

# Iowa Climate Statement 2014: Impacts on the Health of Iowans

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# Climate Change Impacts on Respiratory Health in Iowa



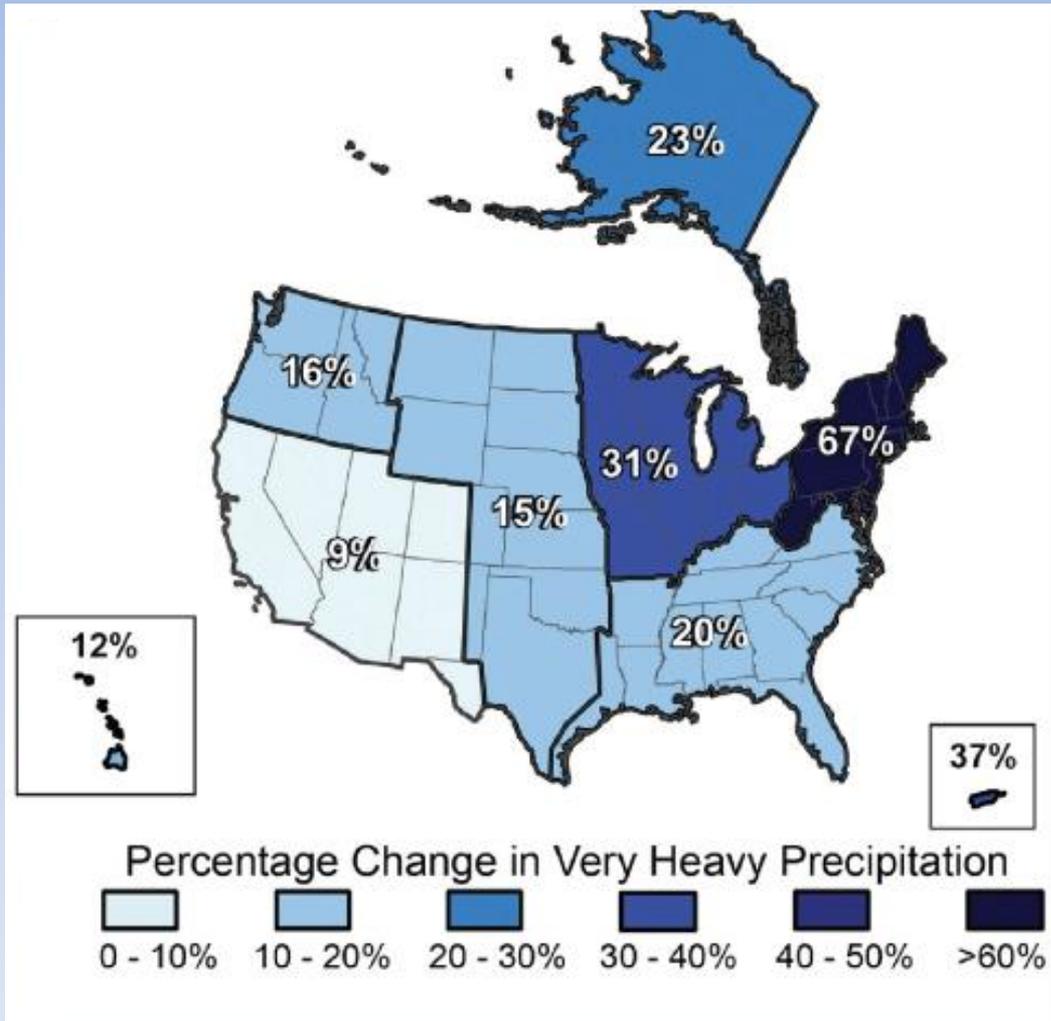
1. Respiratory diseases from increased mold exposures
2. Increased burden of allergy and asthma from allergenic plants
3. Increased lung and heart disease from exposures to fine particulate matter (PM) and ground level ozone

# Climate Change Impacts on Respiratory Health in Iowa



1. Higher humidities and extreme precipitation events increase mold exposures and induce respiratory diseases
2. New allergenic plants, higher pollen yields and an extended growing period increase the burden of allergy and asthma
3. Increased urban heating leads to higher concentrations of fine particulate matter and ground level ozone increasing lung and heart disease

# Percent Change in Very Heavy Precipitation - United States 1958 to 2007

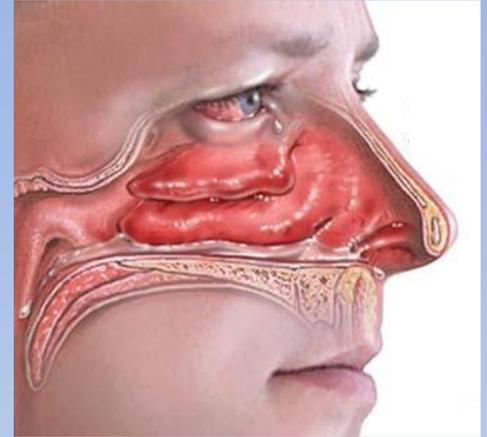


The amount of rain or snow that comes in very heavy precipitation events\* has increased significantly.

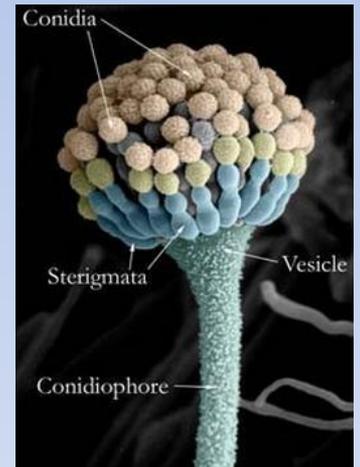
\*defined as the heaviest 1% of all daily events



# Pulmonary Conditions After Floods



- Mold allergies
  - Conjunctivitis, rhinitis, nasal blockage, sneezing, cough
- Asthma (exacerbation and new onset)
  - Wheeze, cough, shortness of breath, sputum production
- Inflammation of the mucous membranes
  - Swollen eyes, nasal congestion, headache, sore throat
- Katrina Cough (the Flood Crud)
  - Cough, sinus headache, congestion, rhinitis, sore throat, swollen eyes
- Toxic alveolitis
  - Fever, dry cough, chest tightness, headache, fatigue, general malaise



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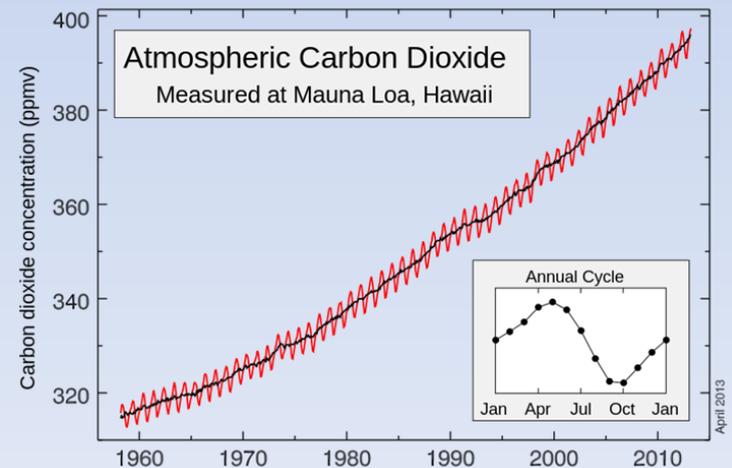
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# Allergy season longer and more severe

- At warmer temperatures and higher CO<sub>2</sub> concentrations
  - More plant biomass
  - More pollen produced
  - Higher allergen content in pollen
  - Expanded range of allergic plants
  - Longer allergy season



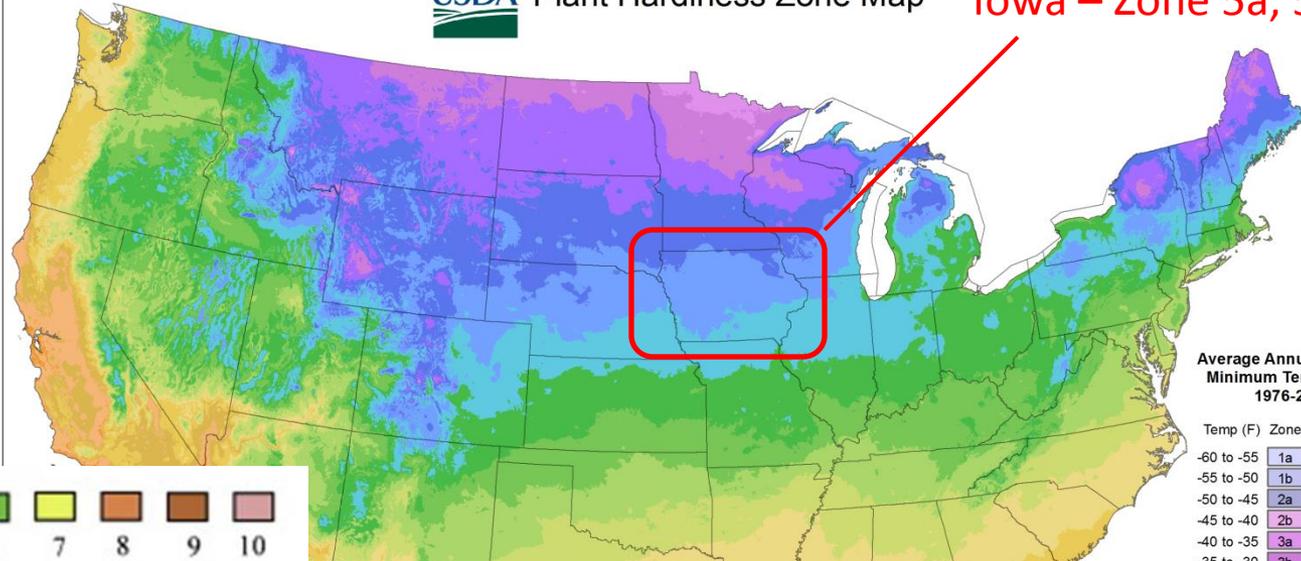
Common Ragweed (*Ambrosia artemisiifolia*)



# 2012 USDA Plant Hardiness Zone Map

USDA Plant Hardiness Zone Map

Iowa – Zone 5a, 5b

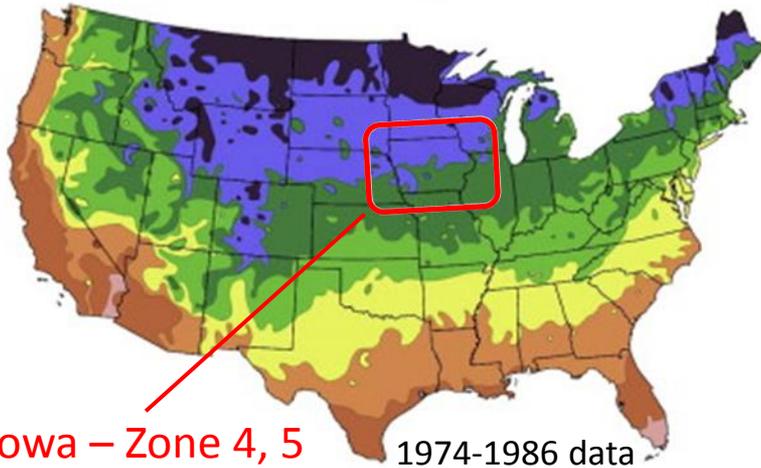


Average Annual Extreme Minimum Temperature 1976-2005

Temp (F)	Zone	Temp (C)
-60 to -55	1a	-51.1 to -48.3
-55 to -50	1b	-48.3 to -45.6
-50 to -45	2a	-45.6 to -42.8
-45 to -40	2b	-42.8 to -40
-40 to -35	3a	-40 to -37.2
-35 to -30	3b	-37.2 to -34.4
-30 to -25	4a	-34.4 to -31.7
-25 to -20	4b	-31.7 to -28.9
-20 to -15	5a	-28.9 to -26.1
-15 to -10	5b	-26.1 to -23.3
-10 to -5	6a	-23.3 to -20.6
-5 to 0	6b	-20.6 to -17.8
0 to 5	7a	-17.8 to -15
5 to 10	7b	-15 to -12.2
10 to 15	8a	-12.2 to -9.4
15 to 20	8b	-9.4 to -6.7
20 to 25	9a	-6.7 to -3.9
25 to 30	9b	-3.9 to -1.1
30 to 35	10a	-1.1 to 1.7
35 to 40	10b	1.7 to 4.4
40 to 45	11a	4.4 to 7.2
45 to 50	11b	7.2 to 10
50 to 55	12a	10 to 12.8
55 to 60	12b	12.8 to 15.6
60 to 65	13a	15.6 to 18.3
65 to 70	13b	18.3 to 21.1



1990 Map



Iowa – Zone 4, 5

1974-1986 data

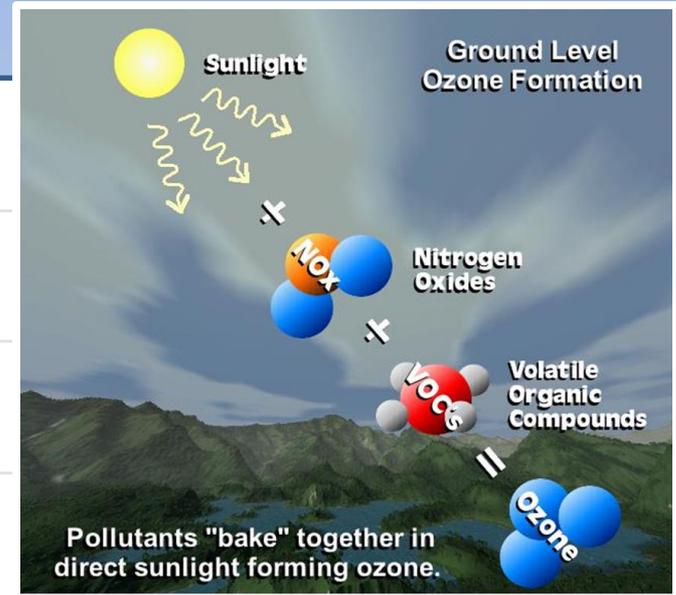
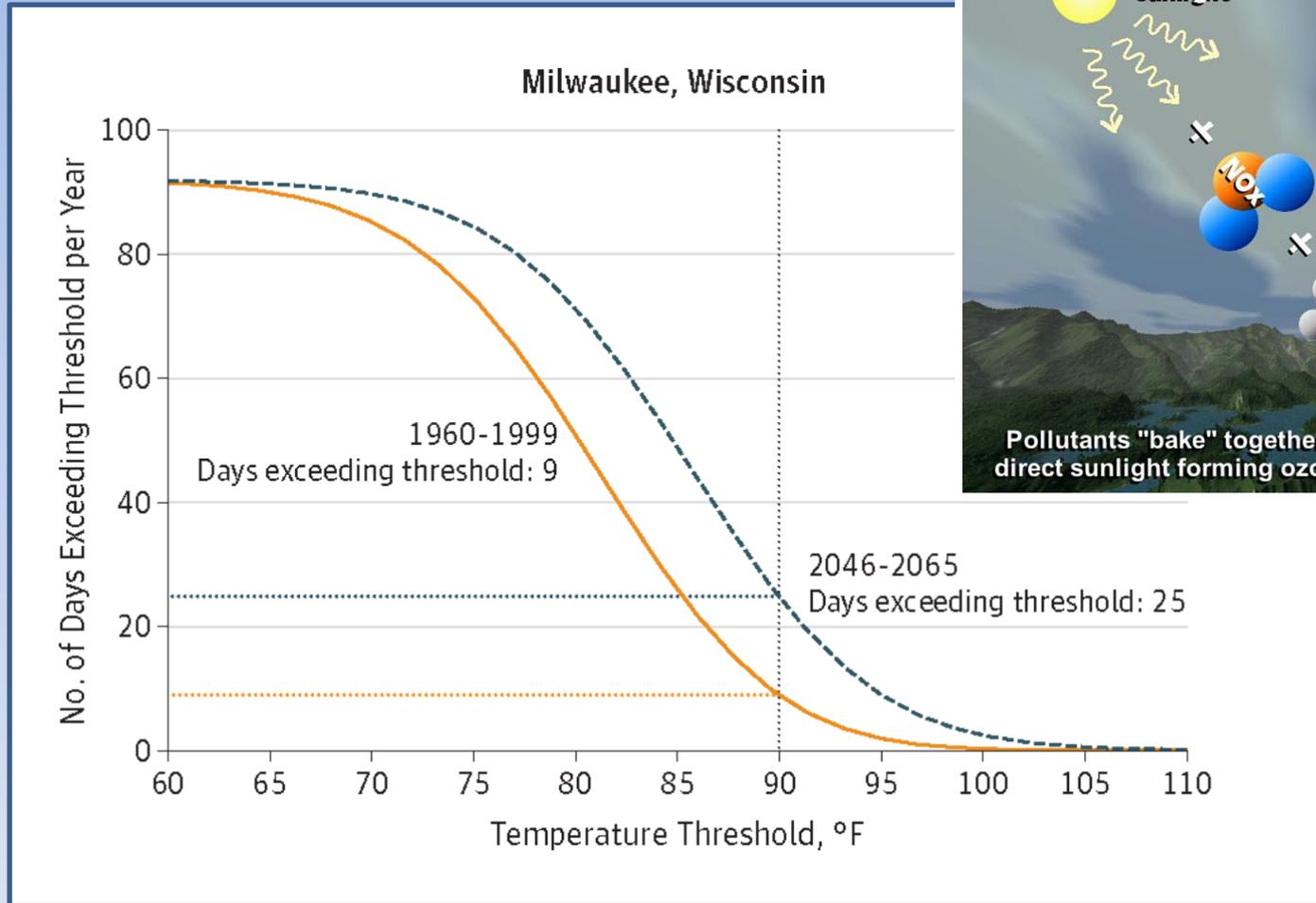
1976-2005 data

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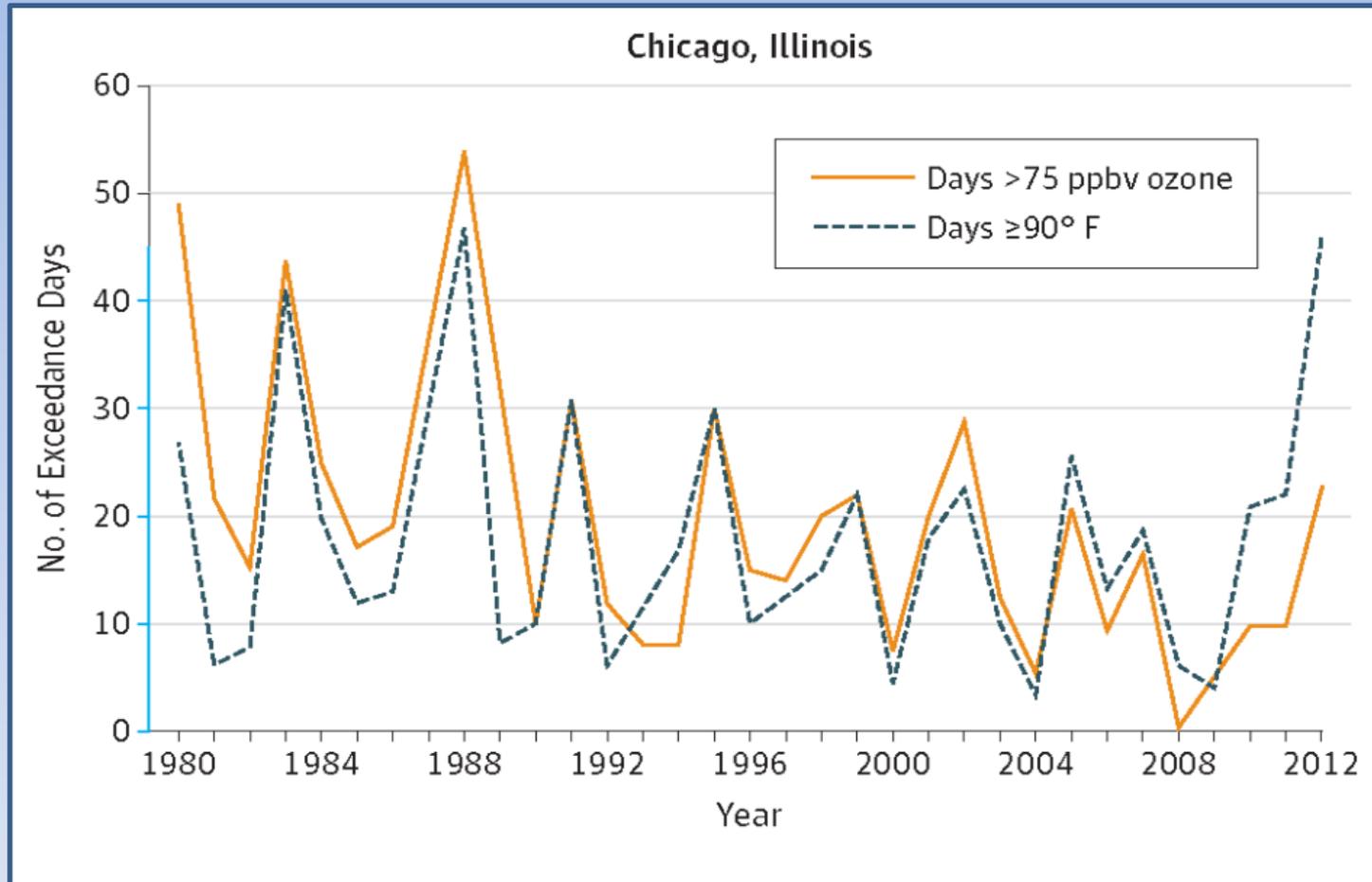
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# Cumulative Distribution of Summer Days/yr > 90°F



Predictions are based on "business as usual" and represent the mean of > 13 climate models

# Relationship Between Days of High Temperatures and Ozone Levels



Number of days in each year temperature  $>90^{\circ}$ F and ozone  $> 75$  ppb (the NAAQS\*)

# Ground-level Ozone Morbidity & Mortality

- Association of episodes of high ozone with:
  - increased wheeze, chest tightness and asthma
  - increased emergency department visits for asthma and respiratory tract infections
  - increased hospitalization and COPD exacerbations
  - increased cardiac inflammation and heart rate variability
  - increased respiratory and cardiac mortality

Bell et al, *Epid*, 16:436, 2005.

Gryparis et al, *AJRCCM* 170:1080, 2004.

Ito et al, *Epid*, 16:446, 2005.

Levy et al, *Epid*, 16:458, 2005.

Burnett et al, *Environ Res*, 72:24, 1997.

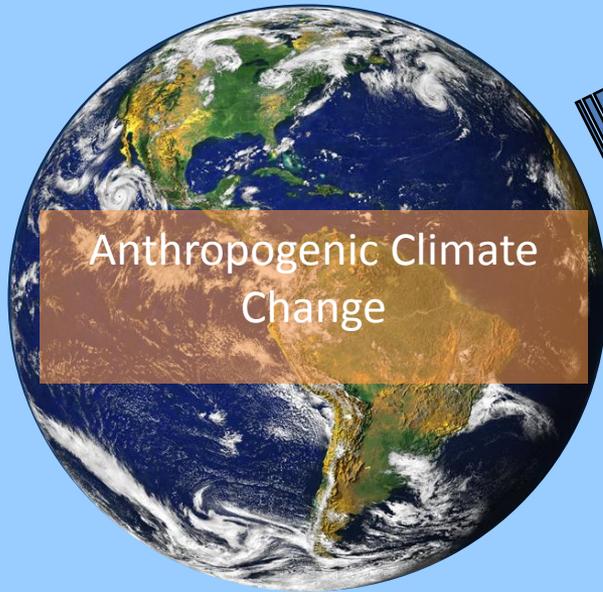
Anderson et al, *ERJ*, 10:1064, 1997.

Mortimer et al, *ERJ* 19:699, 2002.

Peters et al, *AJRCCM*, 159:768, 1999.

Chuang et al, *AJRCCM*, 176:370, 2007.

# Climate Change Respiratory Disease



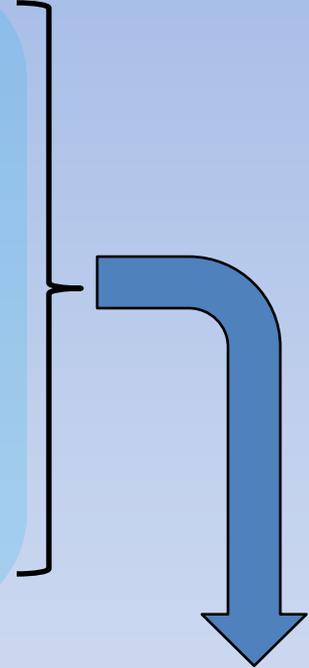
↑ CO<sub>2</sub> → weed & grass biomass



↑ Temp → allergen content  
→ longer allergy season  
→ species redistribution



↑ Floods → ↑ mold spore counts  
↑ Humidity → more moldy homes



↑ Ozone, PM, SO<sub>2</sub> → ↑ inflammation  
↑ susceptibility



↑ Allergy  
↑ Asthma  
↑ CV Dis.