

## *Health Risks & Benefits of Energy Scenarios for the US*

Environmental and Energy Study Institute

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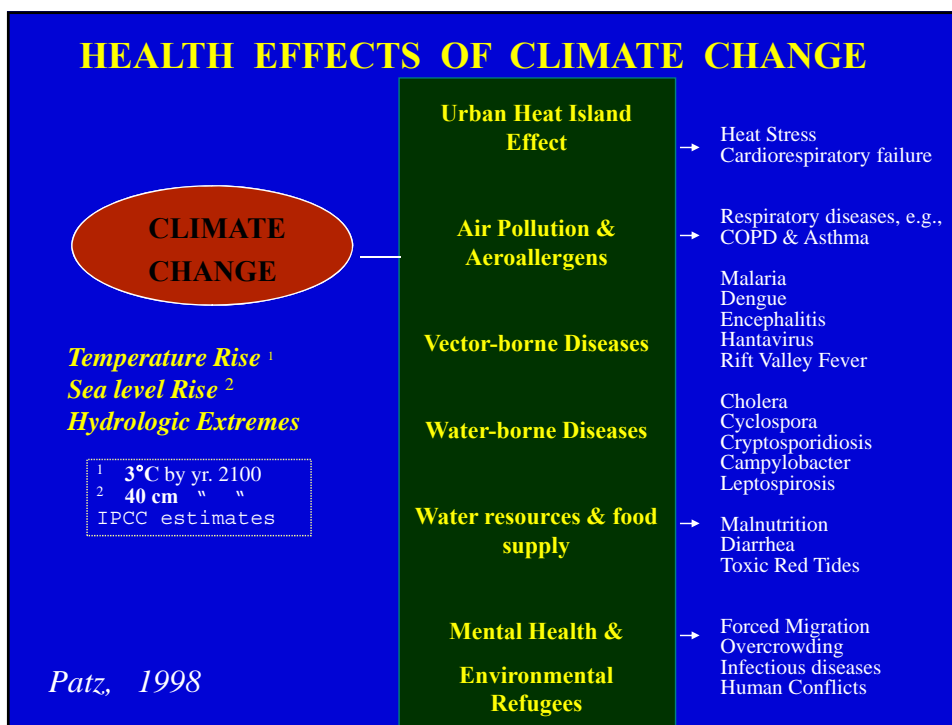
## NAS report released last week

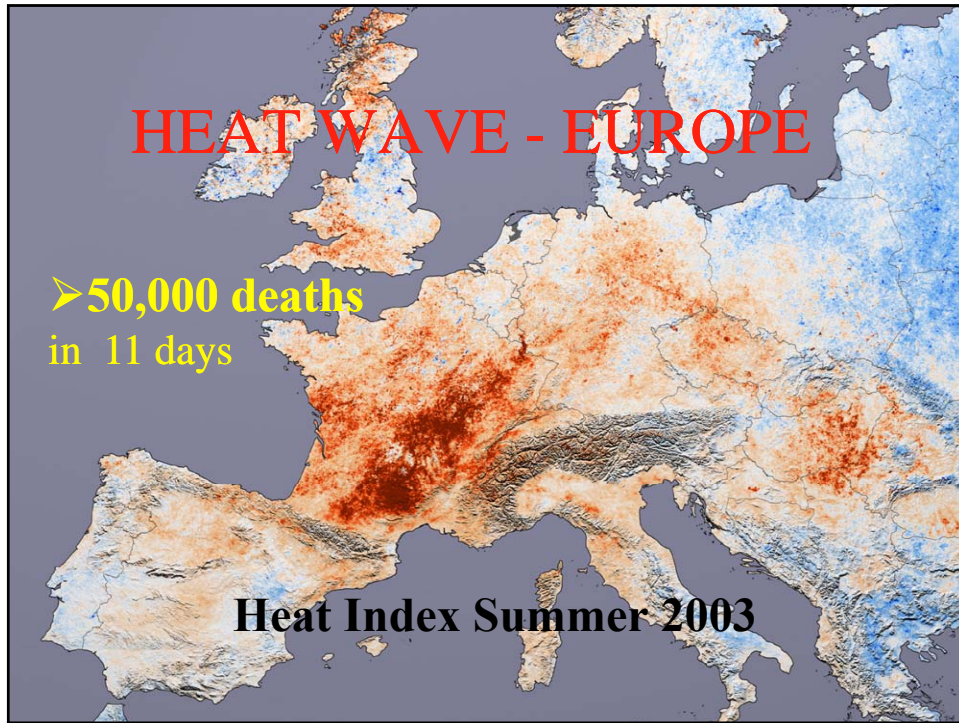
May 19, 2010

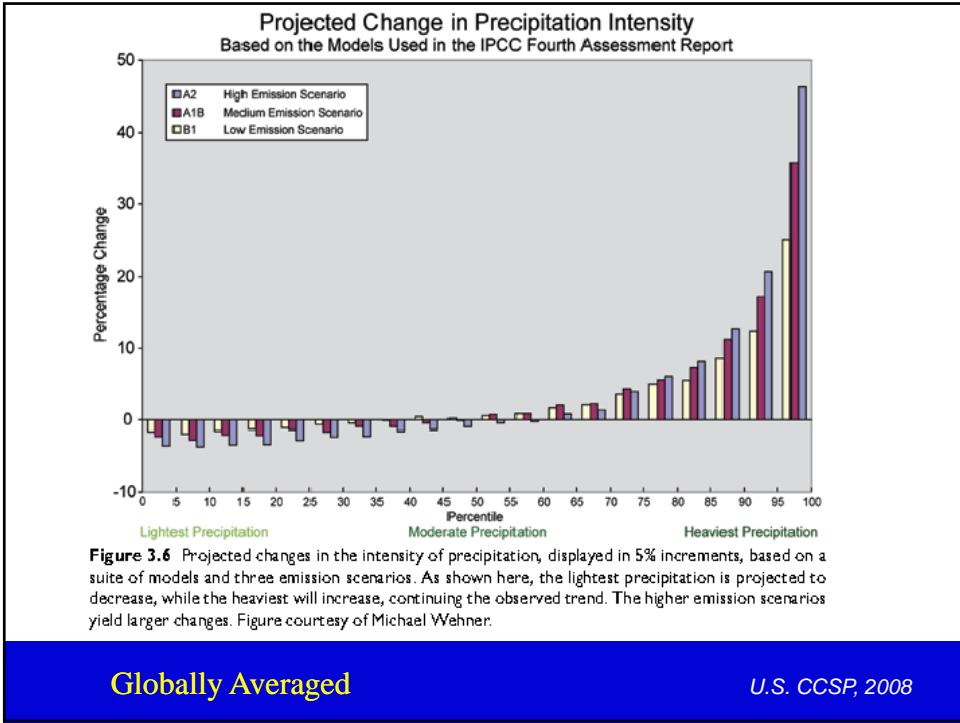
- *Advancing the Science of Climate Change*
- Conclusion:
  - “Climate change is occurring, is caused largely by human activities, and poses significant risks for a broad range of human and natural systems.”

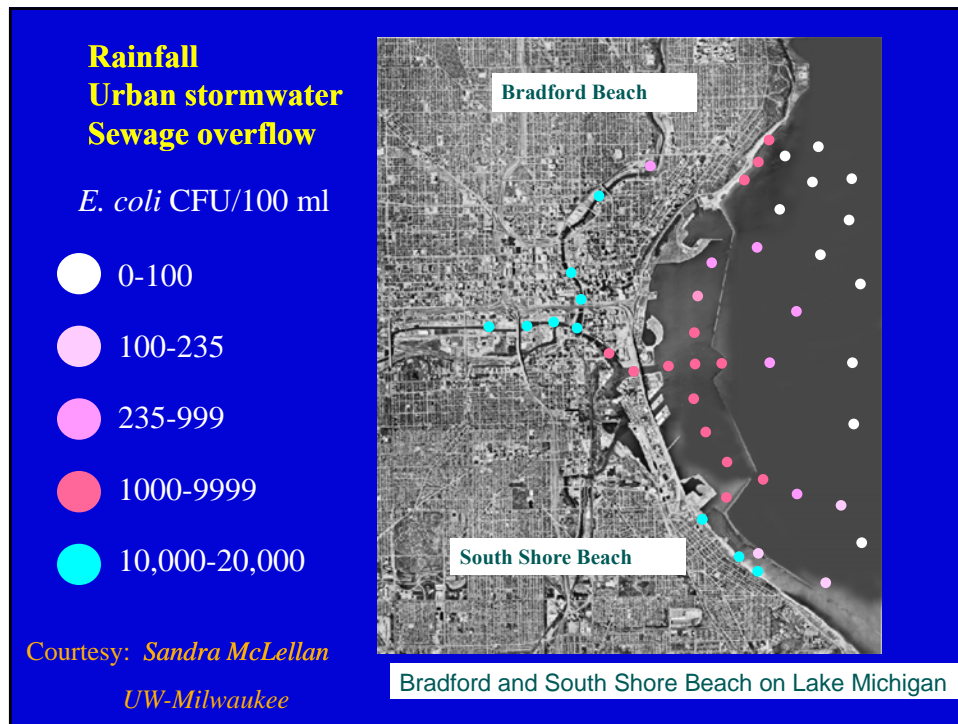
## 2010 NAS report (continued)

- Earth has warmed **1.4°F** over last century, corroborated by variety of independent observations
- Most of the warming over last several decades can be **attributed to human activity**
- Natural climate variability cannot explain or offset the long-term warming trend
- Projected additional warming of **2°-11.5°F** over the 21<sup>st</sup> century









## Health Risks from Energy Production (1)

- Coal
  - From 1985-2001, 724 miles of streams filled from mountain top coal mining
  - Occupational health hazards
  - Air pollution: SO<sub>x</sub>, NO<sub>x</sub>, PM, Hg, & CO<sub>2</sub>
    - Respiratory, Cardiovascular, Neurological effects, and greenhouse gas

## Health Risks from Energy Production (2)

- Natural Gas
  - Occupational health hazards (“fracking” process uses > 150 chemicals)
  - Air pollution:  $\text{SO}_x$ ,  $\text{NO}_x$ , PM, Hg, &  $\text{CO}_2$ 
    - Respiratory effects and greenhouse gas (but half as much  $\text{CO}_2$  as from coal)

## Health Risks from Energy Production (3)

- Nuclear
  - Radon and uranium tailings from mining pose occupational and community health risks
  - Nuclear waste storage and nuclear proliferation
  - Air pollution:  $\text{SO}_x$ ,  $\text{NO}_x$ , PM, Hg, &  $\text{CO}_2$ 
    - Potential radiation from nuclear accident

## Health Risks from New Energy Sources

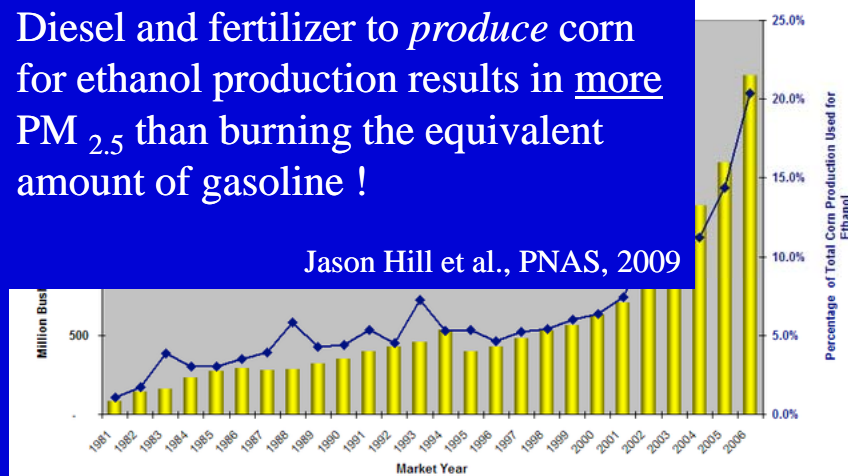
- e.g. Corn-based ethanol
  - Question of global food security (inconclusive)
  - Full “Life Cycle Assessment” – How well are we aware of unintended consequences?

## Life Cycle Analysis shows need for Health Impact Assessment in Energy Policy

US Corn Production Used for Fuel Ethanol

Diesel and fertilizer to *produce* corn for ethanol production results in more PM<sub>2.5</sub> than burning the equivalent amount of gasoline !

Jason Hill et al., PNAS, 2009



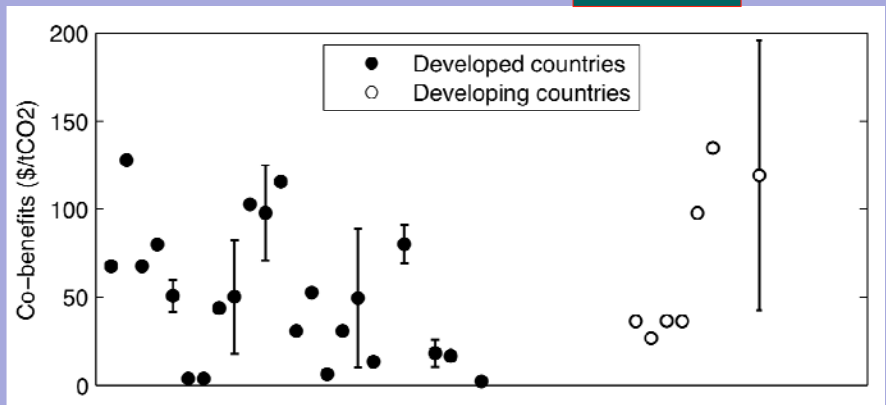
Source: USDA



# The Good News about mitigating greenhouse gases (by burning less fossil fuel)

## Value of co-benefits is large

\$2 – 196 /tCO<sub>2</sub> with a mean of \$49/tCO<sub>2</sub>



Compare to *cost of climate policy*: almost always <\$30/tCO<sub>2</sub>

Nemet G F, Holloway T and Meier P 2010 "Implications of incorporating air-quality co-benefits into climate change policymaking" *Environmental Research Letters* 014007



## The opportunity for improving health determinants

We can reduce:

The **1 million annual deaths** from urban air pollution

The loss of 1.9 million deaths, and **19 million years of healthy life, from physical inactivity**



WHO, 2007



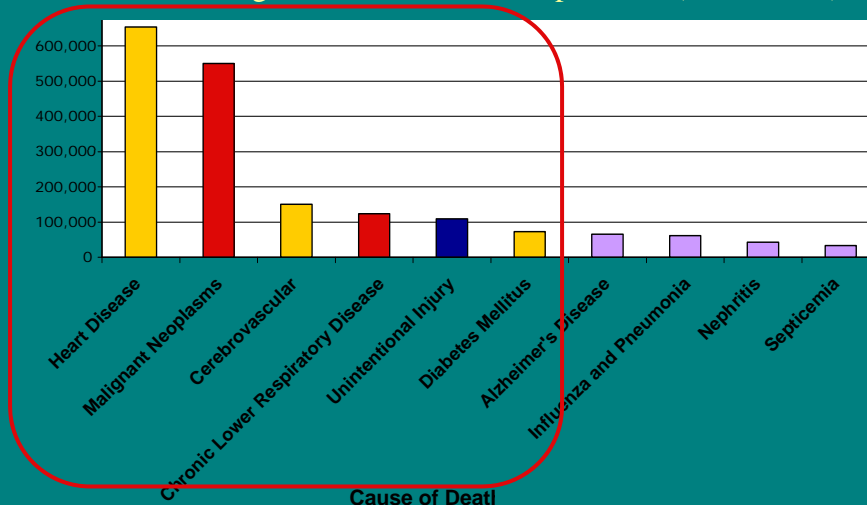
## Status of Americans

- Americans are, on average, **17 pounds heavier** than we were 30 years ago!
- $\approx 15\%$  of children and adolescents age 6-19 are overweight (CDC 2004).
- 20.8 million people have diabetes (7% of the population) (CDCP 2005)
- **60% of American adults do not meet recommended levels of physical activity**, and 25% are completely sedentary (DHHS, 1996)

**40% of trips by car are < 2 miles**

(Dept of Transportation)

Ten Leading Causes of US Deaths per Year (CDC, 2004)





... Why global climate change could be the **greatest public health opportunity** we've had in over a century!



## Personal Fitness and Health

- Average Bicycle Commute in Madison is **3.4 miles**
- Energy Expenditure: **144 kcal** round trip
- Around 200 minutes additional physical activity
  
- **9-10 lbs** weight loss in year
  
- Reduce risk of **ischaemic heart disease** by 47%
- Reduce risk of **stroke** by 39%
- Reduce risk of **breast cancer** for women by 34%
- Reduce risk for **colon cancer** by 43%
- Reduce risk for **type II diabetes** by 31%

WHO, CRA 2002

## Evolution of CDC Physical Activity Recommendations

- **OLD:** sporadic, intense training, 3-5 times per week
- **NEW:** 30-60 minutes, moderate activity, preferably every day, either in a single session or in multiple bouts, each lasting at least 8–10 minutes
- **Added value of commuting by bike?**

## Triple Win Bike Project



1. Health and Personal Fitness  
(personal)



2. Health and Local Air Pollution  
(local)

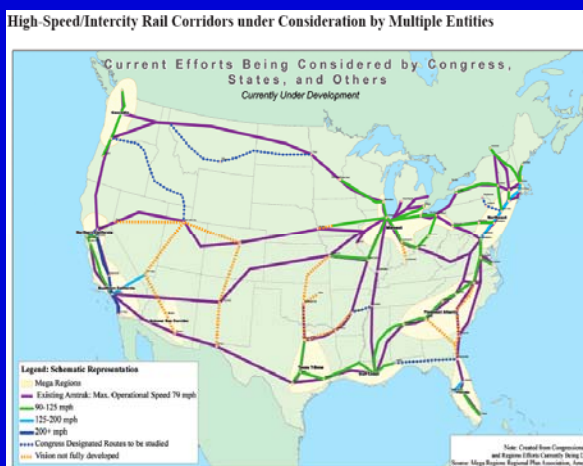


3. Greenhouse Gas Emissions  
and Global Climate Change  
(global)

## National Rail Plan

- Trucking represents 66% of shipping in US
- On-road vehicles emit 44% of man-made U.S.  $\text{NO}_x$ , and semis generate 42% of this value
- Diesel trucks considered the #1 source of health damaging air pollution for the Midwest region

Passenger rail can reduce car and plane trips



## Asthma and Air Pollution

- Natural experiment during 1996 Summer Olympic games in Atlanta
- Peak morning **traffic** decreased 23% and peak **ozone** levels decreased 28%
- **Asthma**-related emergency room visits by children **decreased 42%**
- Children's emergency visits for non-asthma causes did not change during same period

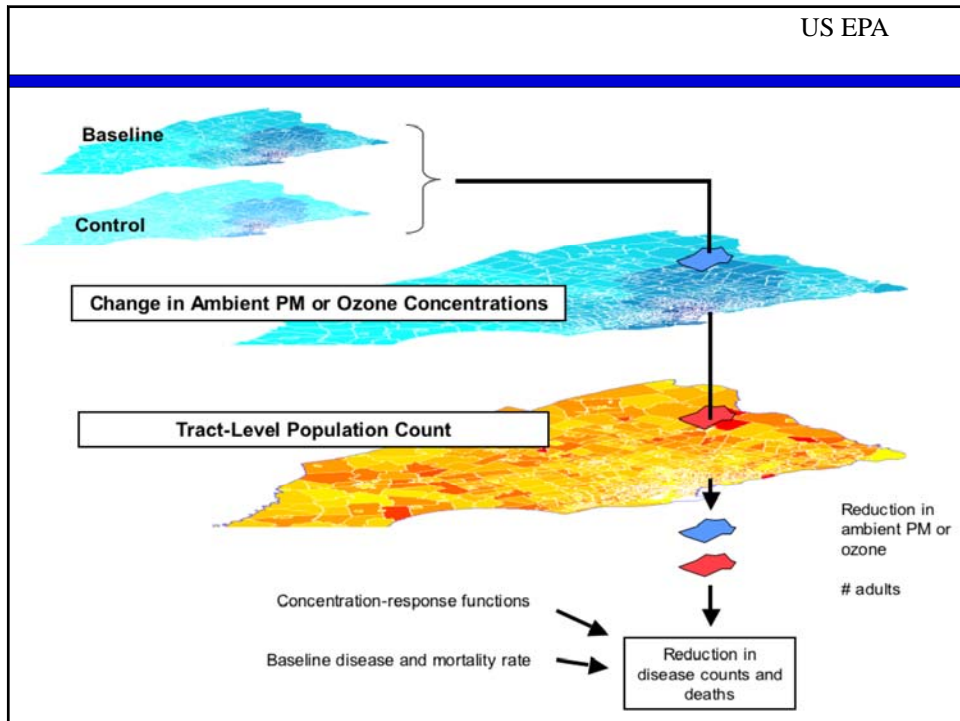


Friedman et al. *JAMA* 2001;285:897

## Comparative Scenario

The Natl. Personal Transportation Survey reports median trip length in urban and suburban areas of the region to be 4-8 km, representing ~20% of VMT for the region. Our alternative scenario thus **assumes that all round trips of 8 km or less could be accomplished through alternative modes of (non ICE) transportation.**

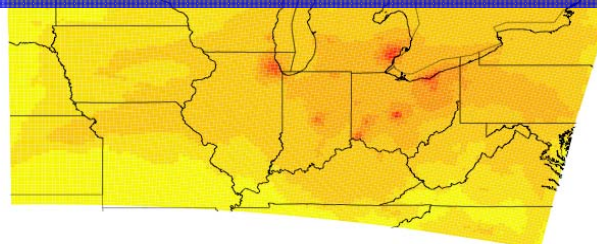
Grabow et al (in review)





## 20% fewer car trips: Change in O<sub>3</sub> & PM<sub>2.5</sub>

- **hundreds of lives saved**
- **Thousands of Hospital admissions avoided**
- **Billions reduction in health care costs**



Grabow et al (in review)

## Ongoing Energy Debates

- Discussing bills to establish a new energy future

If debate solely on direct COSTS without including potential health BENEFITS, decisions not fully informed



Thank you.

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