a patient does not have a thermostat or thermometer that measures room temperature in their home, they can be bought for a few dollars at hardware stores or online. Consider having inexpensive thermometers available in your clinic to distribute.
   A. Indoor temperatures in the patient’s home should remain below 80°F. If they cannot keep the temperature below 80°F, they should consider moving to an air-conditioned space until the temperature cools.
4. When a heat advisory or heat alert has been announced by the National Weather Service (see “Accessing Weather Alerts from the National Weather Service” for more information), advise patients to:
   A. Follow their heat action plan (see “Establishing a Heat Action Plan for Patients” for guidance)
   B. If a heat advisory is issued, patients with COPD/asthma should preferably stay indoors in an air-conditioned space. If going outside is necessary, limit outdoor activities, especially during the hottest part of the day.
C. If an excessive heat warning is issued, COPD/asthma patients should remain in air-conditioned spaces until the warning expires.

5. For tips on how COPD and asthma patients can stay safe in the heat see “Tip Sheet for Patients with COPD and Asthma: Staying Safe When It's Hot Outside”.

References


