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## Air pollution and public health

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### Abstract

One of our era's greatest problem is air pollution, it impacts on climate change as well as on public and individual health due to increasing morbidity and mortality. Instead of previous improvements in air quality, a very large proportion of the population in urban areas breathes air that does not meet European standards that alone meet health-based WHO air quality guidelines. There has been a substantial increase in findings that particulate matter air pollution that is not only having a greater impact on established health endpoints, but is also widely associated with disease outcomes. Having firmly established this important public health problem, a major effort has been made to identify what is in the ambient PM that affects health and understand the underlying biological basis of toxicity by identifying mechanistic pathways. This information that in turn will inform policy makers - legislation for the best cleaner air. Undeniably bold, realistic and effective policies have the potential to reduce air pollution by translating true scientific evidence, so that it does not impose any harmful impact on public health.

**Keywords:** Air pollution, public health, disease, harmful, impacts

### Introduction

Air pollution is the presence of substances in the atmosphere that are harmful to the health of humans and other living beings, or damage to the climate or materials. Pollutants are harmful solids, liquids, or gases produced in higher than usual concentrations that reduce the quality of our environment. There are primary and secondary pollutants. Primary pollutants are usually produced by human activities. Secondary pollutants are not emitted directly. Some primary pollutants include Carbon dioxide, Sulphur oxides, Nitrogen oxides, Carbon monoxide, Particulate matter, Ammonia, etc. Secondary pollutant include smog, ground level ozone and Peroxyacetyl nitrate. Minor air pollutant includes a large number of minor hazardous air pollutants and persistent organic pollutants.

### Pollutants emitted into the atmosphere by human activity include

- Carbon dioxide (CO<sub>2</sub>) – Because of its role as a greenhouse gas it has been described as "the leading pollutant" and "the worst climate pollutant".
- Sulfur oxides - SO<sub>2</sub> is produced by volcanoes and in various industrial processes.
- Nitrogen oxides (NO<sub>x</sub>) –nitrogen oxide, are expelled from high temperature combustion.
- Carbon monoxide (CO) – CO is a colorless, odorless, toxic gas. It is a product of combustion of fuel such as natural gas, coal or wood.
- Volatile organic compounds (VOC) – VOCs are a well-known outdoor air pollutant.
- Particulate matter /particles, alternatively referred to as particulate matter (PM), atmospheric particulate matter, or fine particles, are tiny particles of solid or liquid suspended in a gas. Particulates are related to respiratory infections and can be particularly harmful to those already suffering from conditions like asthma.
- Chlorofluorocarbons (CFCs) – harmful to the ozone layer; emitted from products are currently banned from use.
- Ammonia – emitted mainly by agricultural waste.
- Odors — such as from garbage, sewage, and industrial processes
- Radioactive pollutants – produced by nuclear explosions, nuclear events, war explosives, and natural processes such as the radioactive decay of radon.

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Human activities are adversely affected by the pollution of the water we drink, the air we breathe, and the plant in which the soil grows. Although the Industrial Revolution was a major breakthrough in terms of technology, society, and the provision of many services, it also introduced the production of large amounts of pollutants emitted into the air which are harmful to human health. Without a doubt, global environmental pollution is considered an international public health issue with many aspects. Social, economic and legislative concerns and lifestyle habits are related to this major problem. Clearly, urbanization and industrialization are reaching unprecedented and disturbing proportions worldwide in our era. Anthropogenic air pollution is one of the biggest public health hazards worldwide, given that it accounts for approximately 9 million deaths per year.

Air pollution is a mixture of particulate matter (PM), gases, and vapor-phase molecules. The direct route of exposure to air pollution is a respiratory tract. In the case of dust pollutants, particle size is playing an important role in environmental health risks. PMs are classified by aerodynamic diameter. Particles below 10  $\mu\text{m}$  in diameter are classified as thoracic particles PM<sub>10</sub>, particles below 2.5  $\mu\text{m}$  as fine particles, and particles with a diameter <0.1  $\mu\text{m}$  to ultraviolet particles (UFP). in the form of. Particles larger than 10  $\mu\text{m}$  are likely to land in the proximal airways, but microscopic particles reach the lungs and accumulate in the alveoli. Therefore PM<sub>2.5</sub> may be more harmful than older people. Ambient fine particulate pollution was associated with an increased risk of heart diseases. UFPs accumulate deeply in the lungs.

Air pollution caused premature deaths in Europe on an average of 1 year, and was an important risk factor for many pollution-related diseases, including respiratory infections, heart disease, COPD, stroke, and lung cancer. Health effects caused by air pollution can include difficulty breathing, wheezing, cough, asthma and worsening of existing respiratory and heart conditions. These effects can result in increased drug use, visits to the doctor or emergency department, more hospital admissions and premature death. The human health effects of poor air quality are far reaching, but mainly affect the body's respiratory system and cardiovascular system. Individual responses to air pollutants depend on the type of pollutant an individual is in contact with, the degree of risk and the person's health status and genetics. The most common sources of air pollution include particulate, ozone, nitrogen dioxide, and sulfur dioxide. Children under five who live in developing countries are the most vulnerable population in terms of total deaths due to indoor and outdoor air pollution.

Environmental risk factors contribute to about a quarter of the global burden of diseases. In 2012, an estimated 23% of deaths and 22% of disability-adjusted life years were due to variable environmental risk factors, thus pointing to the potential for prevention, intervention, and remedial action to promote health and prevent disease. The attribute 16% mortality and 12% DALYs to environmental risks, reflecting differences and indicating sufficient potential for prevention. estimates from the Global Burden of Disease.

Air pollution has various health effects. A sensitive individual can be impacted even on low air pollution days. Air pollutants is affected by COPD, cough, shortness of breath, wheezing, asthma, respiratory disease, and high rates of hospitalization. Air pollution mainly affects people living

in large urban areas, where road emissions contribute most to the degradation of air quality. There is also the risk of industrial accidents, where the spread of a poisonous fog can be fatal to the population of surrounding areas. The spread of pollutants is determined by several parameters, most notably atmospheric stability and wind.

The accumulation of air pollution, particularly sulfur dioxide and smoke, reached 1,500 mg / m<sup>3</sup>, resulting in the death toll (4,000 deaths) in London in December 1952 and 400 deaths in New York City in 1963 (400 deaths). In six US metropolitan cities, a concomitant of pollution with mortality was reported based on monitoring outdoor pollution. In each case, it appears that mortality was related to levels of fine particulate, breathable, and sulfate particles, which were higher than total particulate pollution, aerosol acidity, sulfur dioxide, or nitrogen dioxide levels.

Air pollution risk is a function of the hazard of a pollutant and the exposure to that pollutant. Air pollution risk can be expressed for an individual, for certain groups, or for the entire population. For example, one may want to calculate exposure to a hazardous air pollutant for a geographic area, which includes different micro-environments and age groups. This can be calculated as an inhalation risk. It will be responsible for daily performance in various settings. Exposure needs to include different age and other demographic groups, especially infants, children, pregnant women, and other sensitive subtotals. The concentrations of air pollutants exposed to an air pollutant must be integrated with respect to the time spent in each setting and the corresponding inhalation rates for each subgroup in the subgroup setting and engaged in particular activities.

Air pollution and climate change are closely related. Climate is another aspect of the same coin that reduces the quality of our earth. Pollutants such as black carbon, methane, tropospheric ozone, and aerosols affect the amount of incoming sunlight. As a result, the Earth's temperature is rising, resulting in melting snow, icebergs and glaciers.

In this vein, climate change will affect the incidence and spread of both residual and imported infections in Europe. Climate and weather affect the duration, time and intensity of the outbreak and change the map of infectious diseases in the world. Mosquito-transmitted parasites or viral diseases are extremely climate-sensitive, as the first warming pathogen shortens the incubation period and the second time changes the geographic map of the vector.

The spread of epidemics is associated with natural climate disasters and hurricanes, which seem to be higher nowadays. Malnutrition and immune system inequality are also associated with emerging infections affecting public health.

### Health Hazards

Health hazards, each abnormal suspended material in the air that causes difficulties in normal function of human organs, is defined as air poisoning. According to available data, the main toxic effects of exposure to air pollutants are mainly on the respiratory, cardiovascular, ophthalmic, dermatologic, neuropathic, hematologic, immunologic, and reproductive systems. However, molecular and cell toxicity can also lead to various types of cancer in the long term. On the other hand, small amounts of air toxins are considered dangerous for susceptible groups, including children and the elderly, as well as for patients suffering from respiratory and cardiovascular diseases.

### Public Awareness and Education

Public awareness is fundamentally dependent on optimal air pollution monitoring, forecasting and reporting. Many countries have air quality monitoring networks that are structured around a particular country's regulatory obligation to report monitored air quality data and modeled predictions. Production from measured concentrations of pollutants, air quality modeling systems, and meteorological data is also processed to create a national air quality index. Again in line with national law, an AQI indicates pollution levels and health effects that may be experienced on or soon after the day described by the index. These data are used by the public and organizations to reduce the health effects of projected air pollution. Another information tool is provided by accessible air pollution warning services that provide real-time data and imminently alert registered users of imminent pollution incidents via a computer / tablet or phone. These are becoming increasingly informative and engaging, allowing people to engage with specific user groups and receive notifications when pollution exceeds concentrations at the site of their choice. These services also provide ongoing advice on how specific groups can reduce emissions for example, providing a low pollution travel plan to reduce risk.

### Conclusion

Air pollution has a major impact on human health, especially in developing countries like Iran causing many diseases due to high morbidity and mortality. Therefore, air pollution control is important and should top the priority list of governments. Policy makers and legislators of these countries should update all laws and regulations related to air pollution. Coordination between the various departments involved in air pollution should be led by a powerful environmental protection organization. An effective environmental protection organization should have an adequate budget for full control of the environment, including administration, research, development, monitoring, and air pollution.

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