Air Quality, Climate Change, and Transportation

The Medical Society Consortium on Climate and Health Webinar

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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 (NO₂)
• Sulfur dioxide (SO₂)
• Particulate matter
  – <2.5 μm (PM_{2.5})
    • Ultrafine PM
  – <10 μm (PM_{10})

https://www.momscleanairforce.org/5-reasons-moms-need-a-strong-soot-standard/
Size of particulate matter impacts health

PM10
< 10 μm

HUMAN HAIR
50-70 μm

PM2.5
< 2.5 μm

https://www2.arb.ca.gov/resources/inhalable-particulate-matter-and-health

• Mechanisms
  – Oxidative Stress
  – Inflammation
    • Acute
    • Chronic
      – Airway remodeling
• Mechanisms linking particulate matter and cardiovascular disease
  – Direct
  – Indirect
Health Impacts

• Data shows an independent association between short-term exposure to PM$_{10}$ and PM$_{2.5}$ and daily all-cause, cardiovascular, and respiratory mortality in more than 600 cities across the globe.
Children and PM$_{2.5}$

- 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.
Children and PM$_{2.5}$

Reviews article
Exposure to traffic-related air pollution and risk of development of childhood asthma: A systematic review and meta-analysis

Results from this meta-analysis indicate a statistically significant association of exposure to black carbon, nitrogen dioxide, PM$_{2.5}$, and PM$_{10}$ and risk of asthma development.
Does cleaner air = better health?

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

- NO$_2$
- PM$_{2.5}$

School of Medicine & Health Sciences
THE GEORGE WASHINGTON UNIVERSITY
Does cleaner air = better health?

Asthma incidence

NO$_2$

PM$_{2.5}$
COVID-19 and PM$_{2.5}$

• Multiple public health concerns

• *Exposure to air pollution and COVID-19 mortality in the United States: A nationwide cross-sectional study*
  
  “an increase of 1 μg/m$^3$ in PM$_{2.5}$ is associated with an 8% increase in the COVID-19 death rate”
• Questions/future connections
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