“Breathing easier for all”
Particulate matter:
A public health concern

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“...patients are becoming the human face of the climate crisis.”
–Dr. Renee Salas
Health Benefits of Cleaner Air

• Since the Clean Air Act was implemented in 1970
  – Emissions of major pollutants were reduced by 73% between 1990 and 2015
  – The EPA determined that 230,000 deaths were avoided per year due to lower concentrations of outdoor particulate matter
  – Economic benefits: valued at 2.0 trillion in 2020
TRAP: Traffic Related Air Pollution

- Nitrogen dioxide (NO$_2$)
- Sulfur dioxide (SO$_2$)
- Particulate matter
  - <2.5 μm (PM$_{2.5}$)
    - Ultrafine PM
  - <10 μm (PM$_{10}$)

https://www.momsclimateforce.org/5-reasons-moms-need-a-strong-soot-standard/
Size of particulate matters

Particulate Size Comparison

PM10
< 10 μm

HUMAN HAIR
50-70 μm

PM2.5
< 2.5 μm

https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health

Respiratory Disease and PM$_{2.5}$

- **Mechanisms**
  - Oxidative Stress
  - Inflammation
    - Acute
    - Chronic
      - Airway remodeling

https://www.elcaminohealth.org/stay-healthy/blog/understanding-lung-conditions
• Increased cardiovascular disease
  – myocardial infarction (MI)
  – cardiac arrhythmias
  – ischemic stroke
  – vascular dysfunction
  – hypertension
  – atherosclerosis
• Mechanisms linking particulate matter and cardiovascular disease
  – Direct
  – Indirect

https://www.health.utah.gov/utahair/CAD/#gsc.tab=0
Health Impacts

- In more than 600 cities across the globe, data shows an independent association between short-term exposure to PM$_{10}$ and PM$_{2.5}$ and:
  - Daily all-cause cardiovascular mortality
  - Daily all-cause respiratory mortality
Results of the study demonstrate that current levels of air pollution have a chronic, adverse affect on lung development in children from the ages of 10 to 18 years.
Does cleaner air = better health?

**Association of Changes in Air Quality With Incident Asthma in Children in California, 1993-2014**

- NO₂
- PM₂.₅
Does cleaner air = better health?

Asthma incidence

- NO₂
- PM₂.₅
• Clean air is important for health.

• Traffic related air pollution is a public health concern.

• Electrification of vehicles is an important step in decreasing the amount of traffic related air pollution.
• Questions/future connections
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