Let’s Talk about
AIR POLLUTION

Particulate Matter
Ozone
Cigarette Smoke
Toxics
Radon
Air Pollution: Particulate Matter (PM)

- Particulate matter, or PM, is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets.

- Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke.

- Others are so small that individually they can only be detected with an electron microscope.
Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. These solid and liquid particles come in a wide range of sizes.

Particles less than 10 micrometers in diameter (PM10) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter (PM2.5) are referred to as "fine" particles and are believed to pose the greatest health risks.

Because of their small size (approximately 1/30th the average width of a human hair), fine particles can lodge deeply into the lungs.
PM10 and PM2.5 are each measured and expressed as the amount (in micrograms) of particles contained in a cubic meter of air, expressed as micrograms per cubic meter (µg/m³).
Health Effects from PMs and Sulfate Particles

• PM 2.5 and PM10 particles easily penetrate into the airways and lungs where they may produce harmful health effects such as the worsening of heart and lung diseases.

• The risk of these health effects is greatest in the elderly and the very young.

• Exposure to elevated concentrations of PM is also associated with increased hospital and doctor visits and increased numbers of premature deaths.

• Effects of sulfate exposure at levels include a decrease in lung function, aggravation of asthmatic symptoms, and an increased risk of cardio-pulmonary disease.

(http://www.arb.ca.gov/research/aaqs/pm/pm.htm)
Who is At Risk from PMs?

• Roughly one out of every three people in the United States is at a higher risk of experiencing PM2.5 related health effects.

• One group at high risk is active children because they often spend a lot of time playing outdoors and their bodies are still developing. In addition, oftentimes the elderly population are at risk.

• People of all ages who are active outdoors are at increased risk because, during physical activity, PM2.5 penetrates deeper into the parts of the lungs that are more vulnerable to injury.
What are the Sources of Airborne Particulate Matter?

- Sources of fine particles include all types of combustion activities (motor vehicles, power plants, wood burning, etc.) and certain industrial processes.
- Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse." Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads.
- Other particles may be formed in the air from the chemical change of gases. They are indirectly formed when gases from burning fuels react with sunlight and water vapor. These can result from fuel combustion in motor vehicles, at power plants, and in other industrial processes.
• **Large diesel trucks and buses** will emit millions of tons of air pollution this year. According to the U.S. Environmental Protection Agency (EPA) these emissions will include 2.2 million tons of smog-forming oxides of nitrogen (NOx) and **131,000 tons of fine particulates** -- probable carcinogens that are breathed deep into the lungs. (see [http://www.epa.gov/otaq/regs/hd-hwy/1999nprm/99ria15.pdf](http://www.epa.gov/otaq/regs/hd-hwy/1999nprm/99ria15.pdf)).

• In March 2000 a study by the South Coast Air Quality Management District of Los Angeles found that emissions of diesel particulates are responsible for **70%** of the risk associated with carcinogenic air pollutants (see [http://www.aqmd.gov/matesiidf/matestoc.htm](http://www.aqmd.gov/matesiidf/matestoc.htm)).
In Gary particulate matter comes from:

- Diesel trucks - the Borman, Toll Road and city streets
- U.S. Steel
- Places where trucks idle, such as truck stops
- Incinerators
- “Fugitive dust” sources – dumps, construction sites, uncovered piles of industrial materials
- Other factories
- Sources outside the city in NW Indiana, like NIPSCO plants, other mills and industries
- Sources and traffic in Chicago
Ozone (O3) is a gas composed of three oxygen atoms. It is not usually emitted directly into the air, but at ground-level is created by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight.

In the earth's lower atmosphere, ground-level ozone is considered "bad."
Sources of Ozone

• Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NOx and VOC that help form ozone.

• Ground-level ozone is the primary constituent of smog. Sunlight and hot weather cause ground-level ozone to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant.

• Many urban areas tend to have high levels of "bad" ozone, but even rural areas are also subject to increased ozone levels because wind carries ozone and pollutants that form it hundreds of miles away from their original sources.
Health Effects of Ozone

Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. Ground-level ozone also can reduce lung function and inflame the linings of the lungs. Repeated exposure may permanently scar lung tissue.
Numerous scientific studies have linked ground level ozone exposure to a variety of problems, including:

- airway irritation, coughing, and pain when taking a deep breath;
- wheezing and breathing difficulties during exercise or outdoor activities;
- inflammation, which is much like a sunburn on the skin;
- aggravation of asthma and increased susceptibility to respiratory illnesses like pneumonia and bronchitis; and,
- permanent lung damage with repeated exposures.
Who is Affected?

- People with lung disease, children, older adults, and people who are active can be affected when ozone levels are unhealthy.
In Gary, ozone is formed from emissions on hot sunny days from:

- automobile and truck traffic
- use of other gasoline powered engines: lawnmowers, hedge trimmers, leaf blowers
- pumping gas
- charcoal lighter fluid
- open burning – leaves, debris, etc.
- industrial emissions
Secondhand Smoke

- Secondhand smoke, also known as environmental tobacco smoke (ETS) or passive smoke, is a mixture of 2 forms of smoke from burning tobacco products:
  - **Sidestream smoke**: smoke that comes from the end of a lighted cigarette, pipe, or cigar
  - **Mainstream smoke**: smoke that is exhaled by a smoker
- When non-smokers are exposed to secondhand smoke it is called involuntary smoking or passive smoking. Non-smokers exposed to secondhand smoke absorb nicotine and other toxic chemicals just like smokers do. The more secondhand smoke you are exposed to, the higher the level of these harmful chemicals in your body.
• It is involuntarily inhaled by nonsmokers, lingers in the air hours after cigarettes have been extinguished.

• Secondhand smoke is classified as a "known human carcinogen" (cancer-causing agent) by the US Environmental Protection Agency (EPA), the US National Toxicology Program, and the International Agency for Research on Cancer (IARC), a branch of the World Health Organization.

• Tobacco smoke contains over 4,000 chemical compounds. More than 60 of these are known or suspected to cause cancer.
What are the effects?

In the United States alone, each year it is responsible for:

• 150,000 to 300,000 lung infections (such as pneumonia and bronchitis) in children younger than 18 months of age, which result in 7,500 to 15,000 hospitalizations

• increases in the number and severity of asthma attacks in about 200,000 to 1 million children who have asthma

• more than 750,000 middle ear infections in children
• an estimated 35,000 deaths from heart disease in non-smokers who live with smokers
• about 3,400 lung cancer deaths in non-smoking adults
• other breathing problems in non-smokers, including coughing, mucus, chest discomfort, and reduced lung function
• Pregnant women exposed to secondhand smoke are also at increased risk of having low birth weight babies.
• In the United States, 21 million, or 35 percent of, children live in homes where residents or visitors smoke in the home on a regular basis. Approximately 50-75 percent of children in the United States have detectable levels of cotinine, the breakdown product of nicotine in the blood.

• Children are more susceptible to secondhand smoke because their respiratory rate is greater than adults because they have smaller lungs.

• The current Surgeon General’s Report concluded that scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke.

• Short exposures to secondhand smoke can cause blood platelets to become stickier, damage the lining of blood vessels, decrease coronary flow velocity reserves, and reduce heart rate variability, potentially increasing the risk of heart attack.
An issue that continues to be studied is whether secondhand smoke may increase the risk of breast cancer. Both mainstream and secondhand smoke contain about 20 chemicals that, in high concentrations, cause breast cancer in rodents. Chemicals in tobacco smoke reach breast tissue and are found in breast milk.
African Americans and Secondhand Smoke

• African Americans suffer disproportionately from many chronic and preventable diseases associated with smoking.
• African American communities have been bombarded with cigarette advertising. Since the Master Settlement Agreement (MSA), the average youth in the United States is annually exposed to 559 tobacco ads, every adult female 617 advertisements, and every African American adult 892 ads.
• Expenditures for magazine advertising of mentholated cigarettes, popular with African Americans, increased from 13 percent of total ad expenditures in 1998 to 49 percent in 2005.
In Gary, exposure to secondhand smoke comes from:

Homes

Restaurants and bars and other public venues

Driving in cars where others are smoking

Anywhere someone is smoking
Air Toxics

• Toxic air pollutants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects.

• Examples of toxic air pollutants include benzene, which is found in gasoline; perchlorethlyene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries.

• Examples of other listed air toxics include dioxin, asbestos, toluene, and metals such as cadmium, mercury, chromium, and lead compounds.
What are the health and environmental effects of toxic air pollutants?

- Increased chance of getting cancer or experiencing other serious health effects. These health effects can include damage to the immune system, as well as neurological, reproductive (e.g., reduced fertility), developmental, respiratory and other health problems.

- In addition to exposure from breathing air toxics, some toxic air pollutants such as mercury can deposit onto soils or surface waters, where they are taken up by plants and ingested by animals and are eventually magnified up through the food chain.
Where do toxic air pollutants come from?

- Most air toxics originate from human-made sources. These include:
  - Mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants) as well as
  - Indoor sources (e.g., some building materials and cleaning solvents).
- Some air toxics are also released from natural sources such as volcanic eruptions and forest fires.
How Do People Get Exposed?

- Breathing contaminated air.
- Eating contaminated food products, such as fish from contaminated waters; meat, milk, or eggs from animals that fed on contaminated plants; and fruits and vegetables grown in contaminated soil on which air toxics have been deposited.
- Drinking water contaminated by toxic air pollutants.
- Ingesting contaminated soil. Young children are especially vulnerable because they often ingest soil from their hands or from objects they place in their mouths.
- Touching (making skin contact with) contaminated soil, dust, or water (for example, during recreational use of contaminated water bodies).
Radon is a naturally-occurring radioactive toxic gas that seeps into buildings from the ground. You cannot smell or taste it. 21,000 deaths a year are attributed to exposure to radon. It is the second leading cause of lung cancer in the U.S. after smoking. Smokers exposed to radon are at very high risk.
Nearly 1 out of 15 homes in the U.S. is estimated to have elevated levels of radon.

Radon can enter a building through:

- Cracks in solid floors
- Construction joints
- Cracks in walls
- Gaps in suspended floors
- Gaps around service pipes
- Cavities inside walls
- The water supply
Testing for radon is relatively easy and solutions to reduce radon levels in homes and schools are readily available.

- All homes and schools should be tested for radon
- All communities should be educated about the dangers of radon
Questions to Think About: Air Pollution Sources

- Does it fall within the intended scope of our environmental health assessment?
- Does it represent a relationship between the environment and human health?
- Is it a local and community concern?
- Can the community effect change on this issue?
On our agenda for future discussion...

- Landfills and pollution in soil, etc.
- Lead
- Pesticides
- Water
- Home products
- Hazard and risk
- What else is missing?