Health Care Without Harm

HEALTH & ENVIRONMENT LEADERSHIP PLATFORM H.E.L.P

Centre for Chronic Disease Control

WHO Collaborating Centre for Surveillance, Capacity building and Translational Research in Cardio-Metabolic Diseases

UNDERSTANDING AIR POLLUTION AND ITS IMPACTS ON HUMAN HEALTH:

A TOOL-KIT FOR PHYSICIANS

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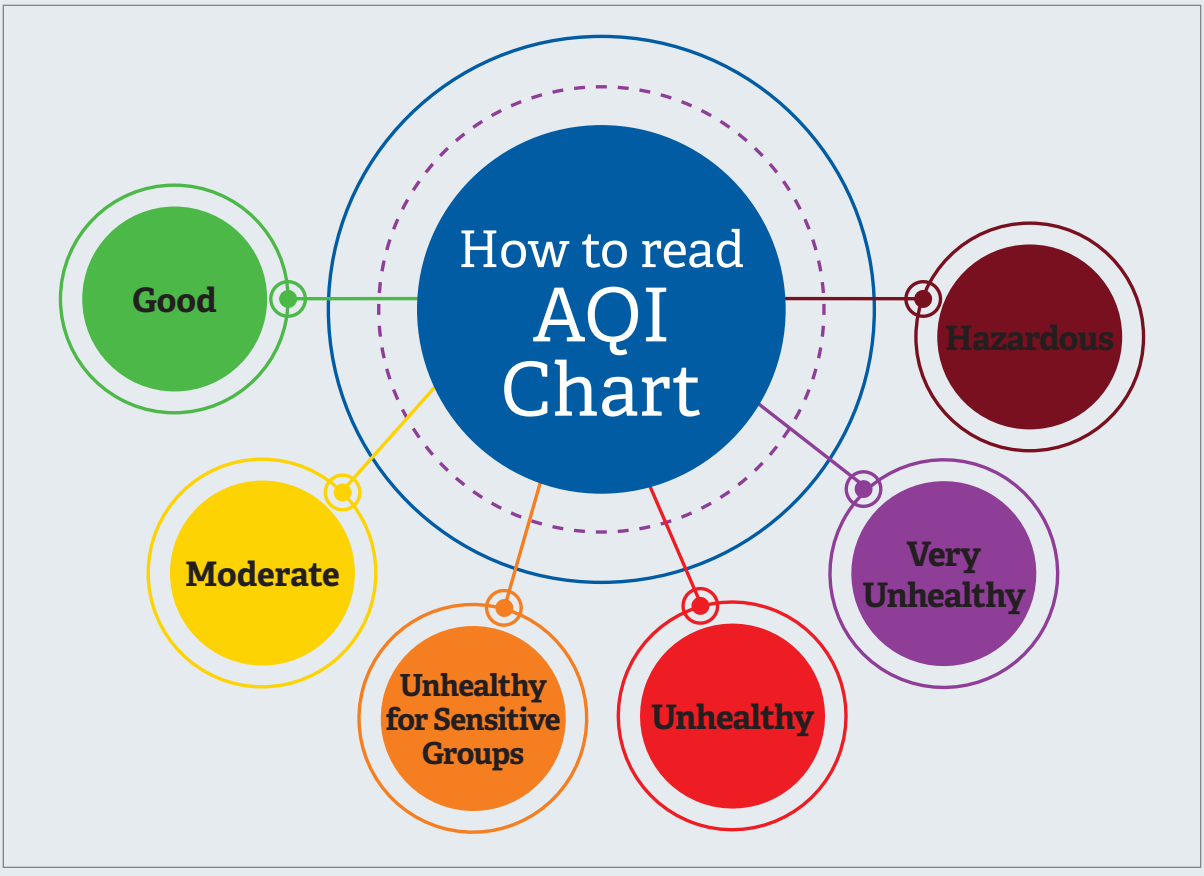
Understanding the Air Quality Index of Your City

Air quality index (AQI) is a numerical scale used for reporting day to day air quality with regard to human health and the environment. The daily results of the index are used to convey to the public an estimate of the air pollution level. An increase in air quality index signifies increased air pollution and severe threats to human health.

In most cases, AQI indicates how clean or polluted the air in our surrounding is, and the associated health risks it might present. The AQI centers on the health effects that may be experienced within a few days or hours after breathing polluted air.

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants, there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.



Before stepping out check what is the status of Air Quality today.

Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
Hazardous

Go to Places for AQI information

- AQI information could be accessed from the Central Pollution Control Board's AQI dashboard. Click the link: https://app.cpcbccr.com/AQI_India/
- Every state in India has a State Pollution Control Board, Union territories have their respective pollution control committees. By visiting their website one can access information about the AQI
- If you do not find AQI of your area from the above mentioned source, you could also look for https://aqicn.org/city/india/gurgaon/vikas-sadan-gurgaon/ the website provides transparent air quality information for more than 100 countries, covering more than 30,000 stations in 1000 major cities,

Where to go if there is no Continuous Ambient Air Quality Monitoring Station

If there are no continuous air quality monitoring stations near your locality, you may look for the below-mentioned air quality data providers to get information on AQI. These are modelled data validated with low-cost ambient air quality data.

- https://urbanemissions.info/india-air-quality-forecasts/iaqi-hourly-timeseries/
- Urban sciences
- AQICN
- https://www.iqair.com/us/india

Introduction: Why this Toolkit?

Air pollution is a global health problem. The World Health Organization estimates that 7 million people die each year from causes directly attributable to air pollution. Ambient air pollution accounts for an estimated 4.2 million deaths per year due to stroke, heart disease, lung cancer and chronic respiratory diseases. Specifically low and middle-income countries are severely plagued with the problem of air pollution. A recent report by the Health Effects Institute highlighted that, if no additional measures are taken to change the ongoing regular air pollution crises, deaths from air pollution in India will rise from 1.1 million in 2015 to 1.7 million deaths annually in 2030 and 3.6 million deaths by 2050.[1]

Despite studies showing the severe implication of air pollution on human health, the general public is still not engaging enough in air quality policy initiatives and the level of awareness and knowledge of the effects of poor air quality on health is often low. High impact issues like air pollution need to be communicated effectively.

Doctors are the first responders to any health crisis, they are not only stewards in their profession but also possess high social regard, any word of information flowing through them is regarded with high value and could have a positive impact.

Informed and aware doctors can effectively communicate to patients and visitors about the ill effects of air pollution and the ways to combat air pollution. This document acts as a guide and a strategic approach on how to create awareness among patients on air pollution and its adverse health outcomes.

[1] GBD MAPS Working Group. (2018). Burden of disease attributable to major air pollution sources in India. *Special report, 21.*

What is in this Toolkit?

a) This Toolkit includes: How to inform doctors about air pollution and the consequences of poor air quality on human health.

b) To increase awareness among patients and the general public on the issue of air pollution through doctors.

c) Factsheets on Air pollution and its impacts on health

d) Information Education and Communication (IEC) materials on

   i. Ambient Air Pollution and Respiratory health
   ii. Ambient Air Pollution and Cardiovascular health
   iii. Ambient Air Pollution and Child Health
   iv. Ambient Air Pollution and Precautions for Vulnerable Population
   v. AQI and its Importance
   vi. Ambient Air Pollution and Asthma

Air Pollution

The air around us comprises of various gases and airborne particles. When the levels of these constituents rise to an extent where it becomes harmful to health, the air is said to be polluted. Air pollutants include particulate matter such as PM 2.5 & PM 10, oxides of nitrogen (NOx), and oxides of sulfur (Sox), ground-level ozone (O_3), carbon monoxide (CO) and volatile organic compounds (VOCs).

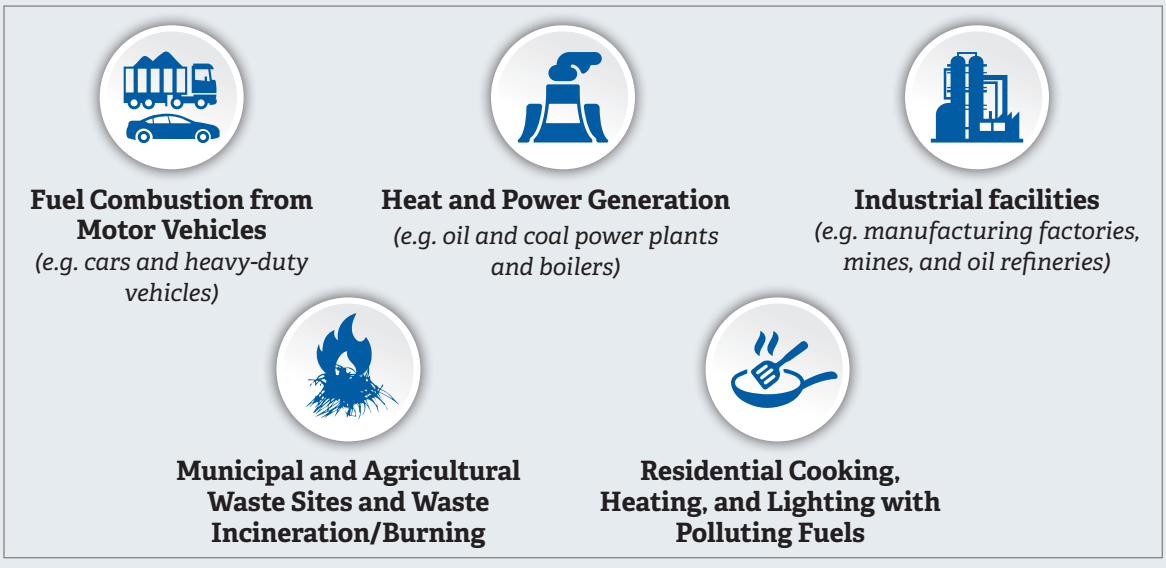
Types of Air Pollution

Air Pollution could be broadly classified into two categories.

1. **Ambient (Outdoor) Air Pollution:** The polluted air present in the outside environment is termed as ambient air pollution. Poor ambient air quality occurs when pollutants reach high enough concentrations to affect human health and/or the environment. Urban outdoor air pollution is a more specific term referring to the ambient air pollution experienced by populations living in urban areas, typically in or around cities.

   Sources of Ambient Air Pollution: Outdoor air pollution originates both from natural and man-made sources. While natural sources contribute significantly to ambient air pollution in arid regions more prone to forest fires and dust storms, the contribution from human activities far exceeds natural sources.

   Human activities that are major sources of outdoor air pollution include:



2. **Household (Indoor) Air Pollution:** Indoor air pollution is the degradation of indoor air quality by harmful chemicals and other materials; it can be up to 10 times worse than outdoor air pollution. This is because contained areas enable potential pollutants to build up more than open spaces. Statistics suggest that in developing countries, the health impacts of indoor air pollution far outweigh those of outdoor air pollution.

   Sources of Household Air Pollution: The principal sources of indoor air pollution are Combustion, building material, and bio-aerosols. While radon, asbestos, pesticides, heavy metals, volatile organic matter, and environmental tobacco smoke are considered major indoor pollutants in developed countries, the combustion products of biomass fuels contribute most to indoor air pollution in developing nations

Particulate Matter: Why it Matters

"Particulate matter", also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

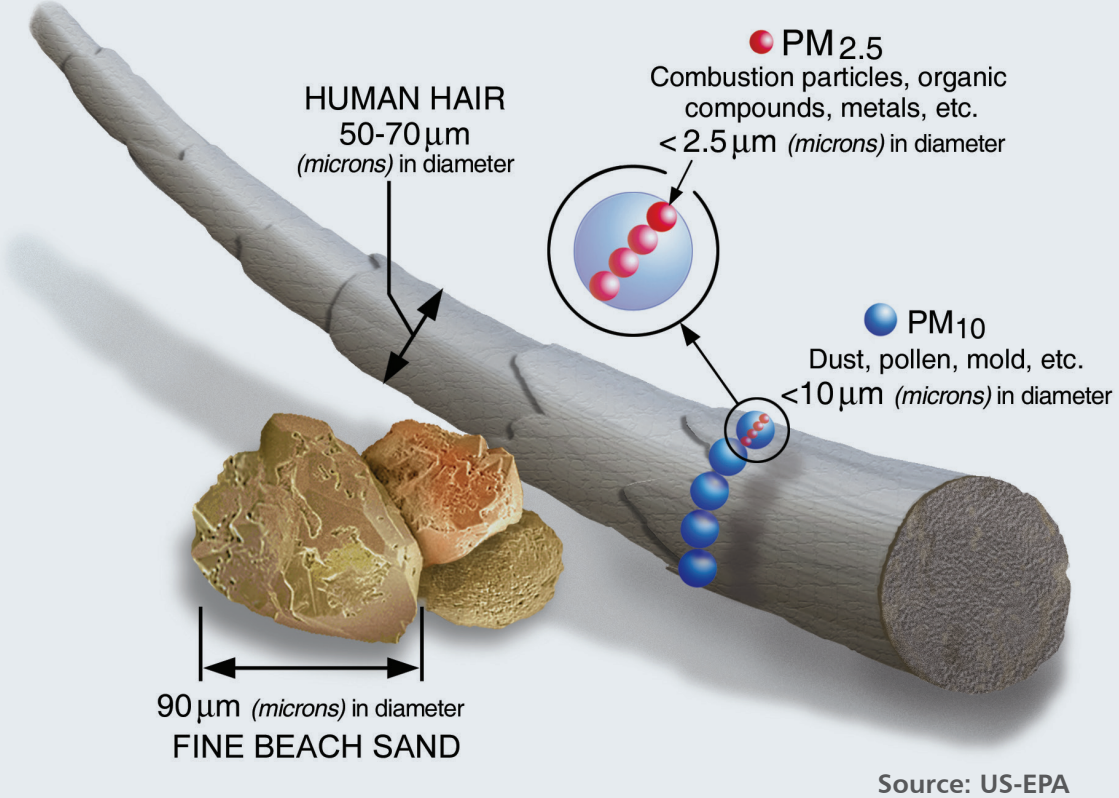
The size of particles is directly linked to their potential for causing health problems. These particles generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects.

Depending upon the size, particulate matter is classified into two categories.

1. **PM_{10}:** inhalable particles, such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter.

2. **$PM_{2.5}$**: fine inhalable particles, such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air.

How small is 2.5 micrometers? Think about a single hair from your head. The average human hair is about 70 micrometers in diameter – making it 30 times larger than the largest fine particle.



Source: US-EPA

Impacts on Human Health

Air pollution causes and exacerbates a number of diseases, ranging from asthma to pulmonary illnesses and heart disease. In accordance with recent estimates by the World Health Organization, exposure to air pollution is thus a more important risk factor for major non-communicable diseases than previously thought. Air pollution is the largest contributor to the burden of disease from the environment. The impact of air pollution on human health is of growing concern as research unravels more links between several serious diseases among various age groups and air pollution

1. **Respiratory diseases:** The respiratory tract is the portal of entry of air pollutants, and thus the lung is the first organ affected. The range of respiratory diseases that can be caused by air pollution exposure is large. The acute effects of pollution may be apparent within hours or days of exposure, but other health effects of air pollution result from long-term exposure, leading to chronic diseases.

2. **Cardiovascular diseases:** Air pollution contributes to cardiovascular illness and mortality. Short-term exposure can increase the risk of heart attack, stroke, arrhythmias and heart failure in susceptible people, such as the elderly or those with pre-existing medical conditions. For instance, someone with atherosclerosis, or buildup of fatty deposits on the inner lining of the arteries, experiences immediate trouble when pollutants may play a role in causing plaque in a blood vessel to rupture, triggering a heart attack.

3. **Asthma:** Around two thirds of people with asthma experience poor air quality which makes their asthma worse, putting them at risk of an asthma attack. This is because pollution can quickly irritate your airways and trigger asthma symptoms. Some pollution particles are small enough to get right into your lungs. Air pollution is a possible risk factor for everyone with asthma, but some people are more at risk, and may be affected by pollution even on moderate or low pollution days. Prenatal exposure to air pollution has been shown to increase the risk of wheezing and asthma development in children. This finding was found to be true whether or not the expectant mother had asthma herself.[2]

4. **Lung Cancer:** Particulate matter in outdoor air pollution as well as certain indoor air pollutants are classified as human carcinogens. Primary carcinogens from air pollution include combustion related compounds from vehicle exhaust, industrial emissions, biomass and waste burning, and indoor coal combustion emissions (excluding tobacco smoke). Prolonged exposure to these indoor and outdoor air pollutants is linked to lung cancer.[3]

5. **Fatigue & headaches:** Increased presence of pollutants in the air can cause an increase in fatigue. Many people feel sluggish during high air pollution days, especially if they exercise outside and inhale above average amounts of the bad air. Headache is also a very common symptom that many people experience during times of poor air quality.

[2] Rosas-Salazar, C., & Hartert, T. V. (2017). Prenatal exposures and the development of childhood wheezing illnesses. Current opinion in allergy and clinical immunology, 17(2), 110.

[3] Straif, K., Cohen, A., & Samet, S. (2017). Air Pollution and cancer.

6. **Irritation of the eyes, nose and throat:** Episodes of high levels of air pollution also leads to irritation in eyes, nose and throat. Amongst people who suffer from other airborne allergies, especially pollen, the symptoms may intensify and might require medical assistance.

7. **Adverse birth outcomes and reproductive health:** Epidemiological studies demonstrated that exposure to ambient levels of air pollutants are associated with low birth weight, intrauterine growth retardation, prematurity, neonatal death, and decreased fertility in males.

8. **Nervous system damage:** Exposure to air pollution is associated with multiple adverse effects on the central nervous system. In addition to a variety of behavioral abnormalities, the most prominent effects caused by air pollution are oxidative stress and neuro-inflammation. Air pollution is also associated with diseases including stroke, Alzheimer's disease, Parkinson's disease, and neurodevelopmental disorders.

Vulnerable Groups

People's health risk from air pollution varies widely depending on age, where they live, their underlying health, and other factors. Many studies show that people with lower socioeconomic status are disproportionately exposed to air pollution and are more vulnerable to adverse health impacts.


People with lung diseases, such as asthma, chronic bronchitis, emphysema, and chronic obstructive pulmonary disease


People with cardiovascular disease


People in poverty; people who lack access to health care


Infants and young children


People who smoke or are exposed to second-hand smoke


People who work or exercise outdoors


People working in occupations where there is high exposure to contaminated air


Adults over 65


People who spend a lot of time near busy roadways


Pregnant Women

Fact Sheet

1. Air pollution is one of the world's leading risk factors for death, attributed to approximately 5 million deaths each year.
2. Air pollution contributes to 9% of deaths globally – this varies from 2% to 15% by country
3. A study published by the World Bank in 2016 revealed that air pollution cost India approximately 8% of its GDP or $560 billion in 2013, as a result of lost productivity due to premature mortality and morbidity
4. Indoor air pollution is a leading risk factor for premature death. It's responsible for 1.6 million deaths each year.
5. Death rates from air pollution are highest in low-income countries. There's greater than the 1000-fold difference between low- and high-income countries.
6. Health cost of air pollution in India assessed at 3 percent of its GDP.
7. India has ranked 168th out of 180 countries in the 2020 Environmental Performance Index (EPI); for Air Quality, India ranks 179th among 180 countries.
8. Air pollution accounts for an estimated 12.5 percent of deaths in India.
9. Air pollution kills an average of 8.5 out of every 10,000 children in India before they turn five.
10. Studies indicate that indoor air pollution is 5 – 100 times more than the outdoor air pollution. Indoor air pollution is therefore a huge concern in the developing countries.

10 Ways to Combat Air Pollution


Do not burn trash.


Turn off the car engine while waiting at the traffic signals.


Using energy efficient light bulbs and appliances.


Avoid bursting of crackers.


When purchasing a new car, consider one that is the most efficient, lowest-polluting vehicle or even a zero-emission electric car.


Turning off lights and appliances when they are not in use.


Plant a tree! Trees filter the air and provide shade that can reduce cooling costs.


Buying fewer things that are manufactured using fossil fuels.


Raise your concerns about air pollution in your community and advocate for effective and appropriate policies to address air pollution.


Riding a bike or walk instead of driving whenever possible.

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