

Climate Change and Its Effects On Asthma

Presentation Outcomes

By the conclusion of this presentation, you will be able to answer the following:

1. What is asthma and its prevalence in EPA Region 3?
2. What are asthma triggers and how can they be identified?



3. What is climate change and how will it affect asthma?
4. What actions can be taken in order to reduce asthma risk associated with climate change?

What is Asthma

- “Asthma is a chronic condition that affects the quality of life of many Americans today” (American Lung Association).
- “Asthma is a lung disease that inflames and narrows the airways. Asthma causes recurring periods of wheezing chest tightness, shortness of breath, and coughing” (National Heart, Lung and Blood Institute).

Asthma Prevalence

- Certain populations are more vulnerable to asthma related morbidity and mortality.
- Vulnerability is characterized by:
 - Exposure to air pollutants
 - Sensitivity to the effects of exposure
- Vulnerable populations include:
 - Children
 - Individuals living below the federal poverty level
 - Persons living in the Northeast US
 - Racial and ethnic minorities

EPA Region

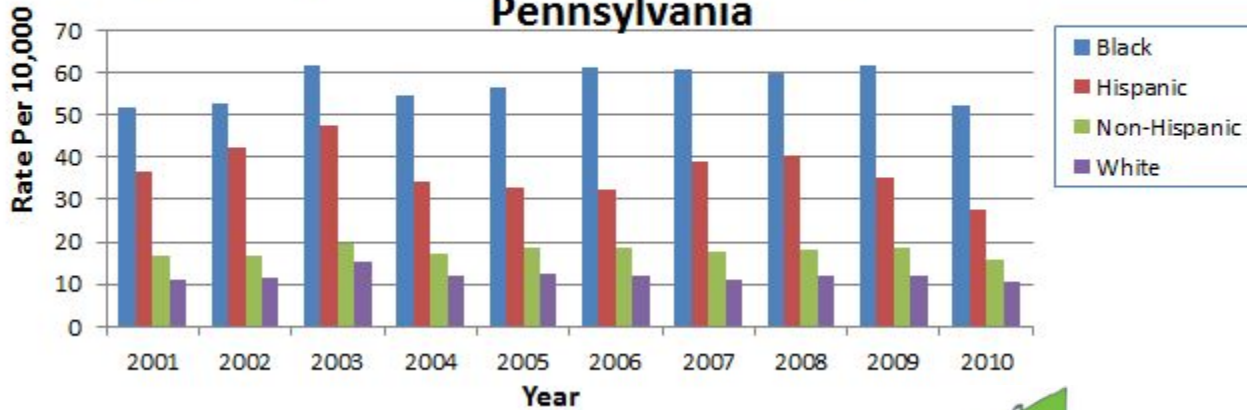


Delaware
District of Columbia
Maryland
Pennsylvania
Virginia
West Virginia

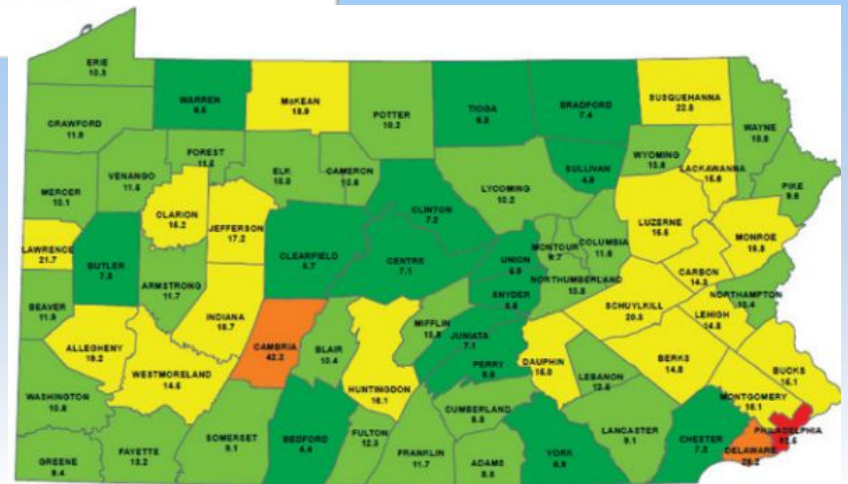
Source: EPA Region 3 (Mid-Atlantic), *Environmental Protection Agency* 29 October 2014

Pennsylvania

Inpatient hospitalization rates with asthma as the primary discharge diagnosis among children in Pennsylvania



Source: Adapted from Pennsylvania Asthma Burden Report, *Pennsylvania Department of Health 2012*



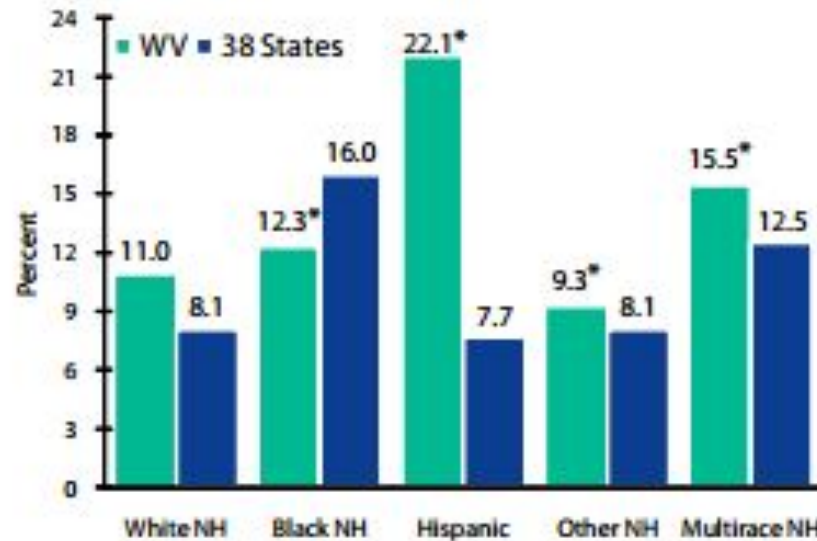
Legend



Source: Pennsylvania Asthma Burden Report, *Pennsylvania Department of Health 2012*

West Virginia

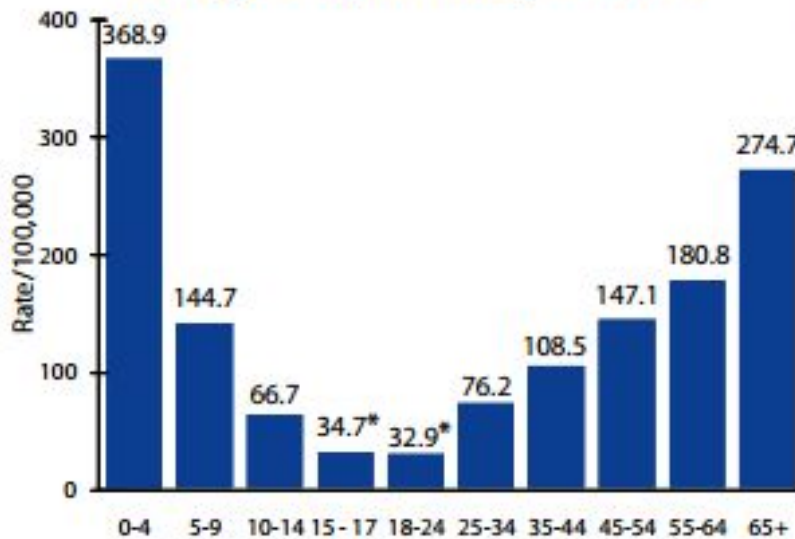
Child Current Asthma Prevalence by Race/Ethnicity, BRFSS, 2008



Source: Asthma in West Virginia, Centers for Disease Control 2008

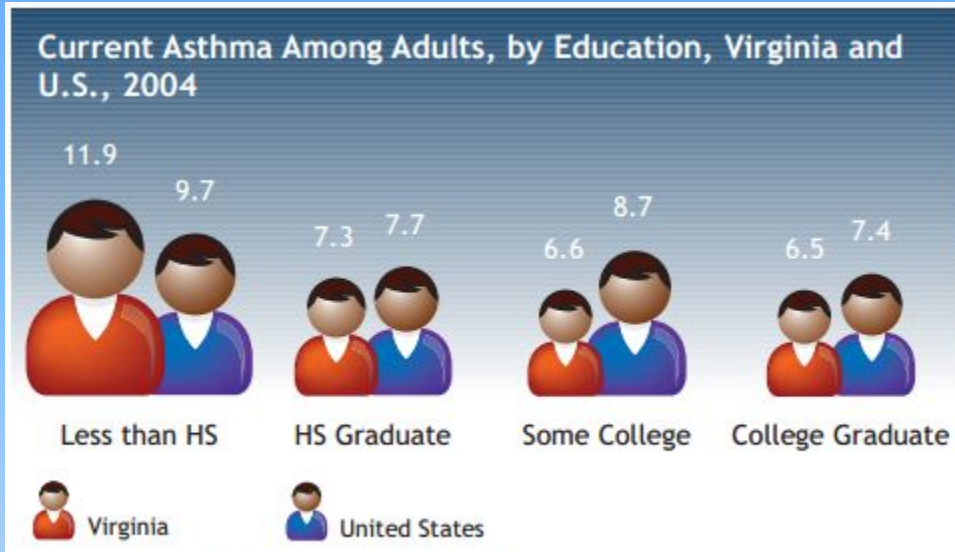
Asthma Hospitalizations

West Virginia Hospital Discharge Data, 2008

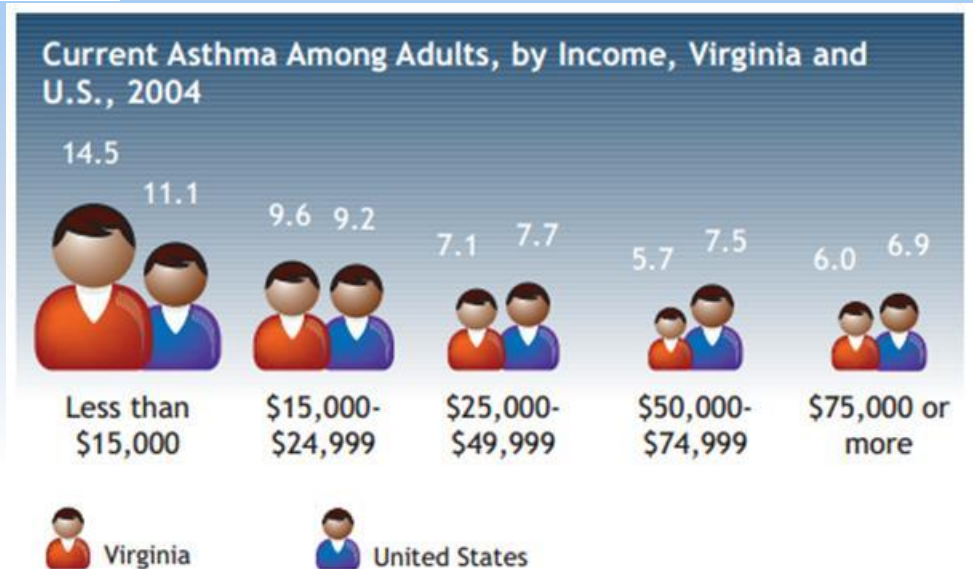


Source: Asthma in West Virginia, Centers for Disease Control 2008

Virginia

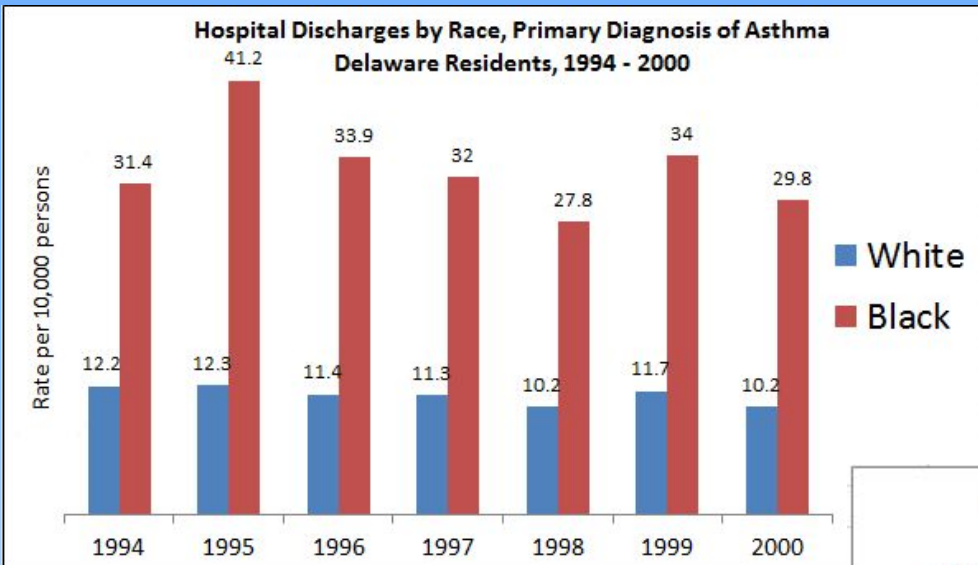


Source: Overview of Asthma in Virginia, Virginia Department of Health 2007

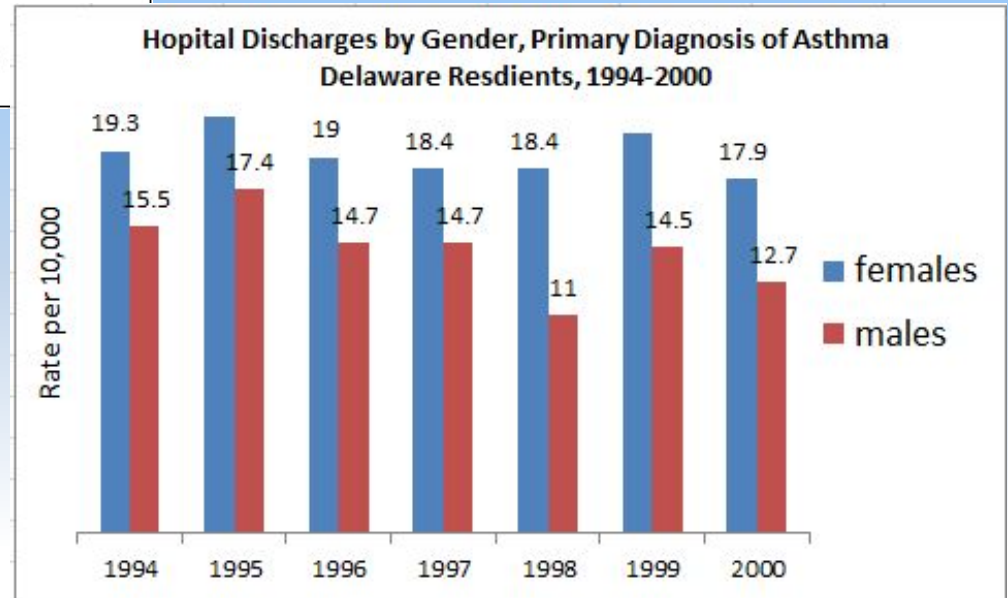


Source: Overview of Asthma in Virginia, Virginia Department of Health 2007

Delaware



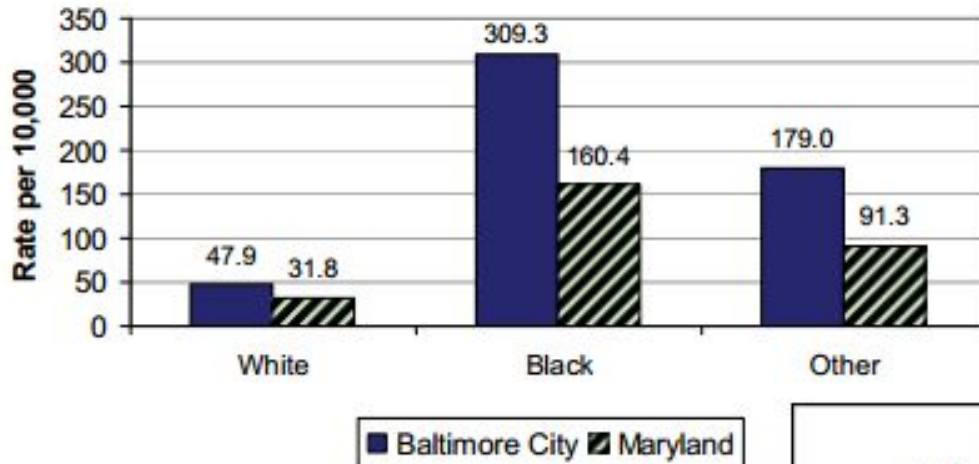
Source: Adapted from The Burden of Asthma in Delaware, *Delaware Health and Social Services Division of Public Health 2005*



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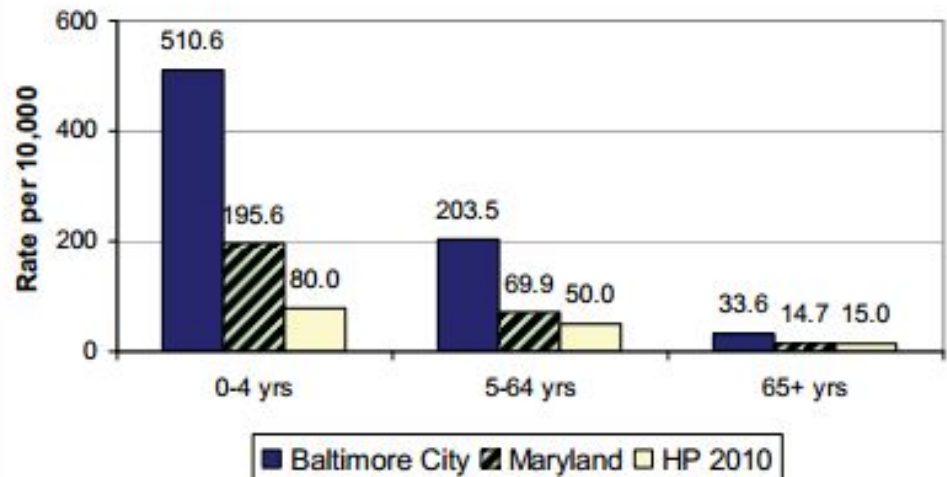
Maryland

**Asthma Emergency Department Visit Rates by Race
Baltimore City vs. Maryland, 2009**



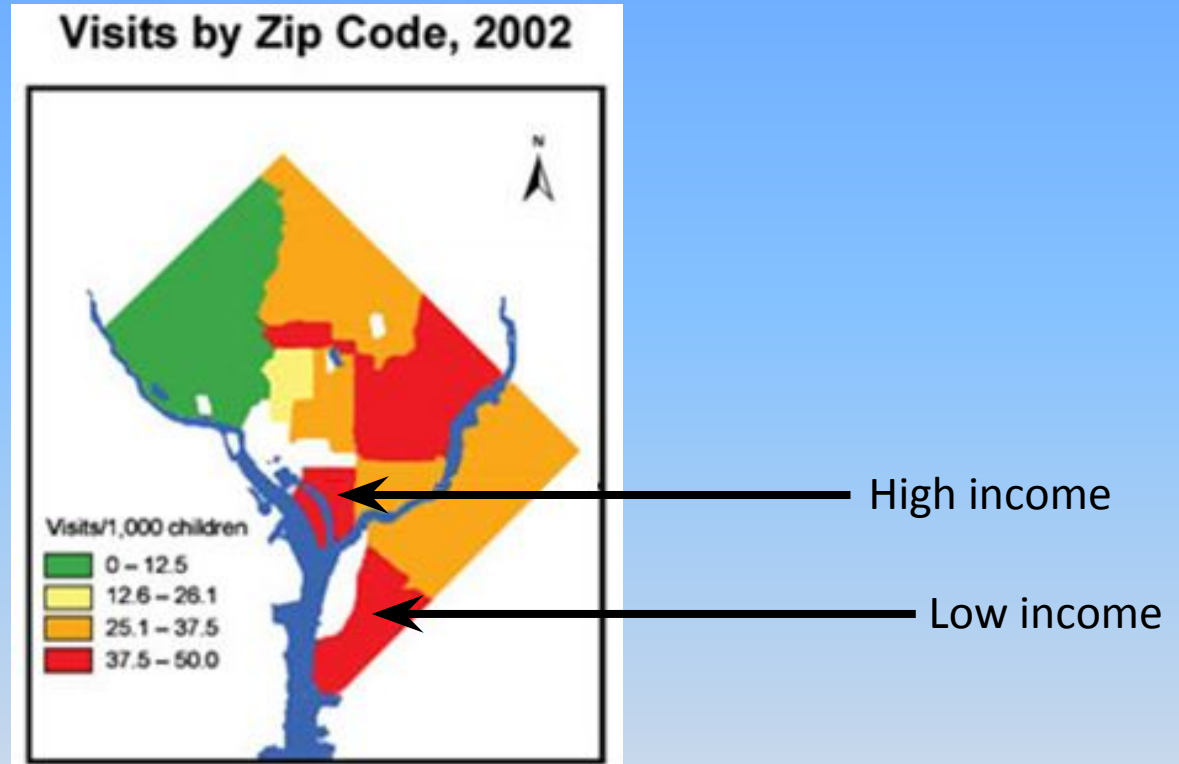
Source: Jurisdiction Profile: Asthma in Baltimore City, *Maryland Asthma Control Program 2009*

**Asthma Emergency Department Visit Rates by Age
Baltimore City vs. Maryland and Healthy People 2010 Goals, 2009**



Source: Jurisdiction Profile: Asthma in Baltimore City, *Maryland Asthma Control Program 2009*

District of Columbia



Source: Mapping Geospatial Access,
*PediatricAsthma.org: Models
for Advancing Asthma Care 2002*

Asthma Triggers

What are environmental asthma triggers?

Where do they come from?



Asthma Trigger

Sources – What, When, and Where?

Nitrous Oxides



- Nitrogen dioxide is a gaseous air pollutant composed of nitrogen and oxygen
- It occurs when fossil fuels are burned at high temperatures
- The highest concentrations of nitrous oxides are found by heavily traveled roadways and highways as well as from gas stoves in indoor environments

VOCs



- Volatile Organic Compounds (VOCs) are gases made of both solid and liquid carbon-based chemicals
- VOCs are often found in paints, cleaning supplies, pesticides, and building materials, including carpeting and certain types of wood or vinyl flooring
- Higher concentrations of VOCs are typically found indoors rather than outdoors

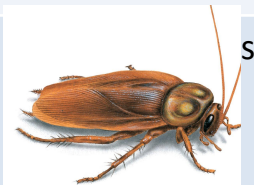
Ground Level Ozone



- Ground level ozone forms when nitrogen oxides and VOCs react with sunlight
- Vehicle exhaust, factory pollution, gas stations, household cleaners, and paints contribute to higher levels of ozone
- At the ground-level, ozone is a harmful air toxin – it is likely to reach unhealthy levels on a hot day in an urban environment and is a major contributor to urban smog.



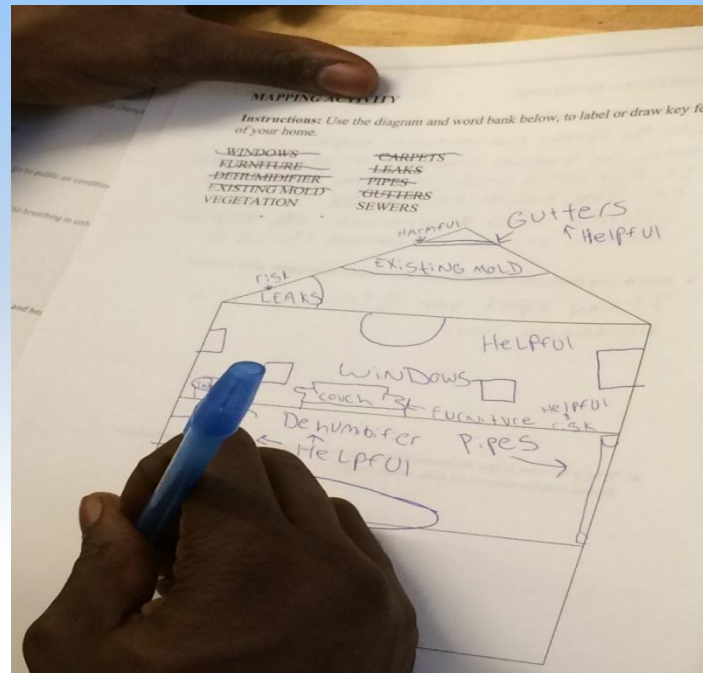
- Mold includes mildew and fungi
- It grows best in warm, damp, humid conditions
- Indoors, mold grows on wet surfaces, primarily where there is an excessive amount of moisture (such as the kitchen, bathroom or basement)



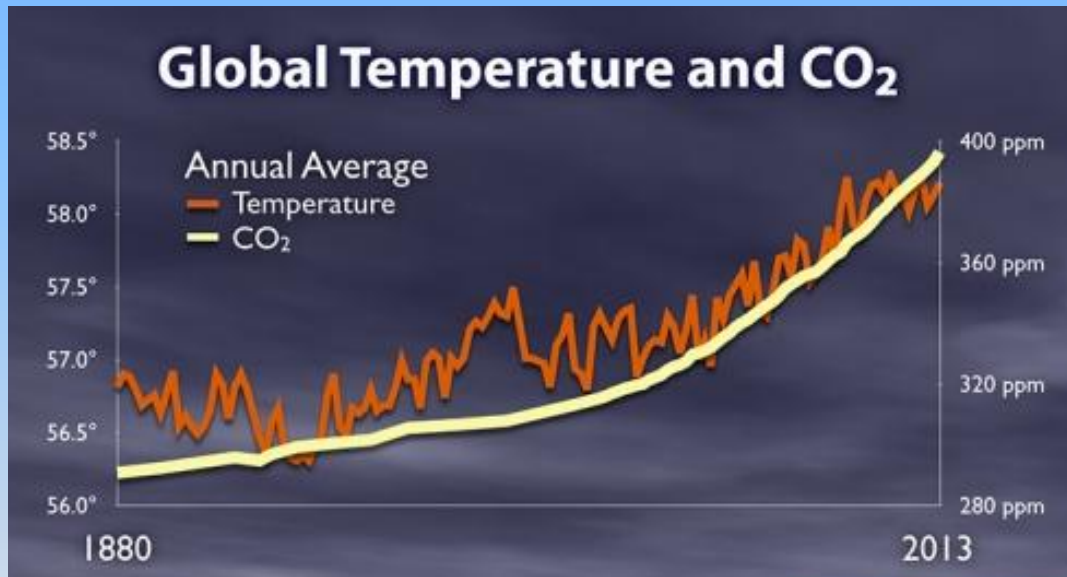
- Dust mites, cockroaches, and mice are all asthma triggers
- Household pests thrive in warm, damp places
- They often are found in furniture, carpets, bedding, and children's stuffed toys

Mapping Activity

- What are assets versus risks?
 - At the household level? The community level?
 - Include both the natural and built environment.



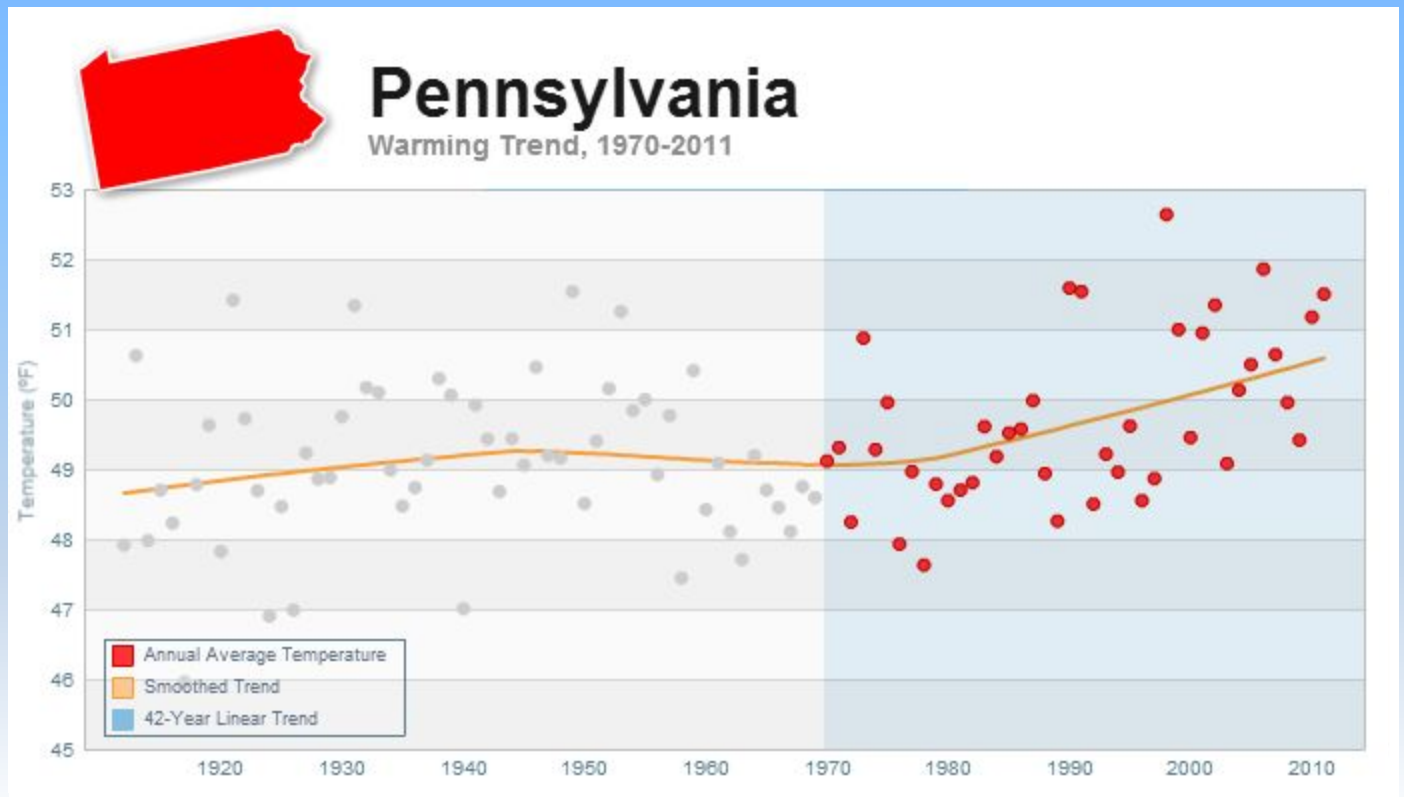
What is Climate Change?



Source: National Climate Assessment, *Climate Central* 2014

- “Climate change refers to any significant change in the measures of climate lasting for an extended period of time.” (EPA, 2014)
- These changes are largely attributed to increased levels of atmospheric carbon dioxide

What Does Climate Change Look Regionally?



Source: The Heat is On: U.S. Temperature Trends, *Climate Central* 2012

What does Climate Change Mean For Asthmatics?



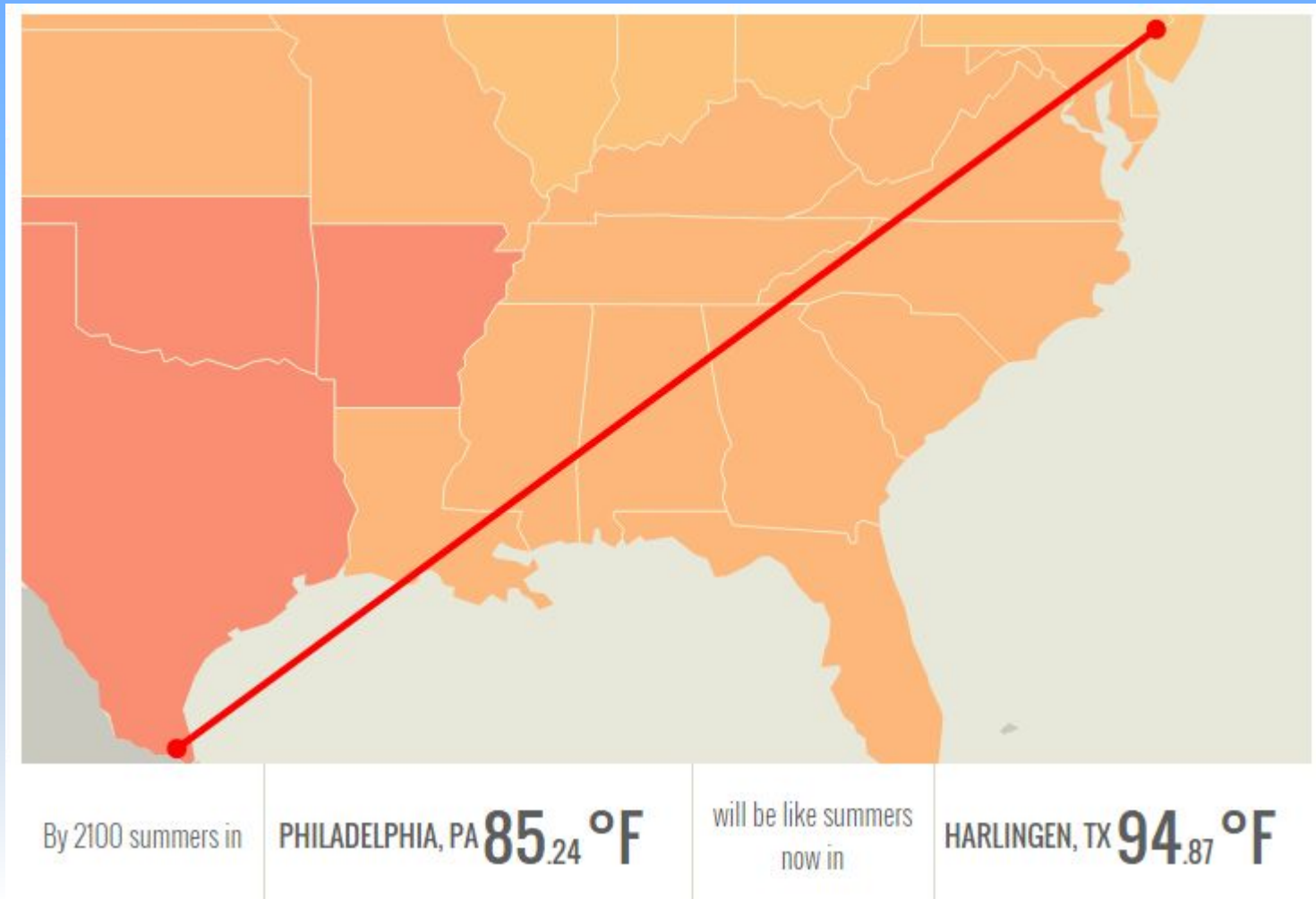
Increased exposure to:

- Air toxins from outdoor sources
- Air toxins from indoor sources
- Household pests
- Molds

Outdoor Air Toxins



Our Summers Are Changing



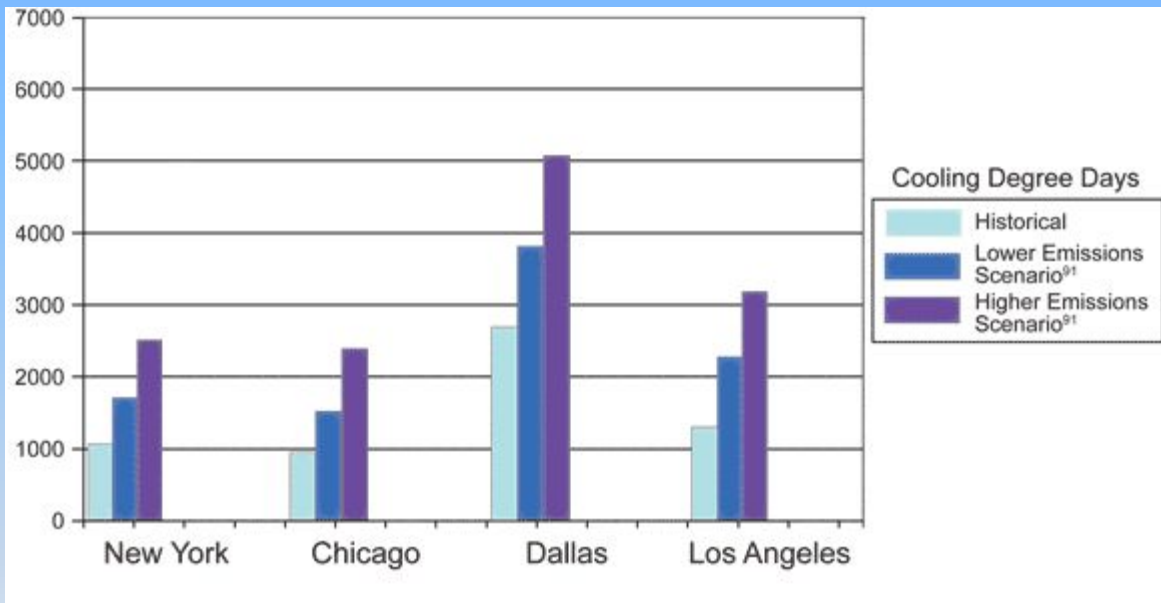
Source: 1001 Blistering Future Summers, *Climate Central* 2014

Outdoor Air Toxins

Good	Air quality is considered satisfactory and air pollution poses little or no risk.
Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy (for sensitive groups)	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy (for all)	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very unhealthy	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	Health alert: everyone may experience more serious health effects.

Source: Breathe If You Dare, Smogtown Z8 November 2008

Increased Energy Demand



Source: Energy Resources, *The Pennsylvania State University: College of Earth and Mineral Science* 2010

- Annual temperature rise of 1.8° F would increase the demand for energy used for cooling by 15-20%
- Electricity generation results in emissions of sulfur dioxide, carbon monoxide, and nitrous oxide
- Compared to primary sources, emergency generators emit more air pollution

Building Ventilation

- Staying inside with doors and windows closed can reduce exposure to outdoor air pollutions by 1/3
- However, this depends on conditions of indoor air quality
 - Stagnant indoor pollutants increases likelihood of inhalation



Indoor Air Toxins



Indoor Air Toxins: Combustion



- Unventilated gas stoves contribute to indoor air pollution
- They emit particulates, carbon monoxide, nitrogen dioxide, and formaldehyde
- Children are especially vulnerable

Indoor Air Toxins: Household Chemicals

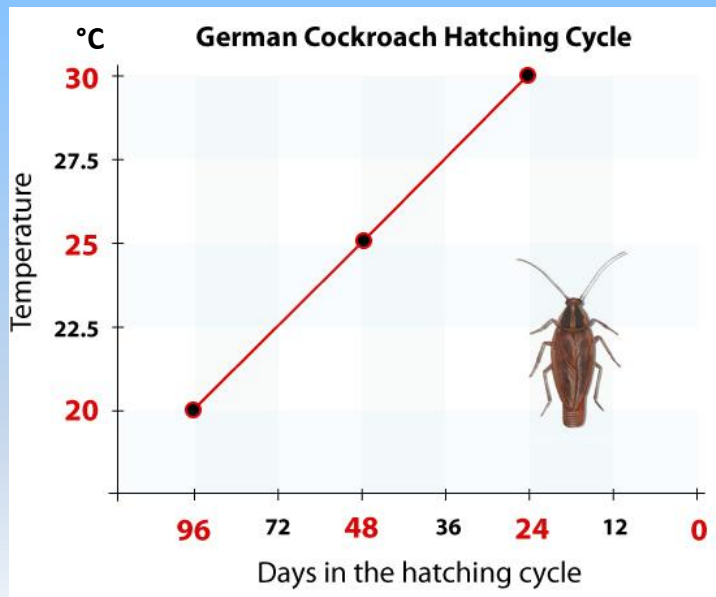
- Aerosol spray products including health, beauty, and cleaning products
- Rug and upholstery cleaners
- Air fresheners
- Chlorine bleach
- Furniture and floor polish
- Oven cleaners



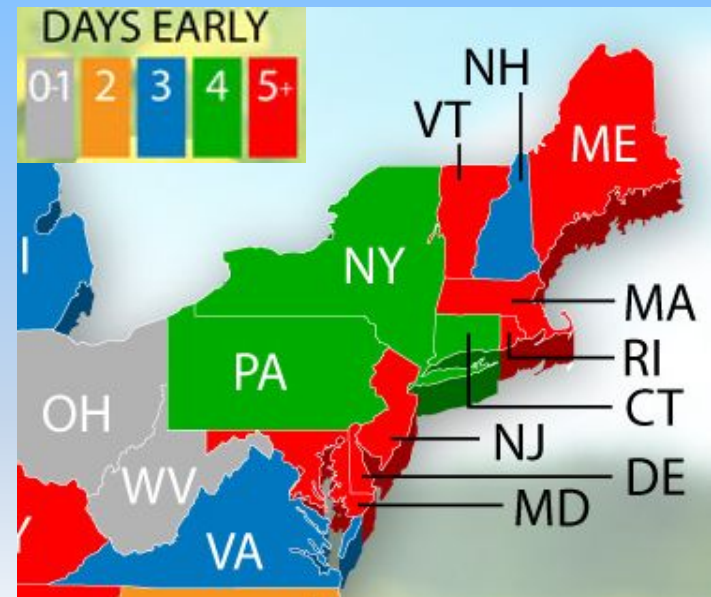
Household Pests



How Climate Change Affects Household Pests

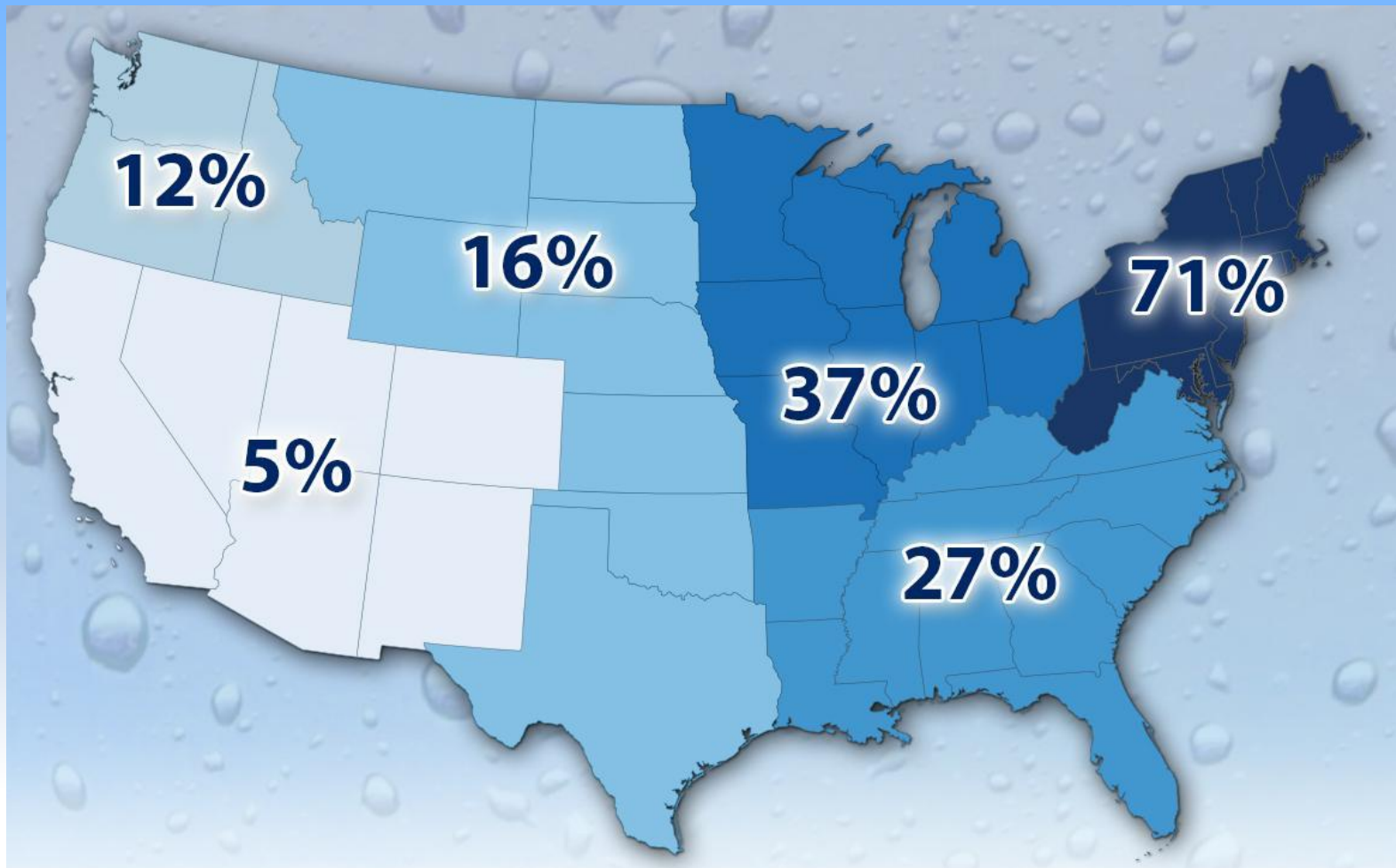


Source: Effects of Climate Change on Pests, *deBugged: The Pest Control Blog* 2009



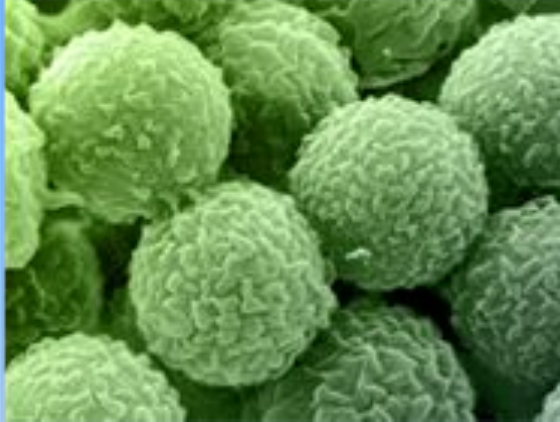
Source: Spring is Arriving Earlier and Earlier in the U.S., *Climate Central* 2014

Heavy Downpours, More Moisture



Source: Observed Changes in Heavy Precipitation, *Climate Central* 2012

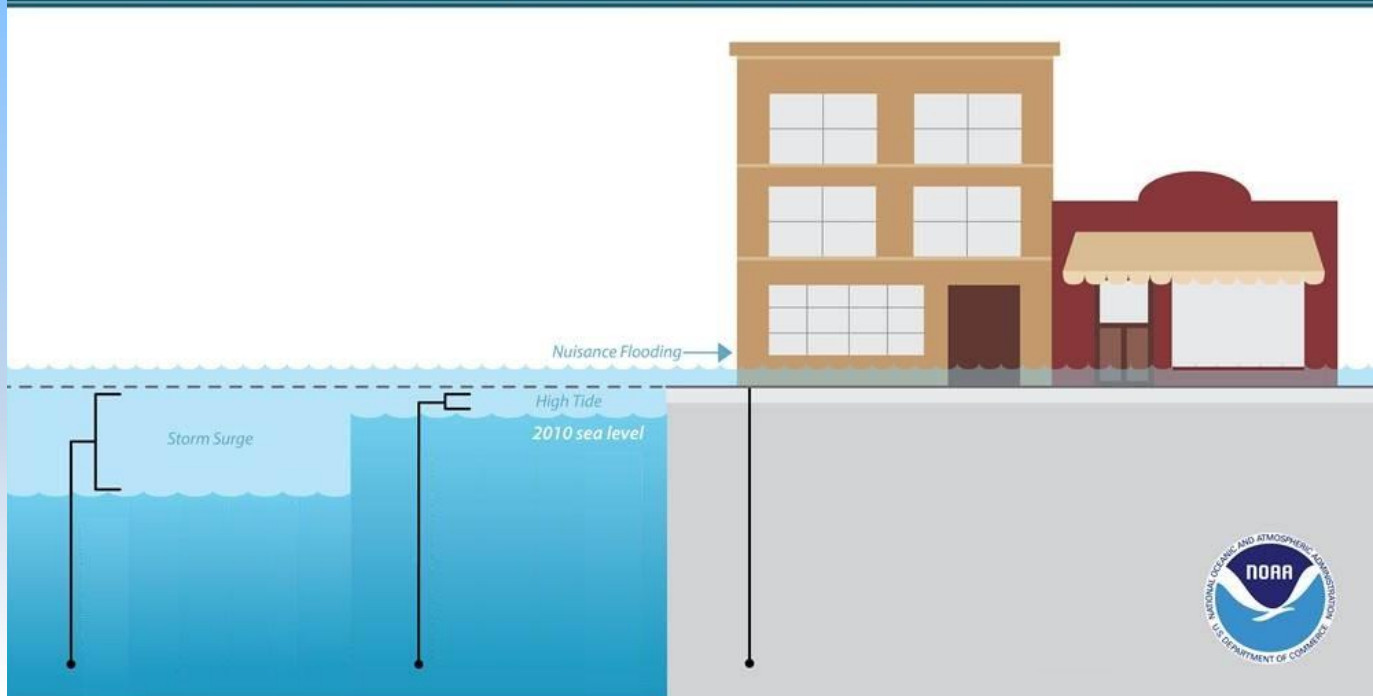
Mold



Source: "Mold Grows Fast After Flooding." *MaidPro*. N.D.




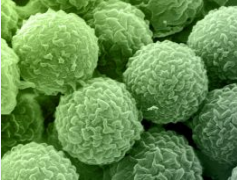
Higher Sea Level, More Flooding

Flood Events Are Significantly Increasing Around the U.S.



Source: What is Nuisance Flooding?, *National Oceanic and Atmospheric Association* 2014

How to Lessen Impacts

Asthma Trigger	First Level	Second Level	Third Level
<p>Outdoor Air Toxins</p> 	<ul style="list-style-type: none"> • Avoid going outdoors on days with high levels of ground-level ozone • Reduce energy use (e.g. turn off lights when leaving a room) 	<ul style="list-style-type: none"> • Take alternative transportation (e.g. public transportation, biking or carpooling) 	<ul style="list-style-type: none"> • Convert to a renewable energy supplier
<p>Indoor Air Toxins</p> 	<ul style="list-style-type: none"> • Open windows when using cleaning chemicals and cooking • Use rear burners when cooking – why? 	<ul style="list-style-type: none"> • Switch to low VOC products- these are usually labeled “green” • Store paints and other high VOC products in shed detached from home 	<ul style="list-style-type: none"> • Convert to a renewable energy supplier
<p>Household Pest</p> 	<ul style="list-style-type: none"> • Regularly recycle cardboard, newspaper and boxes to minimize places for pests to hide • Never leave food out • Regularly vacuum 	<ul style="list-style-type: none"> • Use mattress and pillow encasements to avoid exposure to pest allergens • Wash linens weekly in very hot water 	<ul style="list-style-type: none"> • Patch or replaces holes in walls or screens • Fix leaks and other causes of moisture buildup
<p>Mold</p> 	<ul style="list-style-type: none"> • Regularly clean shower curtains • Ventilate during showers • Do not use a humidifier or vaporizer 	<ul style="list-style-type: none"> • Use a natural, charcoal-based dehumidifier • Monitor home humidity levels with a hydrometer 	<ul style="list-style-type: none"> • Install bathroom exhaust fan • Fix leaks and other causes of moisture buildup • Contact a mold removal specialist

5 Things You Can Do Right Away

1. Open windows when using cleaning chemicals and cooking
2. Never leave food out
3. Regularly vacuum
4. Avoid going outdoors on days with high levels of ground-level ozone
5. Ventilate bathrooms during showers

Summary

- Asthma is one of the most prevalent conditions affecting the Northeast US.
- Children, low socioeconomic individuals, and ethnic minorities are especially vulnerable to the effects of asthma.
- Climate change will increase exposure to a variety of asthma triggers.
- Implementing low-effort actions can lessen the impacts of climate change on health.

Thank You!

Questions?

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