Health Risks of Ground-Level Ozone Pollution

Ozone, the main component of smog, is one of the nation's most pervasive pollutants.

Ozone (O_3) is a highly reactive gas made up of three oxygen atoms. It forms in the atmosphere through chemical reactions of nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the presence of heat and sunlight.[1] Fuel combustion in vehicles, industrial boilers, power plants, oil and gas wells, and vapors from chemical solvents and consumer products are some of the sources of NOx and VOC emissions.

Ozone is "good up high, bad nearby"[2] – when it's part of the ozone layer in upper atmosphere, it's helpful, but when it forms at the ground level in the air we breathe, it's a harmful air pollutant. Ozone levels typically rise between May and October due to higher temperatures, increased sunlight, and stagnant atmospheric conditions. Rising temperatures due to climate change are making it harder to reduce ozone pollution. Locally-formed ozone and its precursors can travel long distances and can thus affect air quality many miles away in downwind areas.

Ozone is a powerful oxidant (like household bleach) and can kill living cells on contact. When inhaled, ozone damages the tissues of the respiratory tract, causing irritation and inflammation, like a "sunburn" of the lung.

Exposure to high ozone levels, frequently seen across the nation during hot summer months, can cause:

- chest tightness[3]
- shortness of breath[5]
- coughing[6]
- cardiovascular issues[8]
- worsening of asthma & COPD requiring emergency treatment[10]
- increased risk of premature death[11]
- increased allergic response[4]
- increased susceptibility to respiratory infections (e.g. pneumonia)[7]
- increased risk of metabolic disorders (e.g. diabetes)[9]
- increased likelihood of reproductive & developmental harm[12,13]
- adverse impacts on central nervous system[14]

Millions of people are especially vulnerable to the health threats from ozone pollution, including:[15]

- children and teens
- people 65 and older
- people with existing lung diseases, such as asthma and COPD
- people who work or exercise outdoors, including healthy adults

We must clean up the emission sources of ozone precursors and address climate change *through personal efforts and policy changes.*

Demand-side voluntary efforts

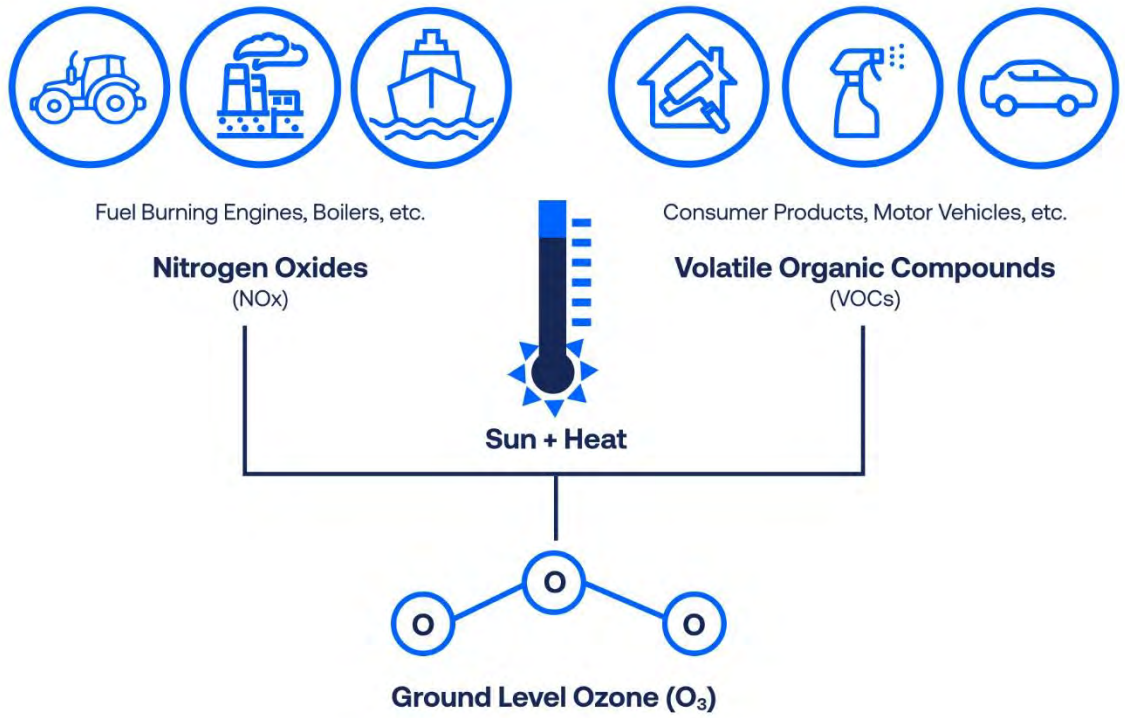
- Choose to walk, ride-share or use public transportation, if possible
- Limit the use of electricity and natural gas
- If you can, choose non-combustion electricity like wind or solar
- If purchasing a vehicle, consider a zero emission electric vehicle

Supply-side policy efforts

- Require stringent NAAQS[16] for ozone and NO_2
- Support policies requiring non-combustion sources for electricity generation
- Support regulations to reduce emissions from power plants and vehicles
- Support transition to zero emission electric transportation

Cleaning up ozone protects public health and saves lives.

To learn more about levels of ozone in your community and steps you can take to protect yourself, visit the American Lung Association's "State of the Air" report at Lung.org/SOTA.



American Lung Association.

[1] U.S. EPA. (2013). Integrated Science Assessment of Ozone and Related Photochemical Oxidants (Final Report). EPA/600/R-10/076F.
[2] https://www.airnow.gov/publications/air-quality-animations/ozone-good-up-high-bad-nearby/
[3] U.S. EPA. (2021, Sep). Ozone Pollution and Your Patients' Health: Health Effects of Ozone in the General Population. https://www.epa.gov/ozone-pollution-and-your-patients-health/health-effects-ozone-general-population
[4] U.S. EPA. (2020, Apr). Integrated Science Assessment for Ozone and Related Photochemical Oxidants. Section 3.2.4.6.
[5] U.S.EPA. (2020, Apr). Integrated Science Assessment for Ozone and Related Photochemical Oxidants. EPA/600/R-20/012. Section 3.1.4.1.
[6] U.S. EPA. (2021, Sep). Ozone Pollution and Your Patients' Health: Health Effects of Ozone in the General Population.
[7] World Health Organization. (2021, Sep). Factsheets: Ambient (outdoor) air pollution..
[8] U.S. EPA. (2020, Apr). Integrated Science Assessment for Ozone and Related Photochemical Oxidants. Sections 4.1 and 4.2
[9] U.S. EPA. (2020, Apr). Integrated Science Assessment for Ozone and Related Photochemical Oxidants. Section 5.1.3.
[10] Strosnider, H. M., Chang, H. H., Darrow, L. A., Liu, Y., Vaidyanathan, A., & Strickland. M. J. (2019, Apr). Age-Specific Associations of Ozone and Fine Particulate Matter with Respiratory Emergency Department Visits in the United States. *Am J Respir Crit Care Med*., 199(7),882-890.
[11] Zhang,J., Wei,Y., and Zhangfu Fang, Z. (2019, Oct.). Ozone Pollution: A Major Health Hazard Worldwide. Front Immunol. 10, 2518.
[12] U.S. EPA. (2020, Apr). Integrated Science Assessment for Ozone and Related Photochemical Oxidants. Section 7.1.3.
[13] Mendola, P., Ha, S., Pollack, A. Z., Zhu, Y., Seeni, I., Kim, S. S., Sherman, S., & Liu, D. (2017). Chronic and acute ozone exposure in the week prior to delivery is associated with risk of stillbirth. *Int. J. Environ. Res. Public Health,* 14(7), 731.
[14] U.S. EPA. (2020, Apr). Integrated Science Assessment for Ozone and Related Photochemical Oxidants. Sections 7.2.1 and 7.2.2.
[15] U.S. EPA. (2020, Apr). Integrated Science Assessment for Ozone and Related Photochemical Oxidants, Section IS.4.4
[16] Ozone and Nitrogen Dioxide (which is used as a surrogate for NOx) are criteria pollutants regulated under the Clean Air Act through the National Ambient Air Quality Standards (NAAQS) set by EPA.

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