ASTHMA & THE ENVIRONMENT MAY 21, 2014

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Objectives

- Explain the health effects and consequences of asthma
- Enhance knowledge about asthma and environmental exposures

Introduction to Asthma

- Chronic disease which can be controlled with a comprehensive asthma management plan
- Can be diagnosed at any age and lasts a lifetime

Introduction to Asthma

- 18% of children in the District have asthma compared with 8% in the US
- 10.4% of DC adults have asthma versus 8.2% of adults nationwide
- In 2009 the hospitalization rate for asthma in DC was 21.5 per 10,000 children and adults 5 to 64 years of age compared to a national baseline of 11.1

Children are More Vulnerable to Air Pollution

- Exposure to air pollution alters the normal process of lung development
- Children's lung epithelium is more permeable and presumably easier to damage
- Peripheral airways of infants are more susceptible to inflammatory narrowing
- Environmental exposures influence development of the immune system
- Children are more active and less likely to have increased personal exposure

Defining Asthma

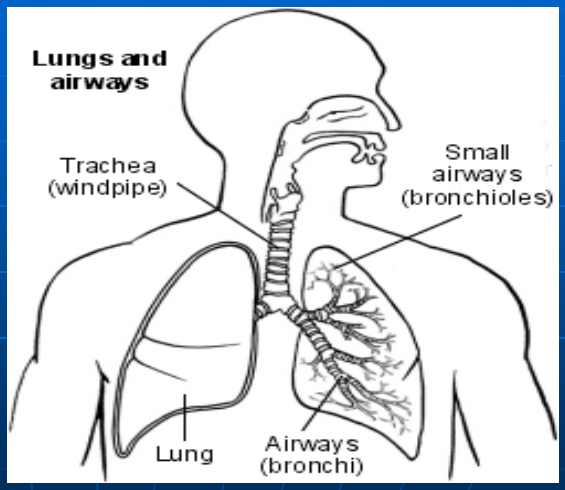
- What is asthma?
  - Asthma is a chronic condition in which the airways of the lungs become swollen, narrowed, and sometimes completely blocked, making it hard to breathe.

Structure of the Lung

• Air reaches the lungs through the windpipe (trachea), which divides into the bronchi.

•Each bronchus divides into more bronchi, and then into bronchioles

•Bronchioles lead to the alveoli, where oxygen from the air is transferred to the bloodstream and carbon dioxide from the bloodstream is transferred to the air.



What is an Asthma Attack?

During an asthma attack a person comes in contact with an allergen (any substance that brings about an immune/allergic response in the body) or an irritant.

- Inflammation and the swelling of the lining of the airways
- Tightening and constriction of the muscles in the airways
- Increase in mucus production

One, two, or all three of these actions can cause an obstruction in the airways making it very difficult to breathe.

What are the Symptoms of Asthma?

- Wheezing
- Coughing
- Chest pain
- Difficulty breathing out
- Gasping for air
- Heavy breathing
- Breathlessness
- Dry mouth
- Tiredness
- Waking at night due to asthma symptoms
- Difficulty exercising

Vulnerable Populations: Children

- Children 5 to 14 years of age are the most affected by asthma.
  - Asthma usually has its onset in early life for the majority of asthmatic children.
  - Up to 50% of babies experience at least one episode of wheezing during the first few years of life.
    - Two-thirds of these are babies who are born with “small airways” and wheeze with virus infections but otherwise do not seem to develop asthma.
    - The remaining one-third are eventually diagnosed with asthma. These are the children who become sensitized to the allergens in their daily environment.

Vulnerable Populations: Ethnic Minorities

- Blacks and Latinos also seem to be at the greatest risk.
  - Blacks 5-34 years old are 5 times more likely to die of asthma than whites
  - Puerto Ricans in the U.S. suffer from asthma far more frequently than other ethnic groups.
    - 20% of Puerto Rican children in the U.S. has asthma in 1982-1984

Vulnerable Populations: Urban Poor

- Poor air quality resulting from contaminants
- Low-income families often live in housing conditions with poor ventilation and cockroaches.
- In some urban areas, more than half the children with asthma receive all their medical care in the emergency room and only at the time of attack.
  - Limited access to long-range care

Why is Lung Disease Increasing?

- Increased levels of certain outdoor air pollutants, such as ozone, sulfur, and exhaust particles
- Increased exposure to tobacco smoke
- "Tighter homes" – High indoor levels of nitrogen and other indoor air contaminants
- People spending more time in the home

Pollutants Associated with Lung Disease

- Ozone
- Fine Particulate Matter
- Sulfur Dioxide
- Carbon Monoxide
- Nitrogen Oxides

Ozone

- Highly reactive gas
- Results from action of sunlight on hydrocarbons and nitrous oxides emitted in fuel combustion
- Oxidizes lung tissues on contact
- Powerful irritant

Ozone Associated Effects

- Reductions in lung function
- Shortness of breath
- Chest pain with deep inhalation
- Wheezing and coughing
- Asthma exacerbations

Particulate Matter

- Mixture of solid particles or liquid droplets of varying chemical composition and physical properties suspended in the air
- Deposition in the respiratory tract varies with particle size
- Smaller particles penetrate more deeply
- Combustion and secondary particles (from motor vehicles and industry) are usually small
- Children mouth breathe and may not filter these particles

Particulate Matter Associated Effects

- Infant respiratory illness
- Infant death
- SIDS

Diesel Exhaust

- Mixture of CO, PM (2.5), nitrogen oxides, hydrocarbons and ozone
- Association with lung cancer?

Triggers of Asthma

- What is an asthma trigger?
  - Something that irritates the airways of the lungs
  - 2 major categories – allergens and irritants

- Allergens: Substances that cause no problem for a majority of people but which trigger an allergic reaction in some people.
  - Examples: Mites, cockroaches, mold, animal dander

- Irritants: Substances that trigger asthma symptoms by stimulating irritant receptors in the airways.
  - Examples: Cigarette smoke, perfumes, gasoline fumes

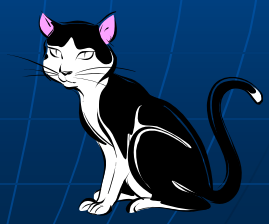
What Allergens and Irritants Trigger Lung Disease?

Irritants:

- Secondhand smoke
- Pollutants
- Ozone
- Strong smells or sprays
- Exercise
- Allergies
- Hot or cold air

Allergens:

- Dust mites
- Pets
- Molds
- Cockroaches



RAND Health

Health Environment Index

- The health index is composed of variables capturing neighborhood safety, the exercise environment, prevalence of vacant housing, extent of overcrowded housing, degree of street connectivity, extent of tree cover, and air pollution;

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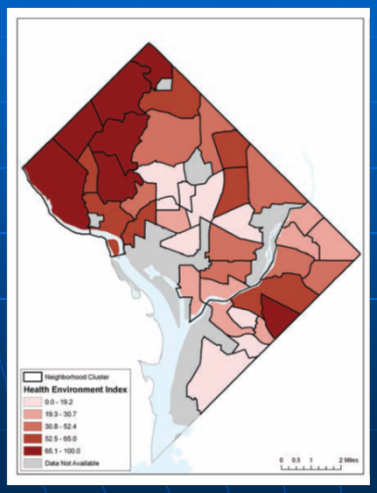
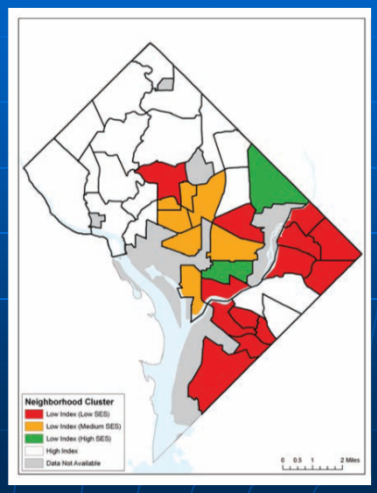
RAND Health

Health Environment Index, by Neighborhood 2009





RAND Health

Low SES & Low Health Indices

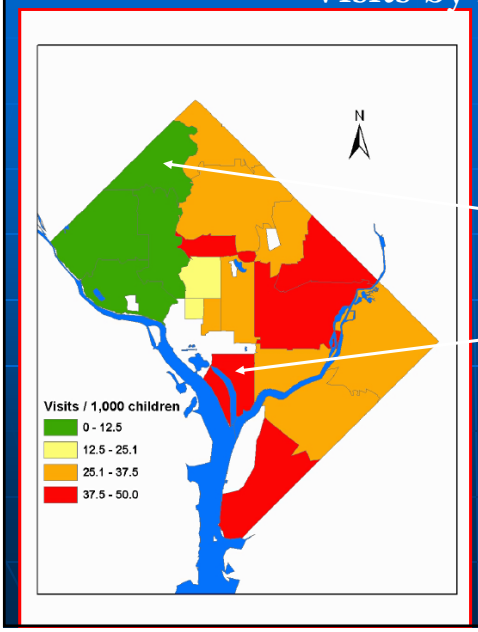
- Columbia Heights, Mt. Pleasant, Pleasant Plains, Park View
- Ivy City, Arboretum, Trinidad, Carver Langston
- Near Southeast, Navy Yard
- Historic Anacostia
- Eastland Gardens, Kenilworth
- Mayfair, Hillbrook, Mahaning Heights
- Deanwood, Burrville, Grant Park, Lincoln Heights, Fairmont Heights
- River Terrace, Benning, Greenway, Fort Dupont
- Capitol View, Marshall Heights, Benning Heights
- Woodland/Fort Stanton, Garfield Heights, Knox Hill
- Sheridan, Barry Farm, Buena Vista
- Douglass, Shipley Terrace
- Congress Heights, Bellevue, Washington Highlands

RAND Health

Lowest Health Environment Index & Mid-range SES

- Howard University, Le Droit Park, Cardozo/Shaw
- Shaw, Logan Circle
- Downtown, Chinatown, Penn Quarter, Mount Vernon Square, North Capitol Street
- Southwest Employment Area, Southwest/Waterfront, Fort McNair, Buzzard Point
- Edgewood, Bloomingdale, Truxton Circle, Eckington
- Union Station, Stanton Park, Kingman Park

Geographic Disparity : ED Asthma Visits by Zip Code



Lowest Rate = 3.9/1000

Highest Rate = 45.2/1000

12-fold Difference in Rate!!

Prevention of Asthma

- Dramatic increase in prevalence of asthma and other allergic disease over last few decades
- Essential primary or secondary preventions
- Risk factors: early feeding, diet, infection, allergens, and exposure to indoor and outdoor pollutants
- Prevention Strategies: Reduce exposure to allergens and irritants in indoor and outdoor environments

THANK YOU