



Climate Change & Human Health

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Source: NASA

Co-Contributors

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Disclosures



- ▶ I am not a vegetarian
- ▶ I drive an SUV
- ▶ I own a gun
- ▶ I have voted Republican

Health Effects of Climate Change



- ▶ Infectious
- ▶ Mental
- ▶ Nutritional
- ▶ Respiratory
- ▶ Cardiovascular

Some Americans Face Greater Risk

- ▶ **The health of any American can be harmed by climate change, but some of us face greater risk than others.**
 - Children
 - Student athletes
 - Pregnant women
 - Elderly individuals
 - People with chronic illnesses and allergies
 - People with limited resources



What could be in store for
Minnesota?

THE NEW NORMAL: GETTING HOTTER

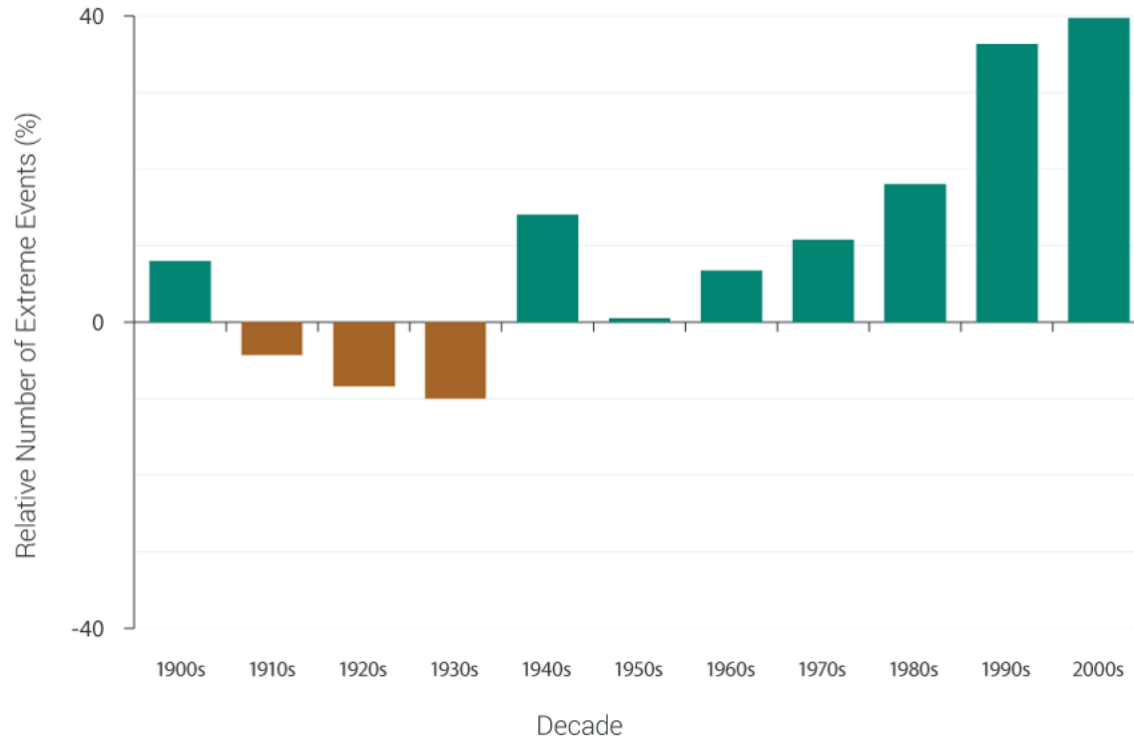
Average Temperature is Rising with Climate Change

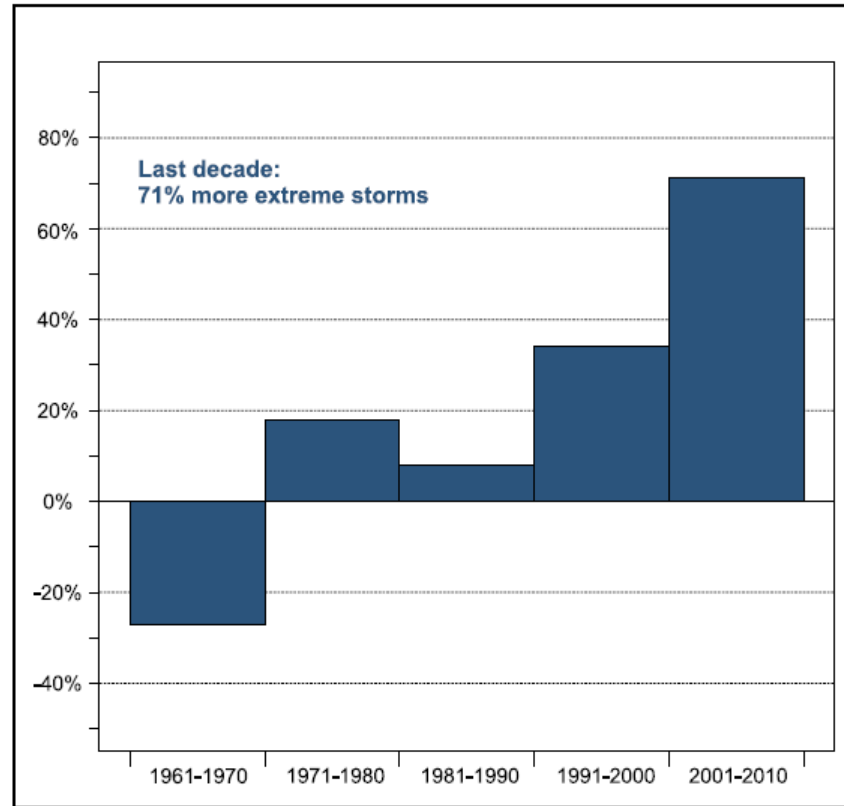


Normal is based on 30-year average temperature, adopted from NOAA.
Source: NCEP/NCAR.org

CLIMATE  CENTRAL

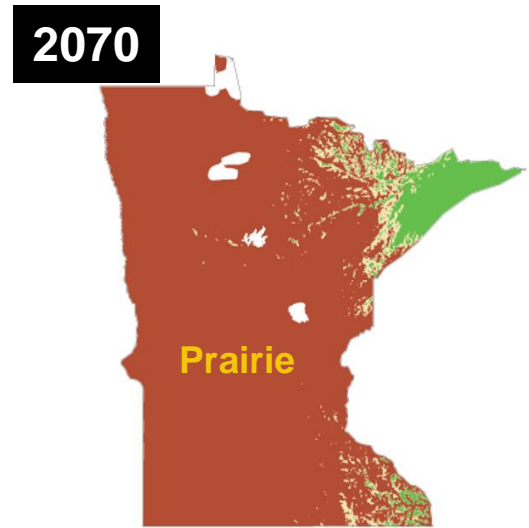
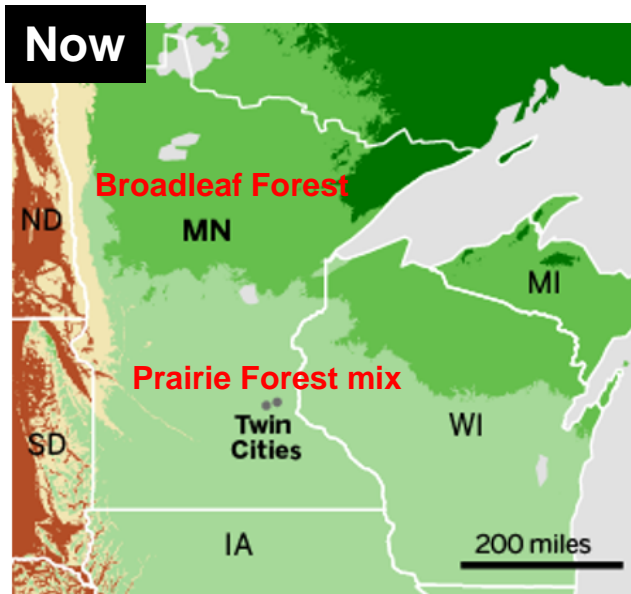
Observed U.S. Trend in Heavy Precipitation





Rainstorms > 3 inches

Current Biome Zones



ONE 2070 PROJECTION

667 parts per million CO₂

Current emission rates paired with warmer temperatures could deplete state forests.

ZONE KEY

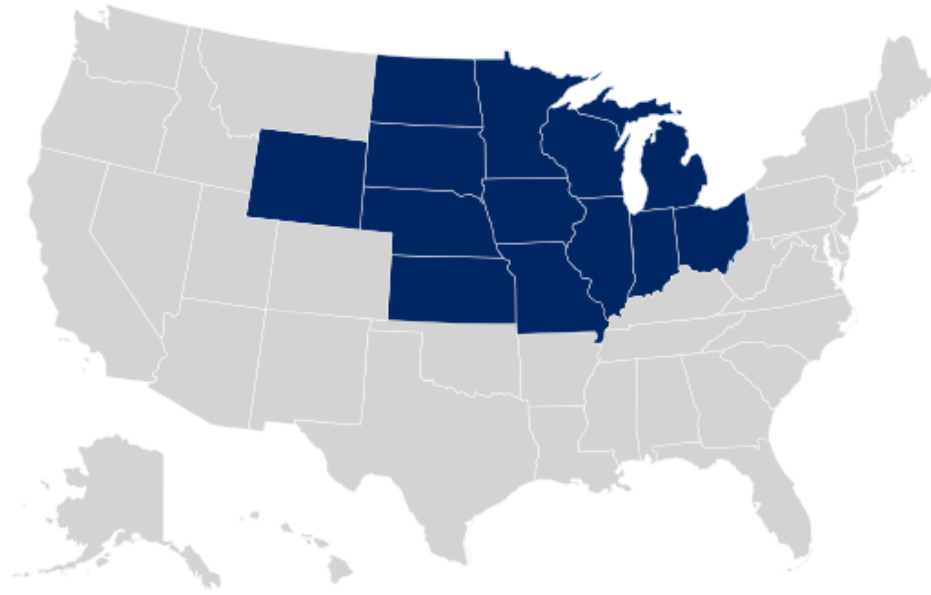




Big Moose Lake
Archival Inkjet Print
2016 / 2017



Big Moose Lake
Archival Inkjet Print
2016 / 2017



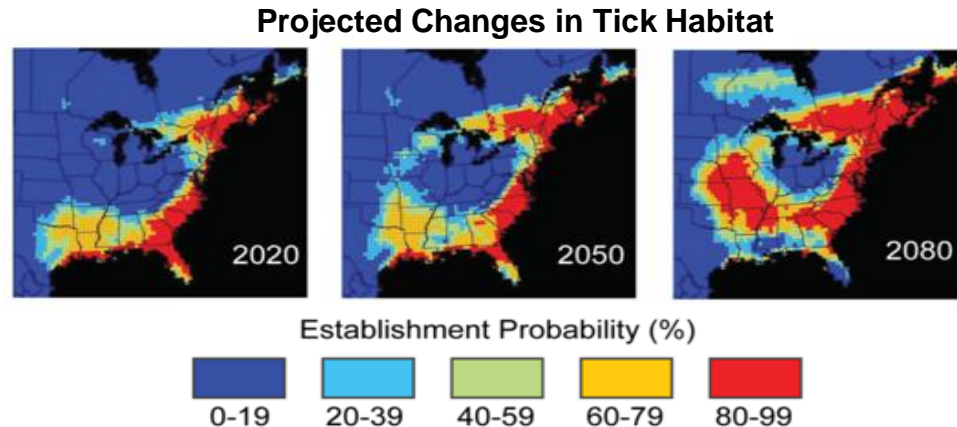
- ▶ The higher rates of pre-mature death will occur in the Midwest due to increased ozone levels.

Health Effect: Spread of Disease by Ticks and Mosquitos



Changes in Vector-Borne Illness

- ▶ Climate affects habitat suitability and reproductive rate
- ▶ Plants and animals are moving poleward and bringing diseases along with them



Zika Virus Baby



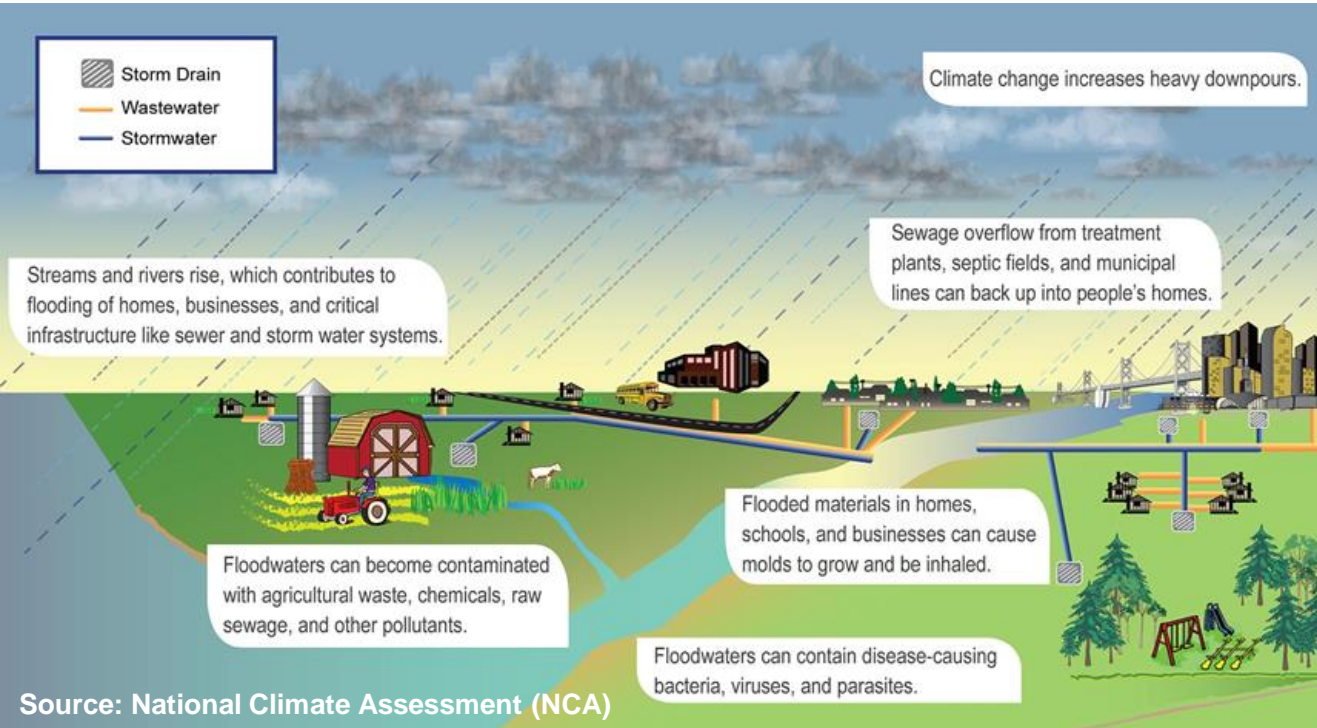
Lyme Disease



88% of disease burden related to climate change falls on children!

(Haines, *Lancet* 2006)

Increase Diarrheal Illnesses



- ▶ Additional 48,000 deaths worldwide in children by 2030

Source: National Climate Assessment (NCA)

A dark blue, irregular ink splatter or blotch serves as the background for the text. The splatter has a textured, watercolor-like appearance with some lighter blue and white areas around the edges. The text "Mental Health" is centered within the dark blue area.

Mental Health



Across Rural Minnesota:

- Torrential Rain/Drought Cycle
- Food and Water Insecurity
- Economic Stress
- Mental Health Crises



Suicide rate of farmers now exceeds that of veterans

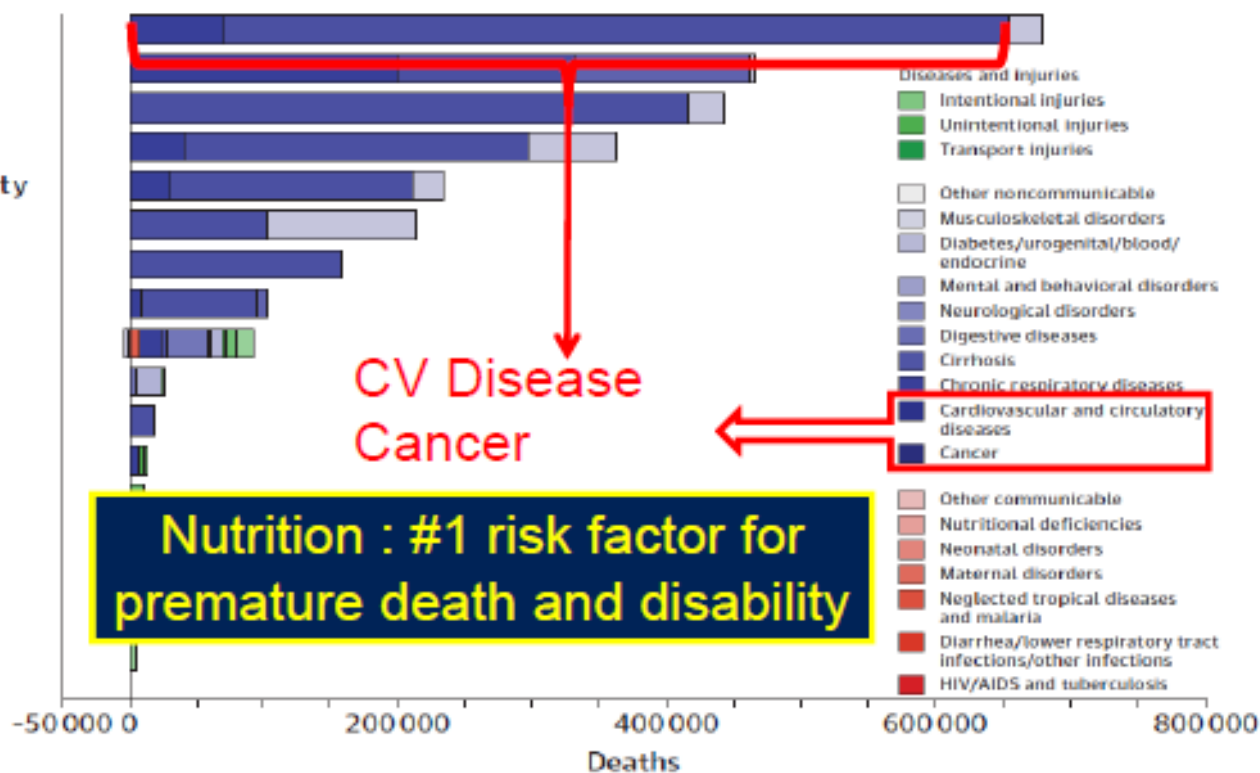


US : Deaths Related to the 17 Leading Risk Factors

Risk Factors

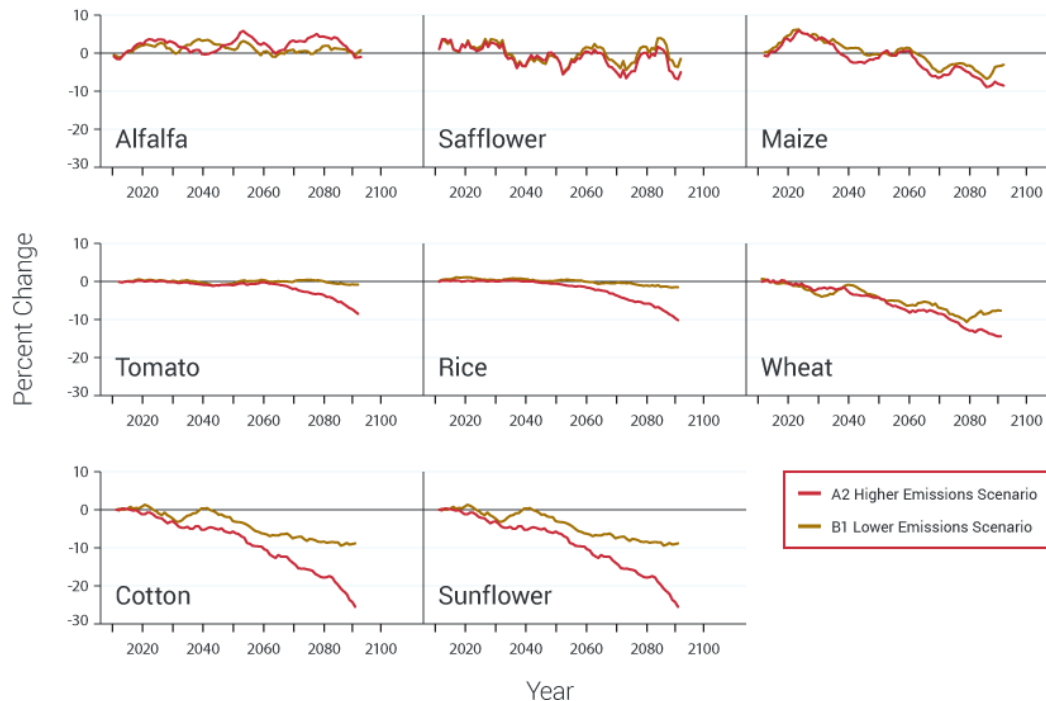
Dietary risks Dietary Risks

- Tobacco smoking
- High blood pressure
- High body mass index
- Physical inactivity and low physical activity
- High fasting plasma glucose
- High total cholesterol
- Ambient particulate matter pollution
- Alcohol use
- Drug use
- Lead exposure
- Occupational risks
- Low bone mineral density
- Residential radon
- Ambient ozone pollution
- Intimate partner violence
- Childhood sexual abuse
- Stress/social
- Sleep



Agricultural Impacts

Crop Yield Response to Warming in California's Central Valley



- **↑ or ↓ in crop yields depending on location**
- **Changes in nutrient and micronutrient contents**

Foods that Increase Mortality: Intake per day

Red Meat

Processed Meat

Sugar Sweet Bev's



Y-Axis=Mortality Risk

X-Axis=grams/day

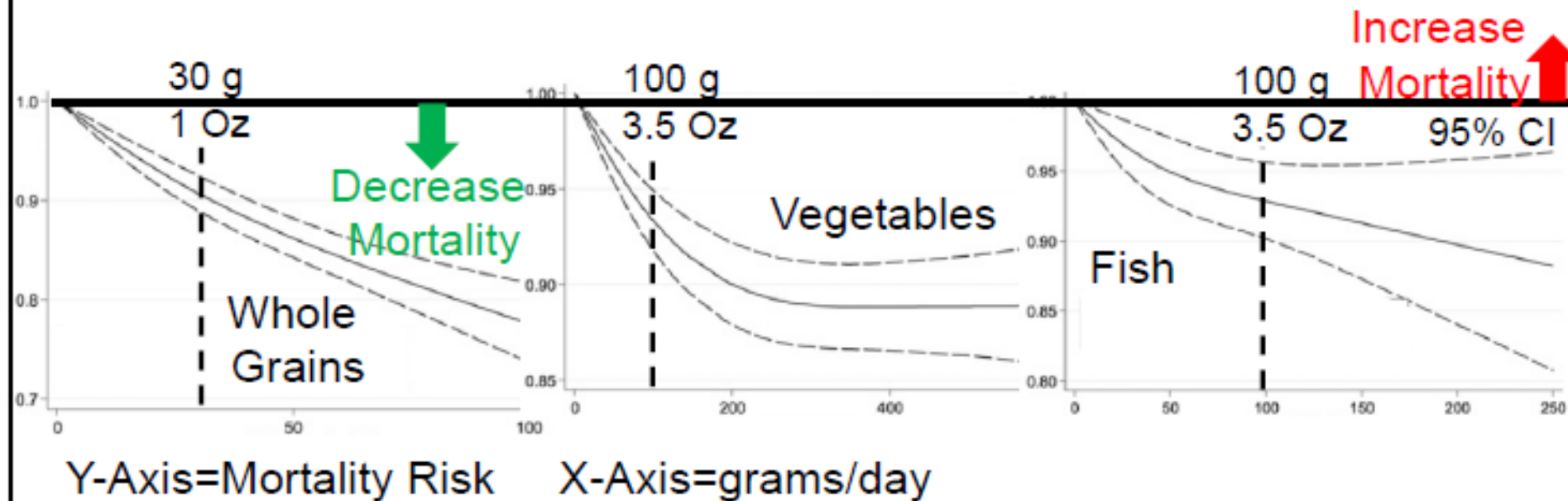
1 Serving Size=

Foods that Decrease Mortality: Intake per day

Whole Grains

Vegetables

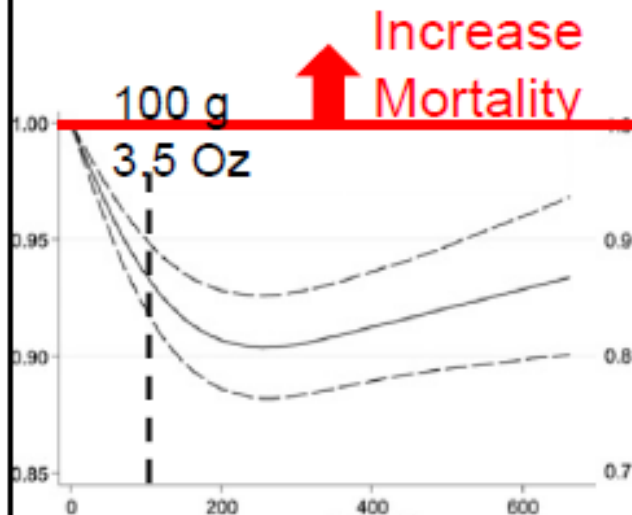
Fish



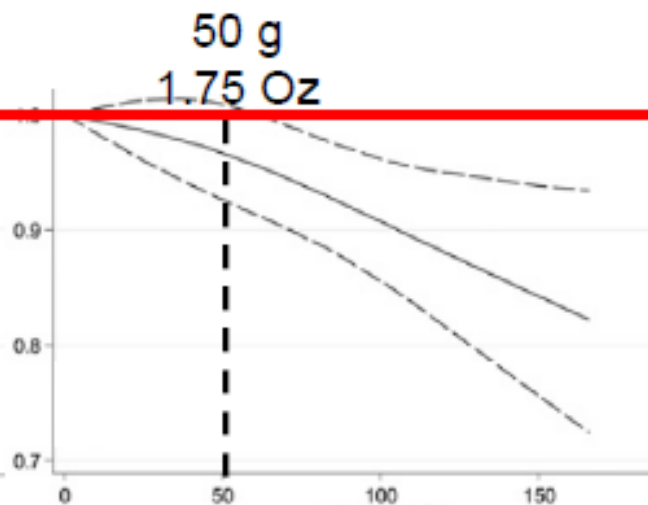
1 Serving Size=

Foods that Decrease Mortality: Intake per day

Fruits



Legumes



Nuts



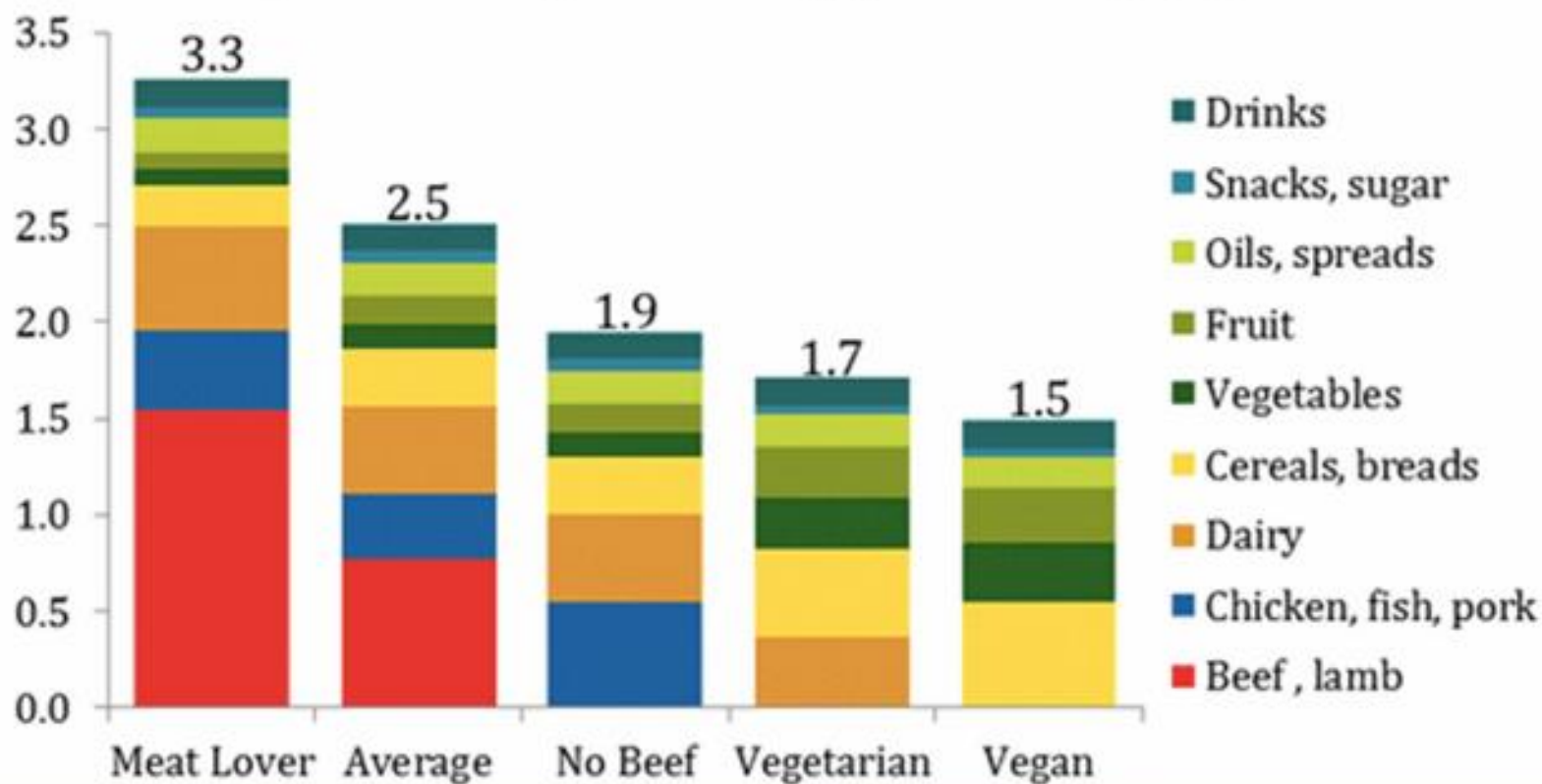
Y-Axis=Mortality Risk X-Axis=grams/day

1 Serving Size=



Mediterranean Diets are Healthier

Foodprints by Diet Type: t CO₂e/person



What is the Environmental footprint of a Western diet vs Mediterranean diet ?

Environmental footprint	Mediterranean	Western
Agricultural land use (10^3 Ha/yr)	8,365	33,162
Energy consumption (TJ/year)	239,042	611,314
Water consumption (Km 3 /yr)	13.2	22.0
Greenhouse gas admissions (Gg CO ₂ -eq/yr)	35,510	217,128

Switching to a Mediterranean diet can reduce :

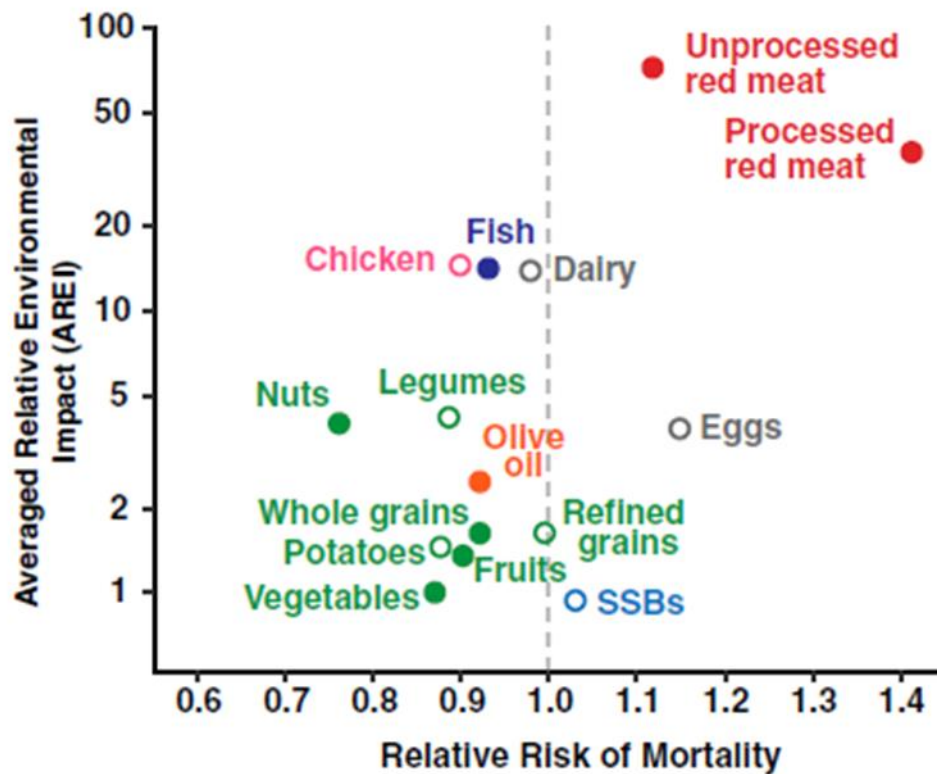
Greenhouse gas emissions \sim 72%

Land use \sim 58%

Energy consumption \sim 52%

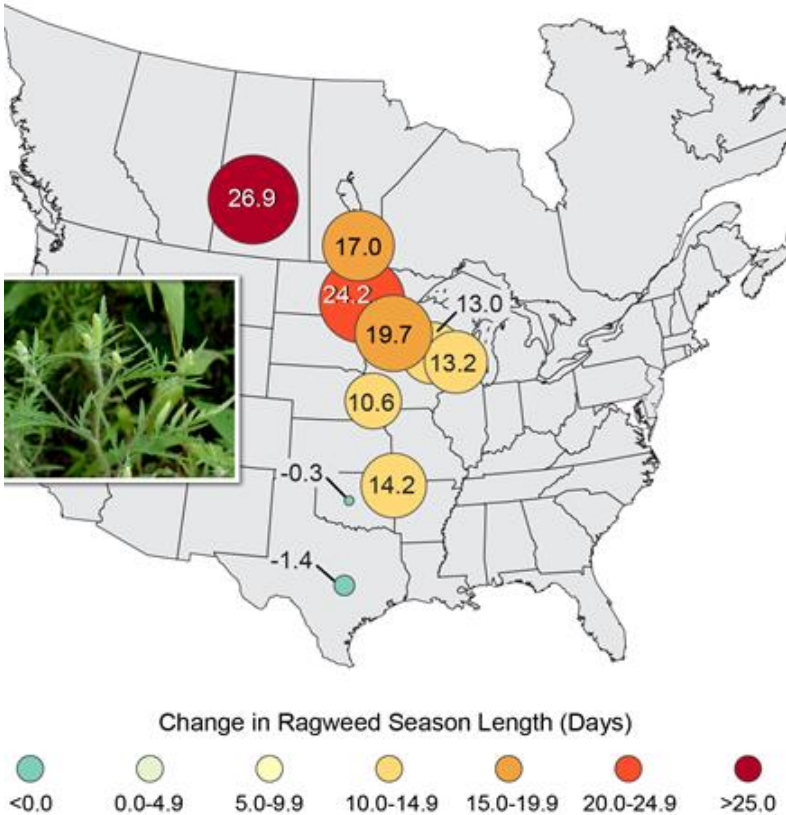
Water consumption \sim 33%

Basic Text



Increase in Allergic and Respiratory Illnesses

Ragweed Pollen Season Lengthens



Increased Allergic Rhinitis



- ▶ High prevalence disease affects 9% of children
- ▶ Worse with climate change due to:
 - Delayed first frost
 - Earlier spring thaw
 - ↑ plant pollen



Increase in
Asthma, especially
in children

Western Wildfires

Health Effect: Air Pollution

- ▶ Fire and soot plus micro particulates
- ▶ MN EPA Warning





\$800 Million / Year

- ▶ Minnesota healthcare costs due to air pollution from greenhouse gases

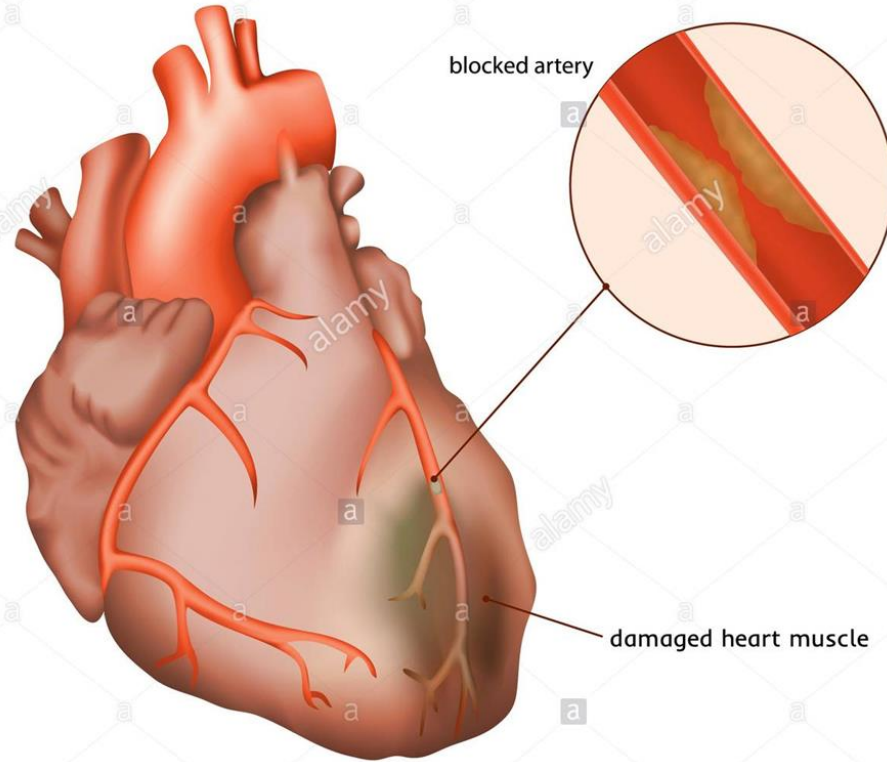
Eqb.state.mn

Climate change increases cardiovascular disease in:

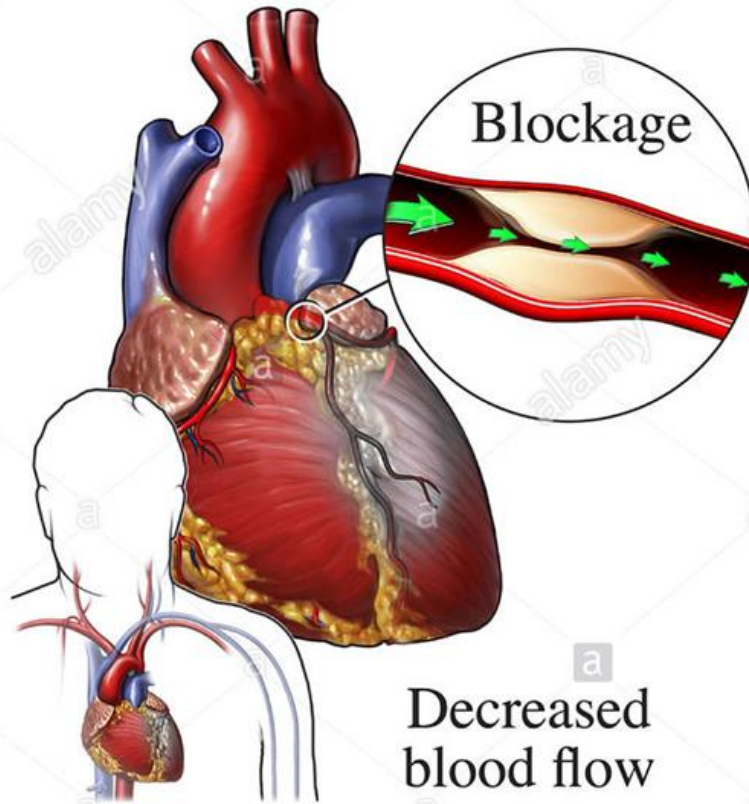


- Those with pre-existing cardiovascular/pulmonary disease
- Those who do physical labor (Farmers!)
- Pregnant women (increased fetal CV defects)
- The elderly
- The impoverished

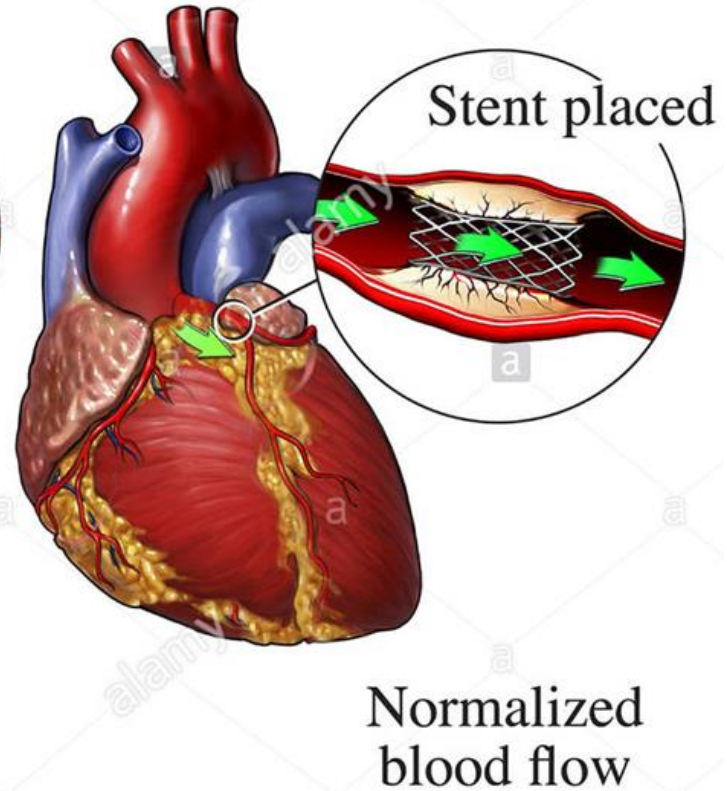
Myocardial infarction



Before procedure



After procedure

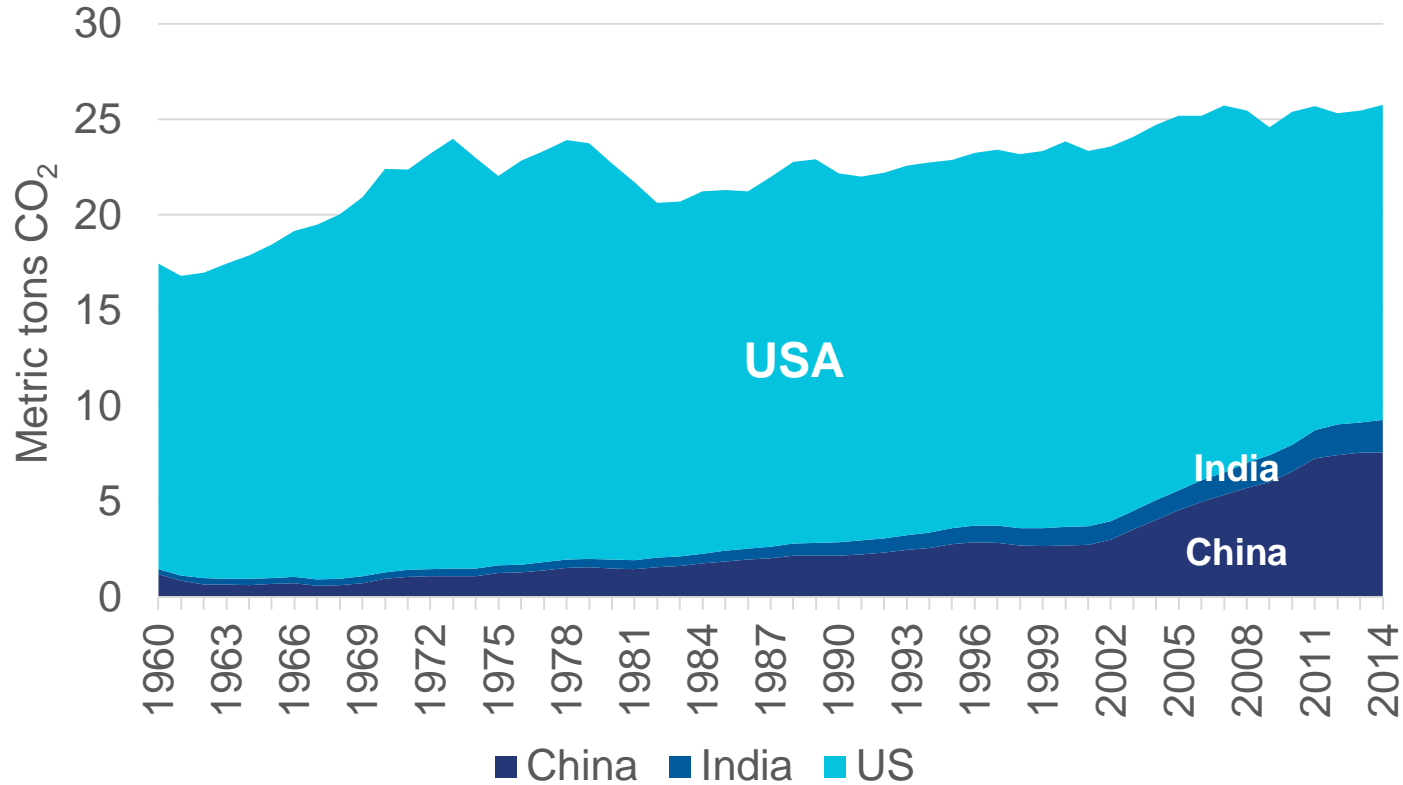


Projected Cost of Climate Change

- ▶ 4% of Global GDP/year
- ▶ 4% of 2019 US GDP = \$840 Billion
- ▶ Paris Climate Accord 1% of GDP/year



CO₂ emitted per person



Climate Video

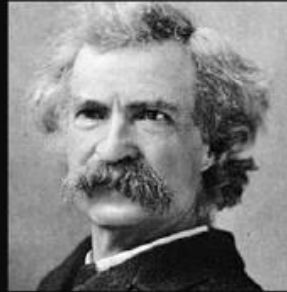
▶ Dr. Ken Holmen

Summary

- ▶ Climate change is real
- ▶ Climate change affects the life of EVERY human, but especially vulnerable populations, like children, pregnant women, the elderly, rural residents and those who work outside.
- ▶ Impacts can be mitigated through policy and behavior
- ▶ Our grandchildren will live in a global village



Final Thought



It ain't what you don't know that gets you into trouble. It's what you know for sure that just ain't so.

~ Mark Twain

AZ QUOTES