

Health Advisory: Outdoor Physical Activity and Smog

Presented by:



The purpose of this advisory is to provide the best available information about the health risk of outdoor physical activity when air pollution or smog is present and about actions you should take to protect your health during those times. This advisory also offers many suggestions that individuals, parents and guardians, and institutions such as schools, camps and day care centers can consider to maintain a healthy exercise regimen while avoiding the ill effects of unhealthy air quality.

Summary

While there are many pollutants affecting outdoor air quality in Georgia, among the two of greatest concern are ground-level ozone and fine particulate matter (PM_{2.5}), also called “particle pollution.” The news media and others often refer to both of these pollutants as “smog.”

Ozone and particles differ in many ways, however. They are chemically different, they are physically different, and they may affect our health differently. In terms of planning physical activity outdoors, three differences between ozone and PM_{2.5} are especially important: time, place, and person. Ozone and particle pollution reach their highest concentrations in outdoor air at different times and at different locations. And, different people may be especially sensitive to their differing health effects.

Although air quality is a year-round concern, most high smog days occur during the warm months of late spring and summer--when people also spend more time outdoors involved in physical activities. While regular exercise is vital to a healthy lifestyle, activity outdoors at times when the air is polluted can harm the heart and lungs, which may lead to other serious health effects.

The health risk rises as outdoor concentrations of either ozone or particle pollution rise. For individuals, this means that a person is more likely to have symptoms as air pollution concentrations increase. Some people react at lower pollutant concentrations than others, but when the concentrations are high, everyone is at some risk. As a result, health experts advise more caution as air pollution increases. At lower air pollution levels, the young, the elderly, and those with medical conditions affecting the heart and lungs should consider limiting the type, duration and location of outdoor activity. This may occur when the Air Quality Index (AQI) is in the “unhealthy for sensitive individuals” range and for some, even the less severe “moderate” range. At very high smog levels, when the AQI is in the “unhealthy” and “very unhealthy” ranges, everyone should limit outdoor activity.

Information about local air quality and the AQI is available from the Georgia Environmental Protection Division and reported through many major media outlets including TV, radio, newspaper, Internet, and telephone hotline.

In order to protect their health, people should:

- become aware of their personal sensitivity to air pollution
- pay attention to local information on air quality, especially during the “smog season” (May - September)
- change their physical activity patterns, when appropriate, to protect their health
- follow medical advice to care for any respiratory or other illnesses

Introduction

Regular exercise is a vital health-promoting activity to improve cardiovascular endurance and prevent obesity, and warm weather months are a popular time for people to engage in outdoor physical activity. However, this also is the time of the year when the outdoor air can contain high concentrations of numerous pollutants, commonly known as smog. *The main questions addressed by this advisory are: what are the health risks from outdoor activity during the smog season, and what precautions should people and institutions take to minimize this risk?*

What is smog?

Smog, a word derived from “smoke” and “fog,” is commonly used to describe all human-made airborne pollutants – some that can be seen and/or smelled, and many others that cannot, but may still cause adverse health effects. In Georgia, two important pollutants known to threaten health are ground-level ozone and fine particulate matter (PM_{2.5} and also called particle pollution).

Ozone is a colorless gas found naturally in the atmosphere. High in the stratosphere, it forms a shield that protects all life from the harmful effects of the sun. High concentrations of ozone near the earth’s surface are unnatural however, and can be harmful to humans, animals, and plants. During the late spring and summer, chemical reactions in the lower atmosphere may transform emissions from motor vehicles, industry, and natural sources into ozone that accumulates at ground level. Though there are some exceptions, ozone concentrations tend to be highest in the late afternoon and early evening hours, generally from about 2:00 PM to 7:00 PM.

Particle pollution may be solid or liquid and come in a variety of sizes, shapes, and chemical compositions. There are both natural and human-made sources of particle pollution such as forest fires, dust storms, road dust, motor vehicles, factories, and power plants. While large particles may settle to the ground relatively quickly and without causing harm, fine particles (less than 2.5 micrometers in diameter, or about 1/30th the width of a human hair) can remain suspended in the air for long periods. When breathed in by humans, these particles can penetrate deeply into the lungs to threaten health.

While ozone concentrations are highest in the warm parts of the day in the warm parts of the year, particle pollution is a year-round problem and can be present throughout the day.

How does smog affect health?

Scientific studies have shown that breathing polluted air is harmful to human health. Initially, temporary changes in lung function can occur without causing any detectable symptoms. When symptoms do appear, they may include cough, chest tightness or congestion, wheezing, inability to breathe deeply, and fatigue. Changes in heart rate and blood pressure have been attributed to breathing some types of particles. Air pollution is recognized as contributing to premature deaths from both cardiovascular (heart and circulatory) and lung diseases. The short-term effects of air pollution on health are better understood than the long-term effects, although evidence suggests that children with chronic exposure to air pollution may have increased chances of developing asthma and decreased lung development.

Who is vulnerable to the effects of smog?

Everyone is susceptible to the effects of smog if exposure is high enough. Even healthy athletes can lose some lung function from exercising when ozone concentrations are high. However, certain features make some people more susceptible:

- **Age:** The very young and the elderly are especially susceptible. Children have narrow airways, breathe more air per unit of body weight, breathe at higher rates, are more likely to mouth-breathe, and tend to be active outdoors. Seniors have less effective natural defenses and are more likely to have underlying heart or lung disease.
- **Health:** People with asthma (an increasingly common condition), chronic bronchitis, emphysema, diabetes, and other heart and lung diseases may be especially susceptible to air pollution health effects.
- **Exposure:** People who are heavily exposed, such as outdoor workers (e.g. construction workers, landscapers, crossing guards) may be especially susceptible.
- **Activity:** People who are physically active can double or triple the amount of air they breathe, increasing their exposure, and therefore their susceptibility.

Is outdoor activity during smog season safer at some hours of the day?

Because very high ozone and particle pollution episodes do not always occur during the same time of the day, the answer to this question unfortunately is, *it depends*. If ozone is high, pollutant concentrations tend to peak in the late afternoon and early evening. Therefore on high ozone days it is generally advisable to exercise outdoors in the morning (earlier than noon) or at night (after 7 PM), or try to move exercise indoors at any time.

Since high particle pollution can occur throughout the day, on days when PM_{2.5} is high it may be necessary to plan physical activities indoors, especially if you are someone who may be part of a sensitive group.

How are smog concentrations reported?

The air pollutants that make up smog are usually described in two ways. It is common for ozone and particle pollution to be reported in precise numbers, for example, 52 parts per billion (ppb) of ozone, or 22 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of PM_{2.5}. Second, a measure called the Air Quality Index (AQI) may be used to rate air pollution on a scale from 0 (the cleanest) to 500 (the most polluted). Health warnings are set according to medical research studies that link health risks with different levels of airborne pollutants. The health-based standard for each pollutant is set at 100. Some people may experience adverse health effects when the AQI is below 100. More begin to experience effects above 100. At 150 and higher, most people will experience adverse health effects.

The Georgia Environmental Protection Division issues a “Smog Alert” whenever the AQI is predicted to exceed 100. Both kinds of air quality information are available from the Georgia Environmental

Protection Division, and the AQI is reported through many major media outlets including TV, radio, newspaper, and the Internet.

Many information sources exist to help you plan ahead.

Current air quality information and forecasts for the next day are available via roadside advisory signs, television, radio, the Internet (www.cleanaircampaign.com, www.epa.gov/airnow, and www.air.dnr.state.ga.us) and the Georgia Environmental Protection Division's Air Quality Hotline (404-362-4909). These forecasts can be useful in determining which pollutants are likely to be high the following day and what strategies you can take to limit exposure.

How do I know if I am sensitive to smog?

Even a healthy person may be sensitive to air pollution, and may not tolerate a generally "safe" level, i.e., when the AQI is below 100. People should be aware of symptoms that may develop while exercising outdoors when smog is elevated. If you develop a tight chest or difficulty breathing while exercising when the air quality index reaches a certain point, you may well be experiencing a reaction to air pollution. If this occurs, you and your doctor should consider changes in your exercise pattern.

What can a person do to be active or exercise safely during periods of smog?

Time spent outdoors is an important health-promoting activity. For **OZONE**, the recommendations are relatively simple. Adjust the time of exercise, and adjust the place. When ozone concentrations are high, they are typically high in the late afternoon and early evening. Therefore, on high-ozone days, outdoor exercise is best in the morning (before noon) or in the late evening or night-time hours when outdoor ozone is not as high. Another option is to switch to indoor exercise at high-ozone times of the day, since indoor ozone concentrations tend to be lower than outdoor concentrations. If exercising outdoors is your only option, then participants should consider taking it easier (for example walking instead of jogging) and limiting time outside (for example playing two sets of tennis instead of three). It is important to know your own limits and "listen to your body" and stop exercising if symptoms develop. If you are sensitive to air pollution at a certain level, you should modify, reduce, or avoid your outdoor physical activity when the air quality reaches that level.

For **PARTICLE POLLUTION**, the recommendations are different. Particle pollution can occur throughout the day. So if you are a person who may be susceptible—somebody with heart disease, arrhythmias, or respiratory disease—and you know that particle pollution is high, you may want to reduce or avoid physical activity for that day. Less sensitive individuals should move exercise indoors and monitor their bodies' response.

In general, it's a good idea to avoid physical activity near busy roads during periods of heavy traffic (such as morning and afternoon rush hours) if you can. Concentrations of PM_{2.5} and other pollutants are highest near roadways with heavy traffic. It is generally safer to exercise outdoors at locations away from traffic such as jogging trails and recreational parks. However, during periods when smog is high, ozone and particle pollution can remain a problem even at these locations. Also, remember to drink plenty of water when you exercise. Finally, if your health care provider has prescribed medications—say, an inhaler for your asthma—it is very important to take it as prescribed.

What should school, camp, and child care officials do during smog episodes?

Principals, teachers, coaches, and school officials can take steps to protect children from harmful exposure to air pollution. They should be aware of air pollution concentrations each day. Information is easily accessible

from the sources listed previously. Consider registering to receive Smog Alerts via e-mail from The Clean Air Campaign by visiting http://www.cleanaircampaign.com/tools/sign_up_form.

On days when ozone concentrations are forecasted to be high, outdoor events such as recess, sports, and band practice can be moved to the morning hours to avoid the late afternoon peak, or moved inside. As an alternative to avoid daily disruptions, schools and other programs can routinely schedule these activities for the morning during the summer ozone season. When particle pollution is elevated, general precautions should be taken to minimize exposure throughout the day.

School and other officials should be aware of the symptoms that some children will have in response to air pollution. They should consider and honor requests from parents to excuse individual students from physical activities when air pollution is forecasted to be high for the area. Coaches should be aware that their players may develop symptoms in relation to air pollution; solutions include offering frequent breaks, rotating and resting players more often, supporting players' use of prescribed medications, moving some practice activities inside, or even canceling practice when air pollution is high. The "no pain, no gain" approach to athletic conditioning is dangerous in an area with high concentrations of air pollution. Children with asthma should carefully follow their treatment plan and have rapid access to rescue medications.

What are the long-term solutions?

The best way to limit adverse health effects from smog is pollution prevention: reducing the pollutants we put into the air. At home, on the road and at work, people can take proactive measures to help reduce air pollution. We can conserve energy and reduce pollution by setting the air conditioner thermostat temperature higher, buying energy-efficient appliances and light bulbs, turning off unused appliances and lights, insulating buildings, and so on. We can reduce vehicle pollution by eliminating trips through carpooling, taking transit, and teleworking. We can drive cleaner, more efficient vehicles. We can also support air quality and health-related planning and policy development, such as "quality growth" and clean energy alternatives that provide long-term improvements in air quality and health. For more details about clean commuting contact The Clean Air Campaign at 1-877-CLEANAIR or www.cleanaircampaign.com. To get involved in policy change for cleaner air, contact Mothers & Others for Clean Air at the Georgia Conservancy, 404-876-2900 x108 or www.mothersandothersforcleanair.org.

Where can I get additional information?

Additional information about air pollution in Georgia and positive steps everyone can take to reduce air pollution and protect health are available from The Clean Air Campaign at 1-877-CLEANAIR, the Georgia Environmental Protection Division at (404) 363-7000, Mothers & Others for Clean Air at the Georgia Conservancy, 404-876-2900 x108, the American Lung Association at (770) 434-5864, and the Georgia Chapter of the American Academy of Pediatrics and the Southeast Pediatric Environmental Health Specialty Unit at Emory University at 1-877-337-3478.