pennsylvania
DEPARTMENT OF HEALTH

EPHT TRACKING DATA SHEET

AIR QUALITY

The Pennsylvania Environmental Public Health Tracking (EPHT) program tracks a set of Nationally Consistent Data and Measures (NCDMs) in order to compare different states and over time. Air quality indicators of Ozone and Particulate Matter ($PM_{2.5}$) pollution are included in the set of NCDMs available on the Enterprise Data Dissemination Informatics Exchange website.

AIR QUALITY AND YOUR HEALTH

Air pollution is linked to several health problems including asthma, heart disease and other breathing problems. Children, the elderly, and people who have lung diseases such as asthma are considered vulnerable or sensitive groups at high-risk for air pollution-related health problems and exacerbations. Since the 1950s, air quality has been a major public health and environmental issue. Although national air quality has improved over the last 20 years, many challenges remain in protecting public health and the environment from air quality problems. Local, state and national programs have provided considerable information on the health problems caused by poor air quality and how to solve them.

THE CLEAN AIR ACT

The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards for six common air pollutants known to harm health and the environment: ground-level ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur oxides and lead. EPA refers to these six pollutants as criteria air pollutants because it regulates them by developing human health-based and environmentally-based criteria, or science-based guidelines, for setting permissible levels. Of the six pollutants, ground-level ozone and particle pollution are the most widespread health threats.

EPA's Criteria Pollutants for Air

1. **Ground-level Ozone (O_3)**, or "bad ozone," is created by chemical reactions between nitrogen oxides and volatile organic compounds (VOCs) in the presence of sunlight. Major sources of nitrogen oxides and VOCs include emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors and chemical solvents.
2. **Particulate Matter (PM)**, or particle pollution, is a complex mixture of extremely small particles and liquid droplets, including acids, organic chemicals, metals and soil or dust particles. These particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries or automobiles react in the air. The smaller the particles the greater the potential for health problems. Of most concern to the EPA are fine particles that have a diameter of 2.5 micrometers or smaller ($PM_{2.5}$) and inhalable coarse particles that have a diameter between 2.5

micrometers and 10 micrometers (PM_{10}), both of which can pass through the throat and nose and enter the lungs.

3. **Carbon Monoxide (CO)** is a colorless, odorless gas emitted from combustion processes in car engines, stoves, furnaces, etc. It can be lethal at extremely high levels.

4. **Nitrogen Oxides** are a group of highly reactive gases, including nitrogen dioxide (NO_2), nitrous acid and nitric acid. NO_2 forms quickly from emissions from cars, trucks and buses, power plants and off-road equipment. It contributes to the formation of ground-level ozone and fine particulate matter as well.

5. **Sulfur Oxides** are a group of highly reactive gases, including sulfur dioxide SO_2. SO_2 emissions largely come from fossil fuel combustion at power plants and other industrial facilities but can also come from industrial processes such as extracting metal from ore and the burning high-sulfur-containing fuels by locomotives, large ships and non-road equipment.

6. **Lead (Pb)** is a metal found naturally in the environment as well as in manufactured products. Lead emissions have historically been from fuels in motor vehicles and industrial sources. Today, the highest levels of lead in air are usually found near lead smelters, and the major sources of lead emissions to the air are ore and metals processing and piston-engine aircrafts operating on leaded aviation gasoline.

AMBIENT AIR QUALITY MONITORING IN THE UNITED STATES

Monitoring Networks

Federal, state and local air agencies operate and maintain a wide variety of air monitoring systems across the United States. In Pennsylvania, the Department of Environmental Protection (DEP) manages the air monitoring system. At a basic level, these systems let us know how clean or polluted the air is and help us track progress in reducing air pollution. They also inform the public about air quality in their communities through the Air Quality Index. EPA provides guidance to help these groups understand the quality of the data produced by these systems.

CDC's tracking program also is working with EPA to produce air quality indicators in areas where there are no air monitors. This is done by combining air monitoring data with emissions and meteorological data to create daily estimates of ozone and airborne fine particulates. This will help produce a more complete picture of air pollution across the country.

Air Quality System (AQS) Database

EPA's AQS database contains ambient air pollution data from thousands of monitoring stations across the United States. The data are collected by EPA, state, local and tribal air pollution control agencies. State and local agencies are required to submit their air quality monitoring data into AQS, ensuring timely submission of these data for use by air quality stakeholders. AQS also contains information about each monitoring station such as its location, operator, meteorological data and data quality assurance and quality control information.

Advantages and Limitations of the Air Quality Monitoring and Reporting System

The AQS is important because it helps EPA and others to:

- Assess air quality
- Assist in determining which areas of the country are (not) meeting air quality standards
- Evaluate state implementation plans for controlling air pollution
- Perform modeling for permit review analysis
- Perform other air quality analyses such as trend analysis and health effect studies
- Submit air pollution-related reports to Congress, which is required by the Clean Air Act

In brief, the AQS data facilitate more comprehensive understanding of the scope and public health consequences of poor air quality.

The challenge is getting measurements of air quality in time and space that are useful for EPHT activities. To compare and correlate ambient concentrations with acute health effects, daily local air quality data is needed. Spatial gaps exist in the air quality monitoring network, especially in rural areas, since the air quality monitoring network is designed to focus on measurement of pollutant concentrations in high population density areas.

$PM_{2.5}$ monitors generally collect samples once every three days, due in part to the time and costs involved in collecting and analyzing the samples. However, monitors that can automatically collect, analyze and report $PM_{2.5}$ measurements on an hourly basis have been introduced over the past several years. These monitors are available in most major metropolitan areas. Ozone is monitored daily, but mostly during the ozone season (the warmer months, primarily April through October). Year-long data would be extremely useful to evaluate whether ozone is a factor in health outcomes during non-ozone seasons.

RELATED LINKS

Pennsylvania DEP Ambient Air Monitoring Reports

Pennsylvania DEP My Air

CDC Asthma and Community Health Branch

CDC Air Quality

EPA Office of Air and Radiation

EPA AirNow

EPA AirCompare

EPA Ozone Webpage

EPA Particulate Matter Webpage