

# *Overview of Particle Air Pollution ( $PM_{2.5}$ and $PM_{10}$ )*

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**USAID**  
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UNIDOS DE AMÉRICA



**CCAD**

COMISIÓN CENTROAMERICANA DE AMBIENTE Y DESARROLLO

ACUERDO DE COOPERACIÓN USAID - CCAD

Ministerio de Medio Ambiente  
y Recursos Naturales



# What is Particle Air Pollution?

- Particulate matter (PM), also called particle pollution, is a general term for extremely small particles and liquid droplets in the atmosphere
- PM<sub>2.5</sub> (fine particles):  $d \leq 2.5 \mu\text{m}$
- PM<sub>10</sub> (coarse particles):  $d \leq 10 \mu\text{m}$
- **Primary** sources:
  - Incomplete combustion
  - Automobile emissions
  - Dust
  - Cooking
- **Secondary** sources:
  - Chemical reactions in the atmosphere





Wood-Burning Stoves



Forest Fires



Diesel Engines

Natural Sources



**There are many sources of particle pollution**

Cars and Buses



Non-Road Vehicles



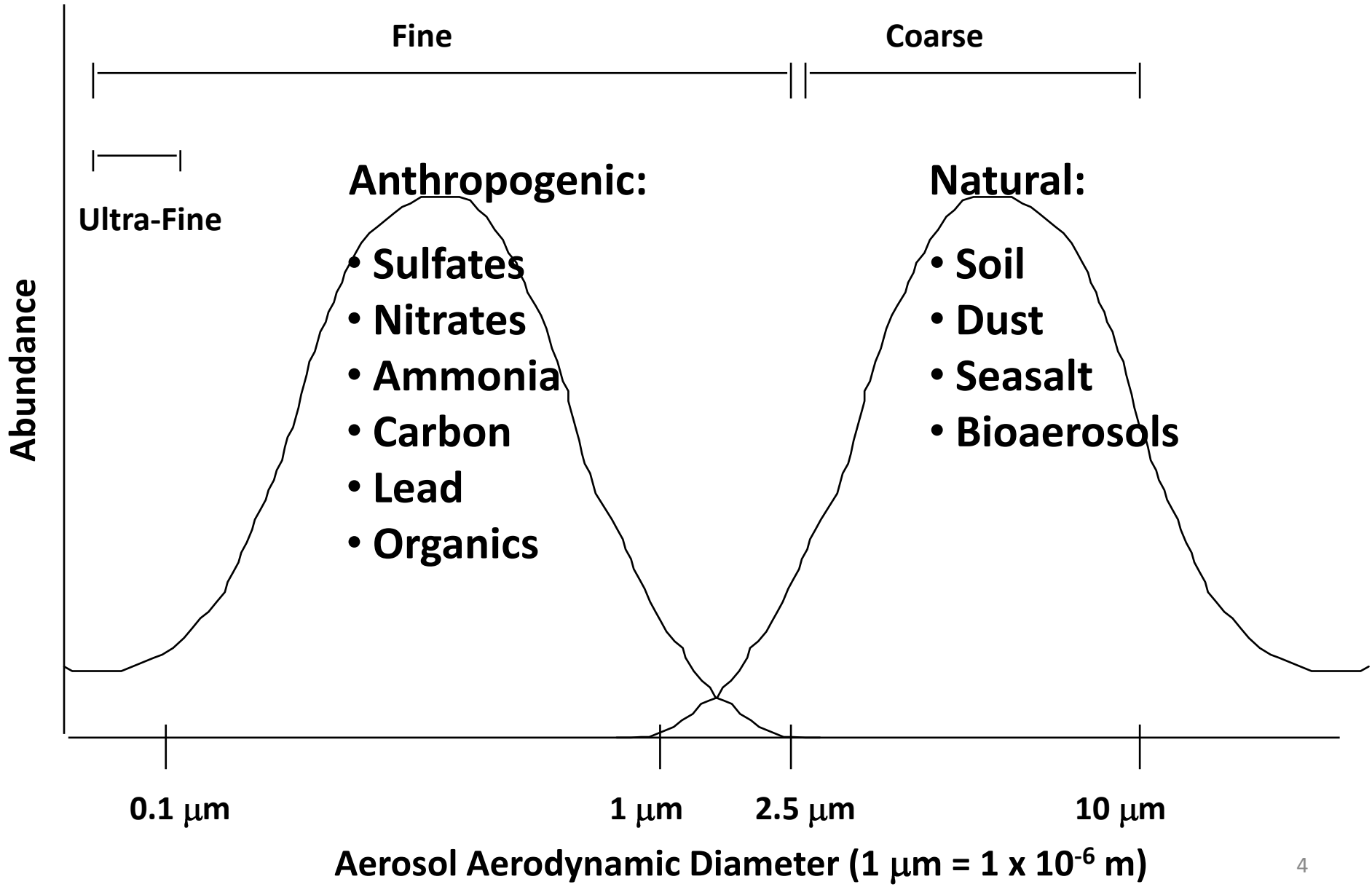
Agricultural Burning



Industry

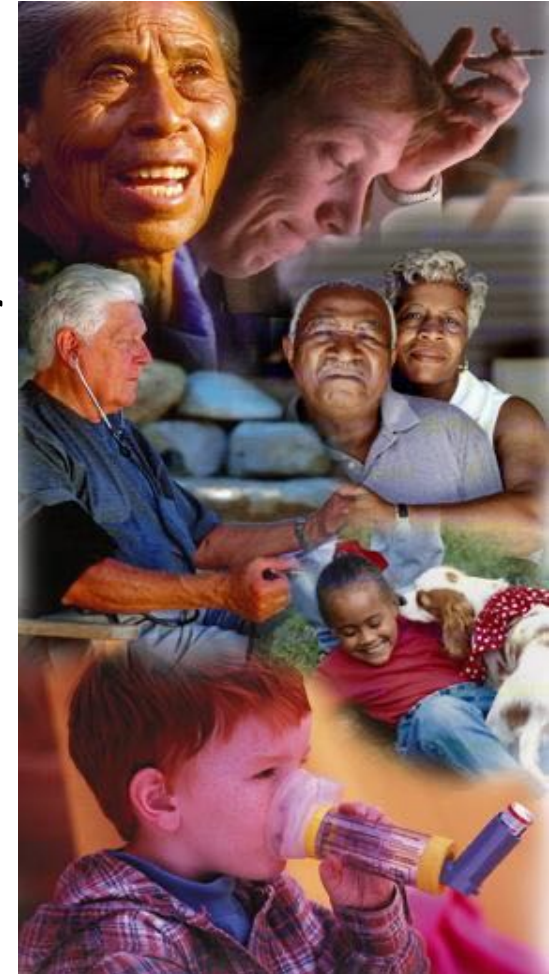


# Sizes and Composition of Particulate Matter



# Why Is it Important to Communicate Information about Particle Pollution to the Public?

- Exposure to particle pollution is a public health hazard
- When inhaled, particle pollution can travel deep into the lungs and cause or aggravate heart and lung diseases
- Exposure to particle pollution causes increases in:
  - Doctor and emergency room visits
  - Hospital admissions
  - Use of prescription medication
  - Absences from work and school



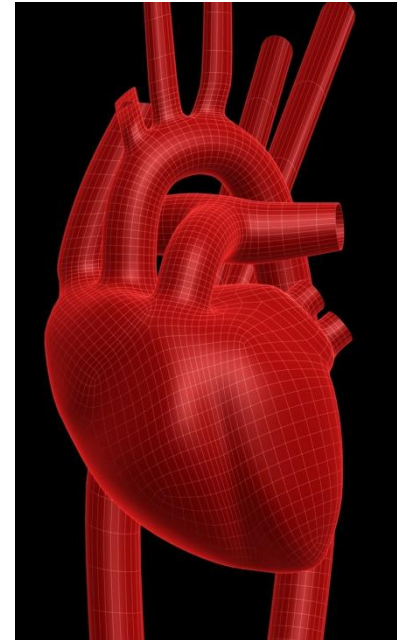
# Particle Pollution Affects the Lungs

- People are exposed to particle pollution when they breathe
- Effects of **short-term (acute)** exposure:
  - Coughing
  - Shortness of breath
  - Tightness of the chest
  - Irritation of the eyes
- Effects of **long-term (chronic)** exposure:
  - Reduced lung function
  - Development of respiratory diseases in children
  - Aggravation of existing lung diseases
  - Premature death of people with lung disease



# Particle Pollution Affects the Heart

- Inhaled particles can pass from the lungs into the bloodstream and affect the cardiovascular system
- Effects of **short-term (acute)** exposure:
  - Irregular heart beat
  - Nonfatal heart attacks
- Effects of **long-term (chronic)** exposure:
  - Aggravation of existing heart diseases
  - Premature death of people with heart disease



# Certain Groups Are Most at Risk from Exposure to Particle Pollution

- Children
  - Lungs are still developing
  - Spend more time at high activity levels
- Senior citizens
  - May have undiagnosed heart or lung diseases
- People with existing heart or lung diseases
  - Particle pollution aggravates these diseases
- People who exercise or work outdoors
  - Breathe faster and deeper than sedentary adults





# Famous Particle Air Pollution Episodes

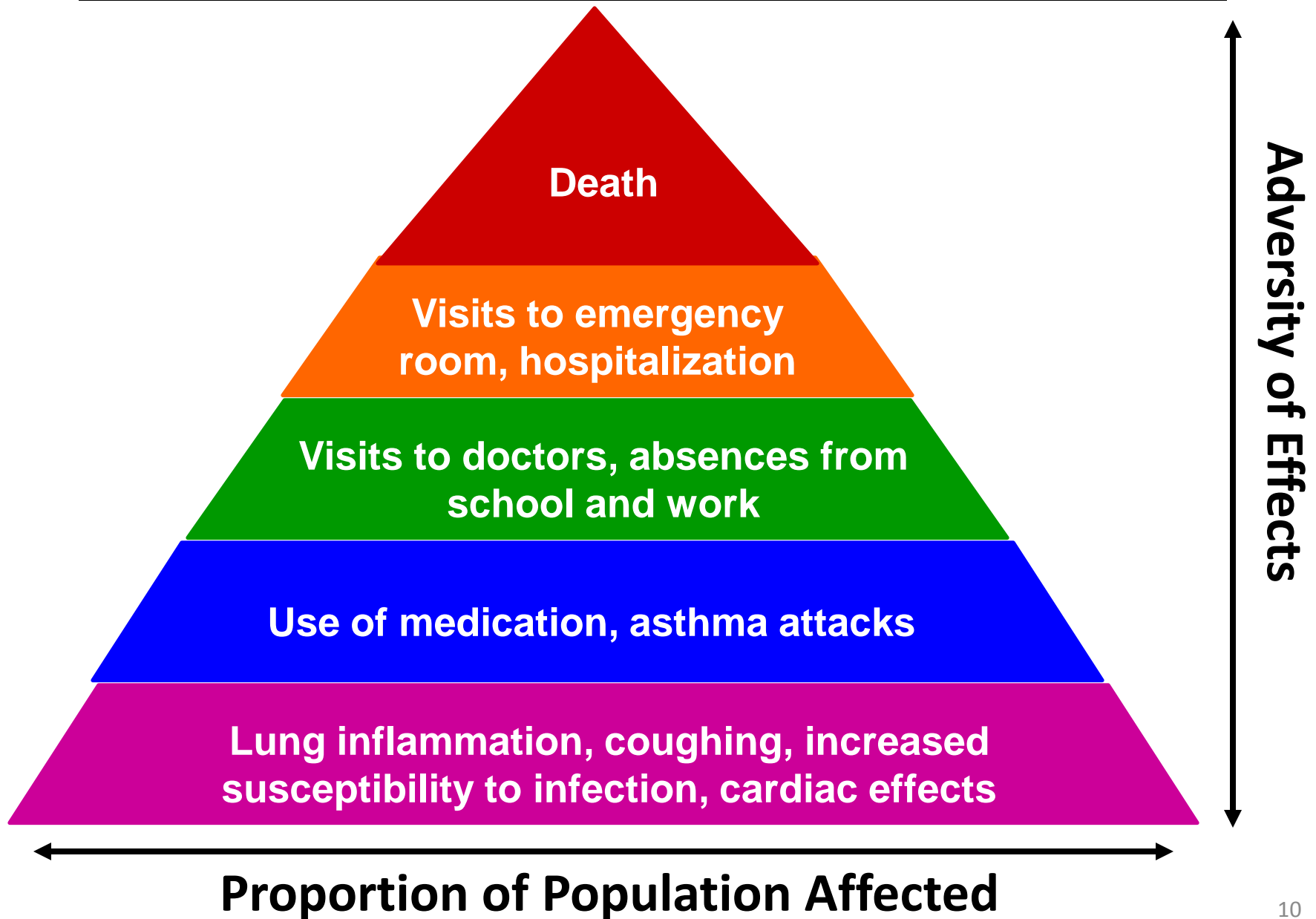
**Donora, Pennsylvania, USA**  
**October 26-31, 1948**  
**air pollution kills 20 people**



**London, England**  
**December 4-9, 1952**  
**air pollution kills 4000 people**

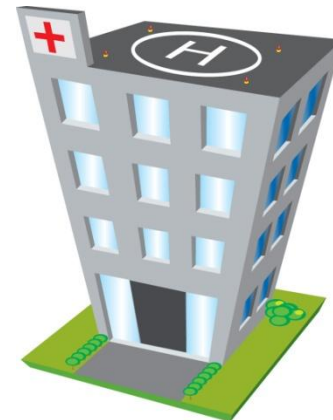


# Pyramid of Health Effects from Air Pollution



# Communicating Health Effects

- Morbidity
  - Increased frequency of chronic bronchitis, respiratory hospital admissions, restricted activity days, etc.
- Disability-Adjusted Life Year (DALY)
  - Indicates how a disease can alter the ability of people to live a normal life compared to those with no disease
  - Expresses years of lost life
- Mortality (number of deaths)



# Examples of Health Effects for Europe

- Air pollution causes 1.8 – 6.4% of deaths of European children age 0-4 years
- Air pollution causes 100,000 deaths and 725,000 years of lost life (DALY) in European cities
- PM<sub>2.5</sub> pollution caused 350,000 premature deaths in 2000
- European citizens have a decrease in average life expectancy of 9 months due to air pollution



# Annual Impacts of Air Pollution in the U.S.

- Human exposure to outdoor air pollution costs between \$40 to \$50 billion
- 50,000 to 120,000 premature deaths are associated with exposure to air pollution
- People with asthma experience more than 100 million days of restricted activity
- Costs associated with treating asthma exceed \$4 billion
- About 4,000 people die of asthma



# Summary

- Particulate matter (PM) is a general term for very small solid and liquid particles in the atmosphere
- There are many different sources of PM, including natural and anthropogenic (man-made) sources
- PM is hazardous to human health – it causes acute and chronic effects to the respiratory and cardiovascular systems
- PM causes a variety of human health and economic impacts each year (e.g., mortality, morbidity, DALYs, lost income from work absences, costs of health care)