

Health effects of wildland fires: What does the future hold?

Sheryl Magzamen

Colorado State University

NASEM Workshop on Wildland Fires

September 25, 2020

sheryl.magzamen@colostate.edu



Colorado State University

Four key thoughts: Health Effects

Q1: What are the long-term health effects from wildfire smoke (WFS)?

- Long-term sequelae from acute exposures
- Chronic, repeated exposure to WFS

Q2: What are the long-term differences between anthropogenic and biogenic sources of PM_{2.5}?

- In terms of source
- In terms of timing and intensity of dose

Q3: How do we understand impacts of communication and behavior on WFS exposure and concomitant health effects?

Q4: How do we collectively promote sound land management decisions (ecological health) and implications for human health?

Q1: Long-term health effects

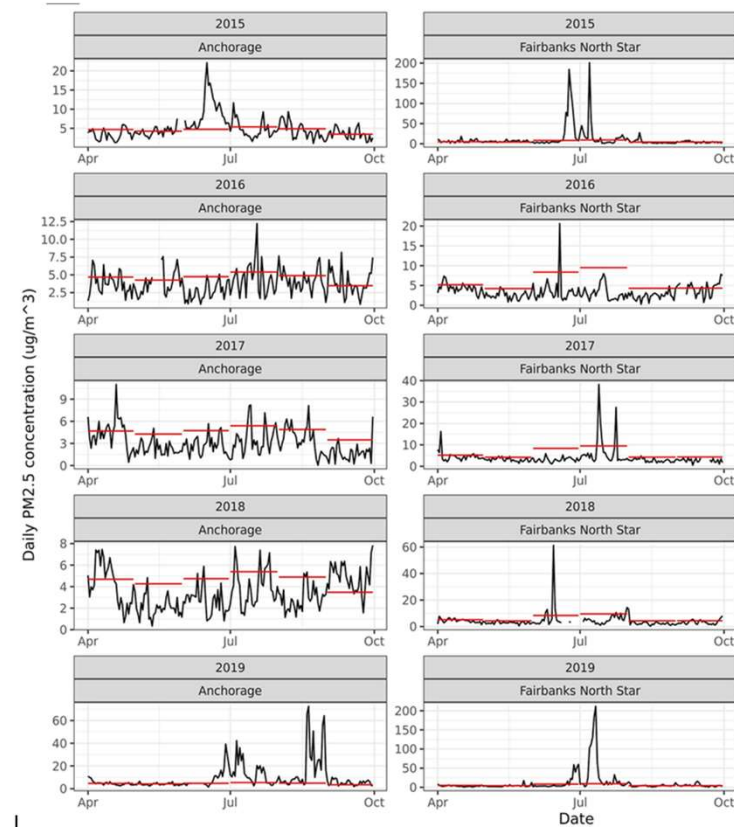
Where we excel:

- Retrospective studies of seasonal or multi-seasonal wildfire events

What we lack: long-term health effects of seasonal events

- Orr *et al.* 2020: Seeley Lake (MT) residents exposed to WFS $PM_{2.5}$ had impairments in lung function two years following 2017 fire season
- Landguth *et al.* 2020: Prior season wildfire smoke $PM_{2.5}$ associated with increased influenza cases in MT

What we need: studies of chronic, repeated exposure to WFS



[Figures courtesy of Grace Kuiper and Micah Hahn, UAA]

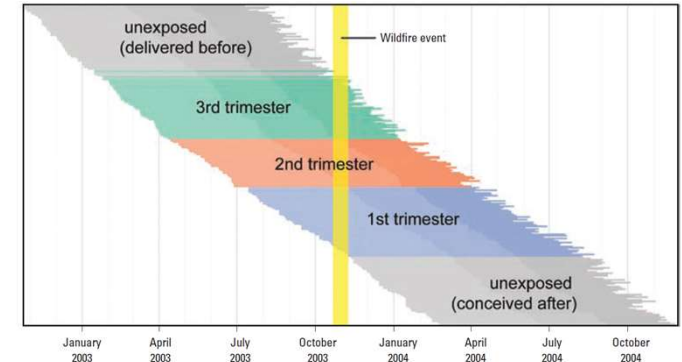
Q2: Health effects of PM_{2.5} by source

Where we excel:

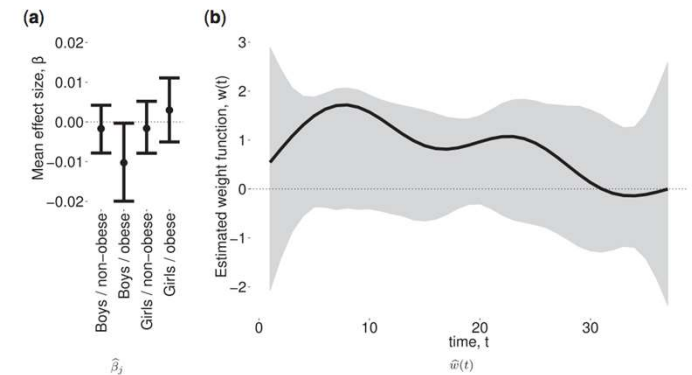
- TRAP/point source air pollutants, both short-term and long-term health effects
- Short-term impacts of WFS on cardiorespiratory health care utilization

What we lack: differences by source

- Biomass burning results in different particle composition and toxicity due to fuel, burn intensity, transport, mixing
- Windows of susceptibility (“critical windows”) known for limited set of outcomes



[Fig 2. from Holstius *et al.* 2012]



[Fig 2. from Wilson *et al.* 2017]

Question 3

What are the impacts of communication on wildfire smoke avoiding and mitigating behavior?

Case Study: Colorado, 2010 - 2015



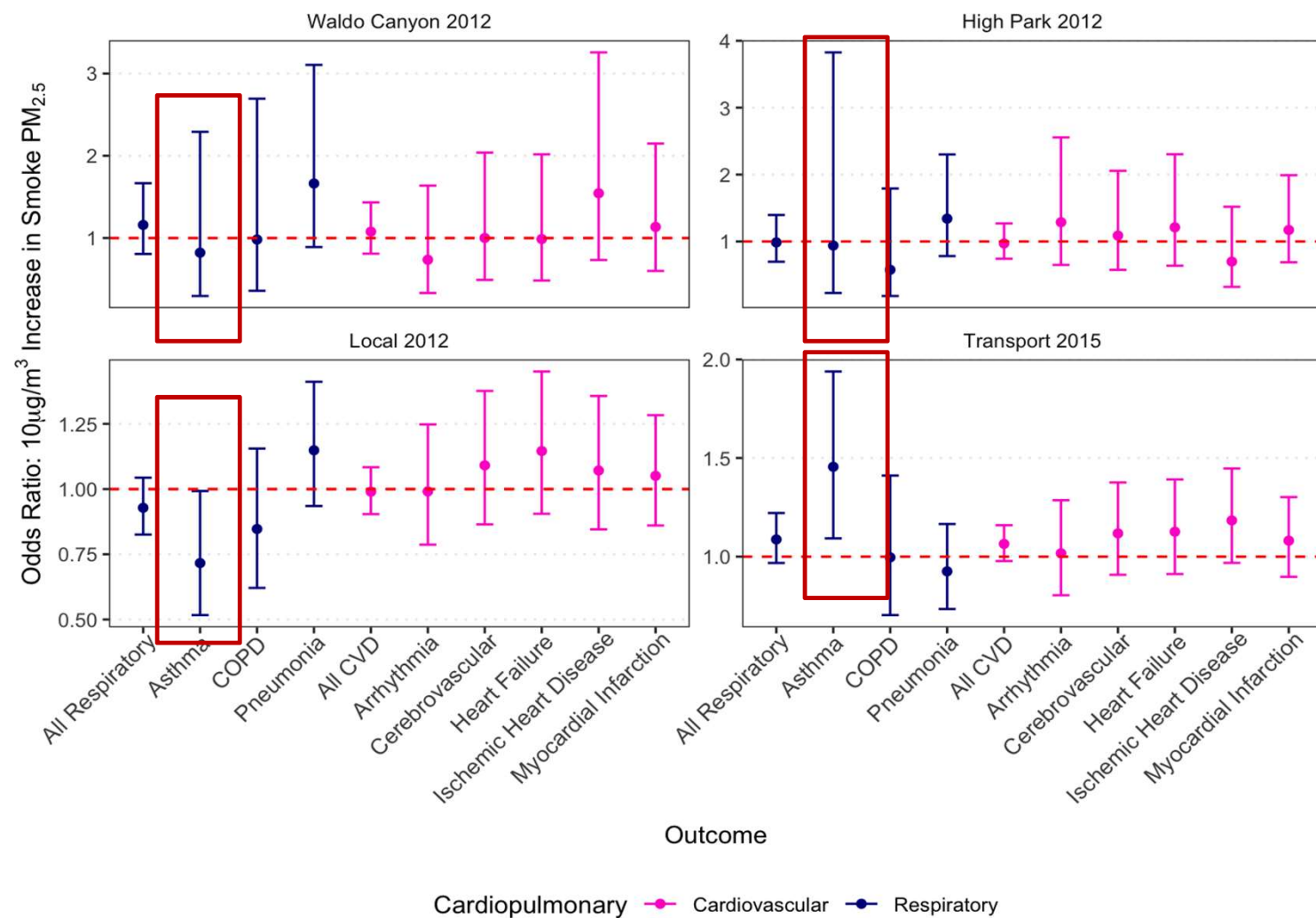


Figure: Cumulative effect (lag days 0 – 3) of a 10 µg/m³ increase in WFS PM_{2.5} on the risk for a cardiopulmonary inpatient hospitalizations for each WFS event.

Q4: Public health implications of land management decisions

Land management decisions:

- Balancing ecosystem health and natural fire regimes with preservation of human life and structures
- Feasibility of suppression

What we lack: integration of health impacts in downwind communities

- Short-term v. long term impacts
- Intensity, frequency, season for wildfires is changing

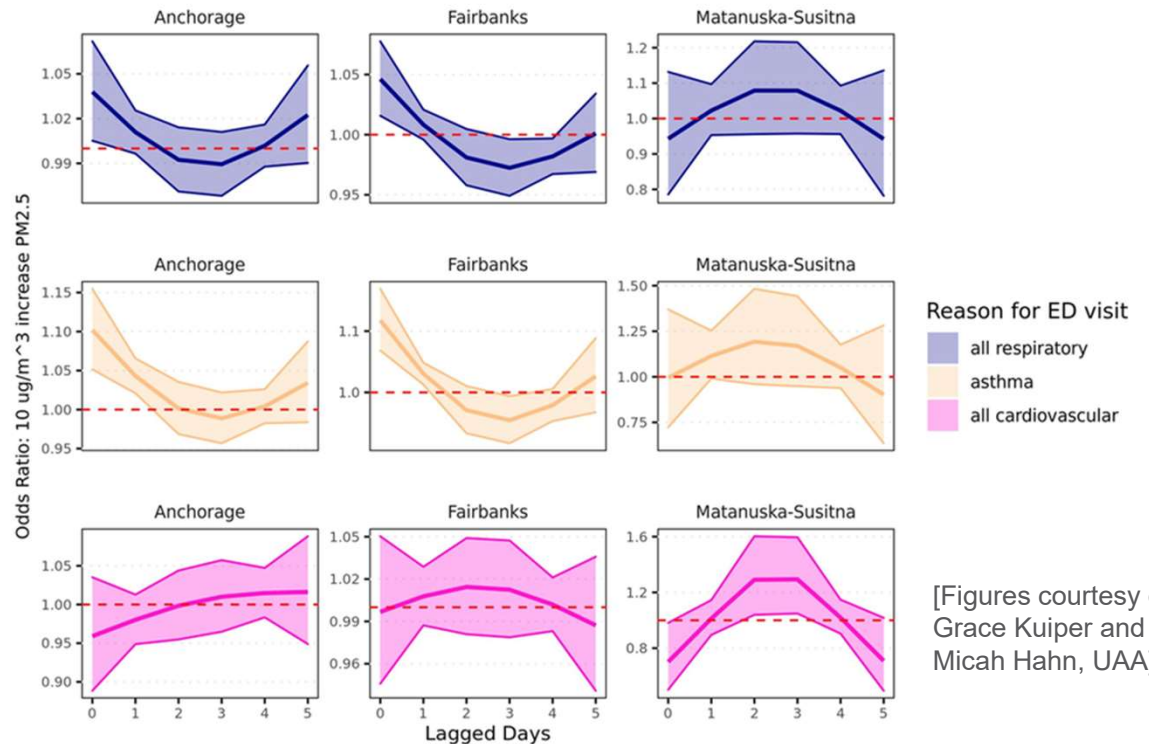


Figure. Results of DLM analyses for 10 $\mu\text{g}/\text{m}^3$ increase in WFS $\text{PM}_{2.5}$ stratified by study site for all respiratory, asthma, and all cardiovascular ED visits by major population borough, Alaska 2015 - 2019

Thank you



Colorado State University