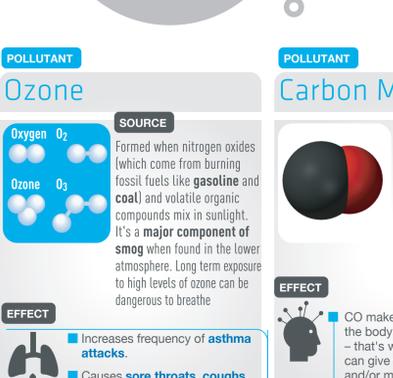


# WHAT'S IN THE AIR WE BREATHE?

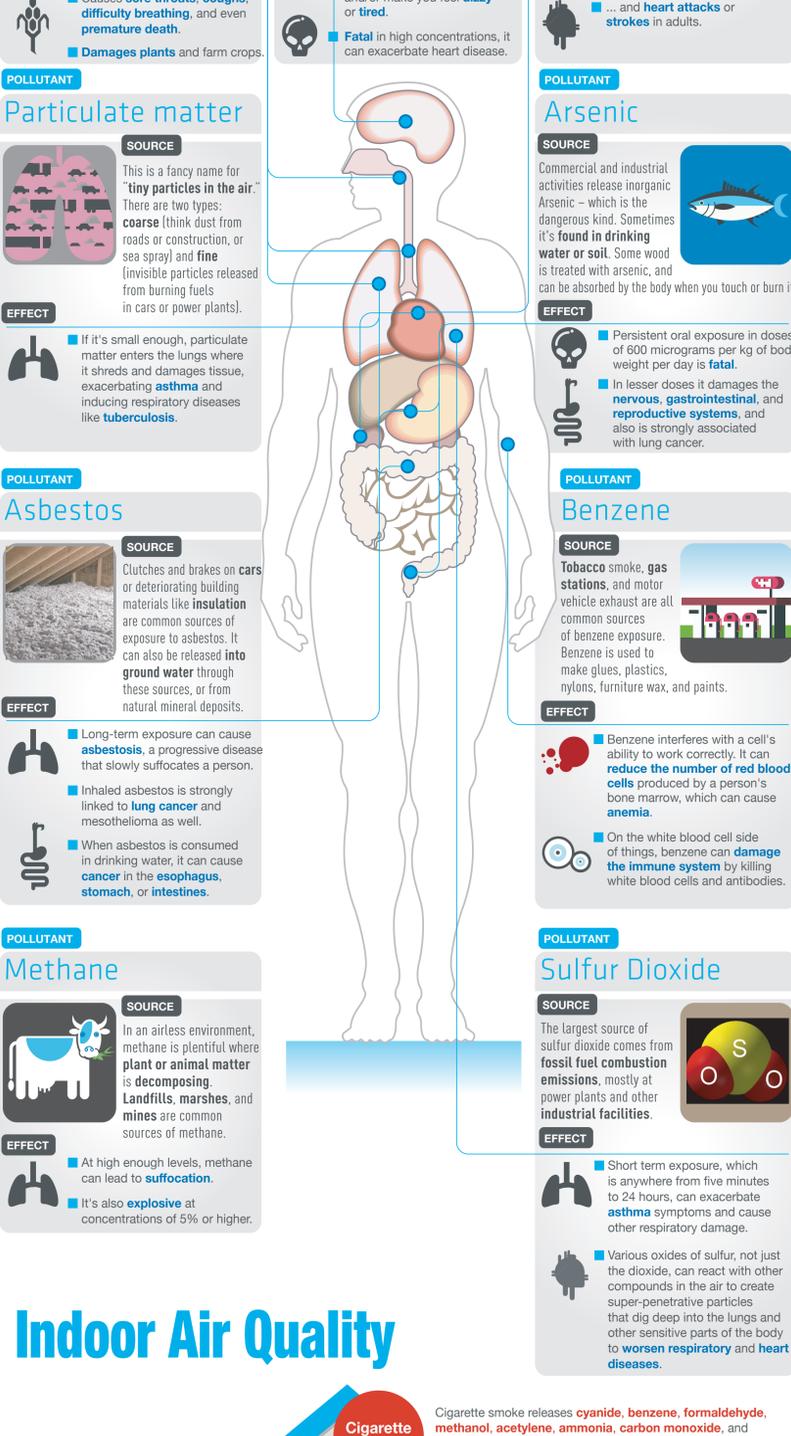
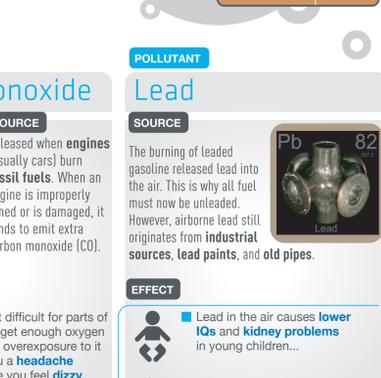
## Air Composition and Pollutants

Breathing is something we do subconsciously, so we aren't always thinking about it – but that doesn't give you a pass to ignore issues of air quality! Knowing what's in the air you breathe is almost as essential as knowing what's in the food you eat or the water you drink. Did you know that around 7 million premature deaths can be attributed to air pollution worldwide? Poor air quality has also been linked to increases in mortality rates from cardiovascular disease, cystic fibrosis, lung disease, and cancer. We've compiled some essential and fun facts about the different flavors of air quality – inside, outside, from country to country – to teach you what you need to know to stay safe and healthy in the air we breathe.

### THE AIR WE INHALE



### THE AIR WE EXHALE



#### POLLUTANT: Ozone

**SOURCE**  
Formed when nitrogen oxides (which come from burning fossil fuels like gasoline and coal) and volatile organic compounds mix in sunlight. It's a major component of smog when found in the lower atmosphere. Long term exposure to high levels of ozone can be dangerous to breathe.

**EFFECT**

- Increases frequency of **asthma attacks**.
- Causes **sore throats, coughs, difficulty breathing**, and even **premature death**.
- Damages plants** and farm crops.

#### POLLUTANT: Carbon Monoxide

**SOURCE**  
Released when **engines** (usually cars) burn **fossil fuels**. When an engine is improperly tuned or is damaged, it tends to emit extra carbon monoxide (CO).

**EFFECT**

- CO makes it difficult for parts of the body to get enough oxygen – that's why overexposure to it can give you a **headache** and/or make you feel **dizzy** or **tired**.
- Fatal** in high concentrations, it can exacerbate heart disease.

#### POLLUTANT: Lead

**SOURCE**  
The burning of leaded gasoline released lead into the air. This is why all fuel must now be unleaded. However, airborne lead still originates from **industrial sources, lead paints, and old pipes**.

**EFFECT**

- Lead in the air causes **lower IQs and kidney problems** in young children...
- ... and **heart attacks or strokes** in adults.

#### POLLUTANT: Particulate matter

**SOURCE**  
This is a fancy name for "tiny particles in the air." There are two types: **coarse** (think dust from roads or construction, or sea spray) and **fine** (invisible particles released from burning fuels in cars or power plants).

**EFFECT**

- If it's small enough, particulate matter enters the lungs where it sheds and **damages tissue**, exacerbating **asthma** and inducing respiratory diseases like **tuberculosis**.

#### POLLUTANT: Arsenic

**SOURCE**  
Commercial and industrial activities release inorganic Arsenic – which is the dangerous kind. Sometimes it's **found in drinking water or soil**. Some wood is treated with arsenic, and can be absorbed by the body when you touch or burn it.

**EFFECT**

- Persistent oral exposure in doses of 600 micrograms per kg of body weight per day is **fatal**.
- In lesser doses it damages the **neurological, gastrointestinal, and reproductive systems**, and also is strongly associated with lung cancer.

#### POLLUTANT: Benzene

**SOURCE**  
Tobacco smoke, gas stations, and motor vehicle exhaust are all common sources of benzene exposure. Benzene is used to make glues, plastics, nylons, furniture wax, and paints.

**EFFECT**

- Benzene interferes with a cell's ability to work correctly. It can **reduce the number of red blood cells** produced by a person's bone marrow, which can cause **anemia**.
- On the white blood cell side of things, benzene can **damage the immune system** by killing white blood cells and antibodies.

#### POLLUTANT: Asbestos

**SOURCE**  
Clutches and brakes on cars or deteriorating building materials like **insulation** are common sources of exposure to asbestos. It can also be released into **ground water** through these sources, or from natural mineral deposits.

**EFFECT**

- Long-term exposure can cause **asbestosis**, a progressive disease that slowly suffocates a person.
- Inhaled asbestos is strongly linked to **lung cancer** and mesothelioma as well.
- When asbestos is consumed in drinking water, it can cause **cancer in the esophagus, stomach, or intestines**.

#### POLLUTANT: Methane

**SOURCE**  
In an airless environment, methane is plentiful where **plant or animal matter is decomposing**. **Landfills, marshes, and mines** are common sources of methane.

**EFFECT**

- At high enough levels, methane can lead to **suffocation**.
- It's also **explosive** at concentrations of 5% or higher.

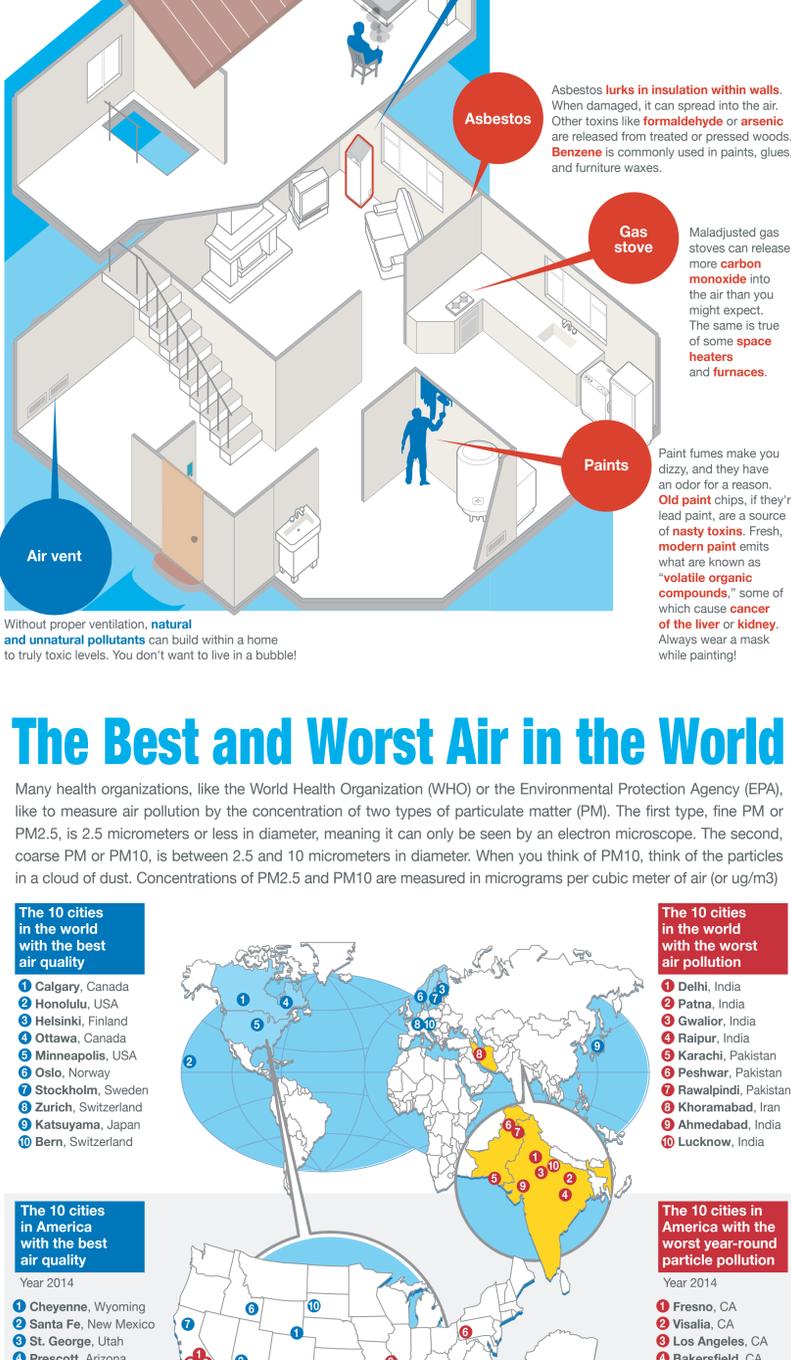
#### POLLUTANT: Sulfur Dioxide

**SOURCE**  
The largest source of sulfur dioxide comes from **fossil fuel combustion emissions**, mostly at power plants and other industrial facilities.

**EFFECT**

- Short term exposure, which is anywhere from five minutes to 24 hours, can exacerbate **asthma** symptoms and cause other respiratory damage.
- Various oxides of sulfur, not just the dioxide, can react with other compounds in the air to create super-penetrative particles that dig deep into the lungs and other sensitive parts of the body to **worsen respiratory and heart diseases**.

## Indoor Air Quality



## The Best and Worst Air in the World

Many health organizations, like the World Health Organization (WHO) or the Environmental Protection Agency (EPA), like to measure air pollution by the concentration of two types of particulate matter (PM). The first type, fine PM or PM2.5, is 2.5 micrometers or less in diameter, meaning it can only be seen by an electron microscope. The second, coarse PM or PM10, is between 2.5 and 10 micrometers in diameter. When you think of PM10, think of the particles in a cloud of dust. Concentrations of PM2.5 and PM10 are measured in micrograms per cubic meter of air (or ug/m3).



## Inside the Earth

Plenty of naturally occurring minerals within the Earth can be hazardous to human health when spread through the air. Among them are arsenic, lead, mercury, and radioactive elements like radon. There are also gases like carbon monoxide and methane. However, you can breathe easy in many natural caverns around the world. They're often connected to the surface via multiple entrances, which improves air circulation. In tropical climates, carbon dioxide rich pockets can form depending on certain biological processes that might be occurring nearby. Ammonia gases can be found where bat guano or where other dung is decaying. Fungi that grow in caves can produce spores which taint the air. Near lava flows or sulfur deposits, concentrations of oxygen might be very low indeed.



## ...And Beyond

### Mercury

Mercury's proximity to the sun has a side effect – its atmosphere has been completely destroyed by the heat. What we can detect in the air and near the surface of the planet are small traces of:

- Helium
- Sodium
- Potassium
- Oxygen

### Venus

Venus' incredibly dense atmosphere is famous for the greenhouse effect it creates.

- 96.5% Carbon dioxide
- 3.5% Nitrogen
- Traces of sulfur dioxide, argon, and water vapor

### Moon

For a long time, it was thought that the Moon had no atmosphere and was surrounded by a vacuum. Now, it's believed that the Moon has an atmosphere that is only slightly thicker than Mercury's. For example, at sea level on Earth every cubic centimeter of air contains 1019 molecules while a cubic centimeter on the Moon only contains 106 molecules.

### Mars

Mars has a very thin atmosphere, but its composition is similar to that of Venus.

- 95% Carbon dioxide
- 1.9% Nitrogen
- 1.9% Argon
- Traces of oxygen and carbon monoxide

### Jupiter

Jupiter boasts the largest planetary atmosphere in the entire Solar System. As a gas giant, the atmosphere doesn't have a lower boundary like the inner, rocky planets do – gases transition gradually to the planet's liquid interior.

**EXTERIOR ATMOSPHERE**

- 76% Hydrogen
- 24% Helium

### Saturn

Saturn is famous for its rings, but not as much for its atmosphere. Saturn's troposphere has a haze of ammonia which causes its storms and banding patterns to be less visible than those of Jupiter. Its winds, however, are among the fastest in the Solar System and have been clocked at 1800 km/h by Voyager.

- 93.2% Hydrogen
- 6.7% Helium

### Uranus

Gas and ice make up the atmosphere of Uranus. Unlike the other gas giants, it's thought that the core of Uranus has no internal energy generation mechanism. This makes it a "peaceful" sort of planet with fewer storms than Saturn or Jupiter.

- 83% Hydrogen
- 15% Helium
- 2% Methane

### Neptune

Neptune's atmosphere is similar in composition to Uranus, but it's much stormier. As one goes deeper and deeper through the atmosphere, the temperature is thought to rise steadily and methane clouds sit in abundance. Neptune's winds are faster even than Saturn's, and stormy breezes can travel as fast as the speed of sound in its atmosphere.

- 80% Hydrogen
- 19% Helium
- 1.5% Methane

### Outer Space

Space is a vacuum, which means that there is an almost total absence of gas molecules. Since that includes oxygen, this explains why we can't breathe in space. Just because there is no "air" in outer space, though, doesn't mean that there's literally nothing there. It's just that there's so little, it might as well be nothing.

