

Expanding the Use of Prescribed Fire Including Cultural Burning to Reduce California's Wildfire Risk

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Wildfire Smoke Inhalation

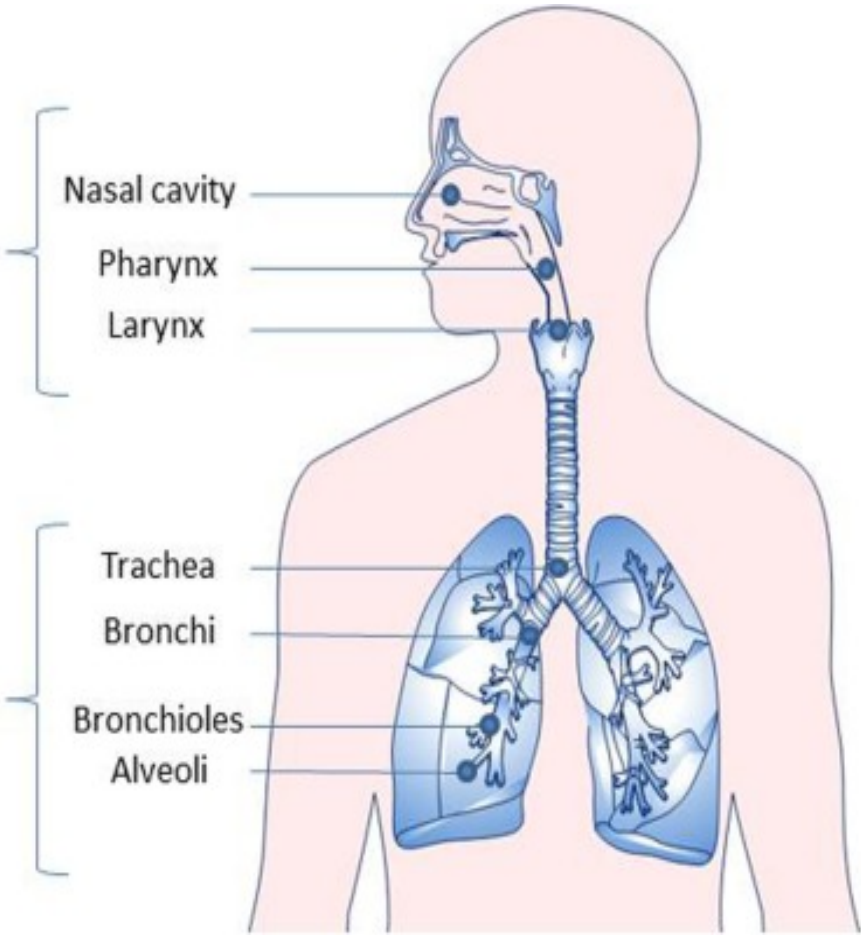
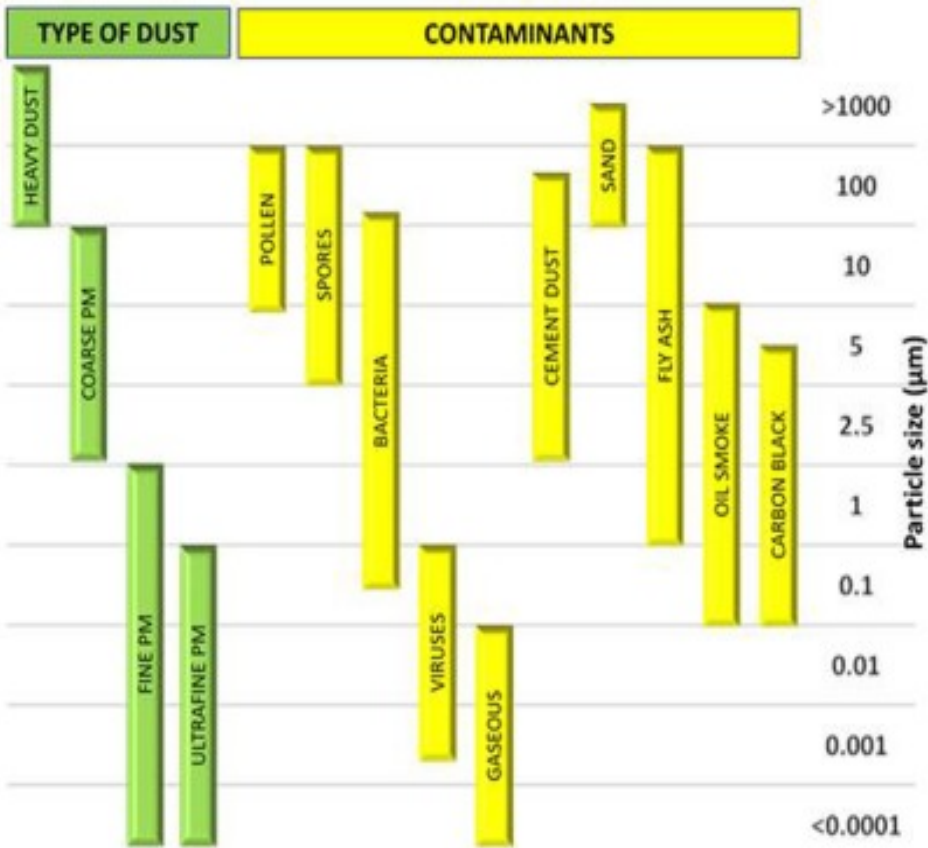
PM_{2.5} plume more likely to stay aloft

August 1, 2020 Cherry Valley, CA



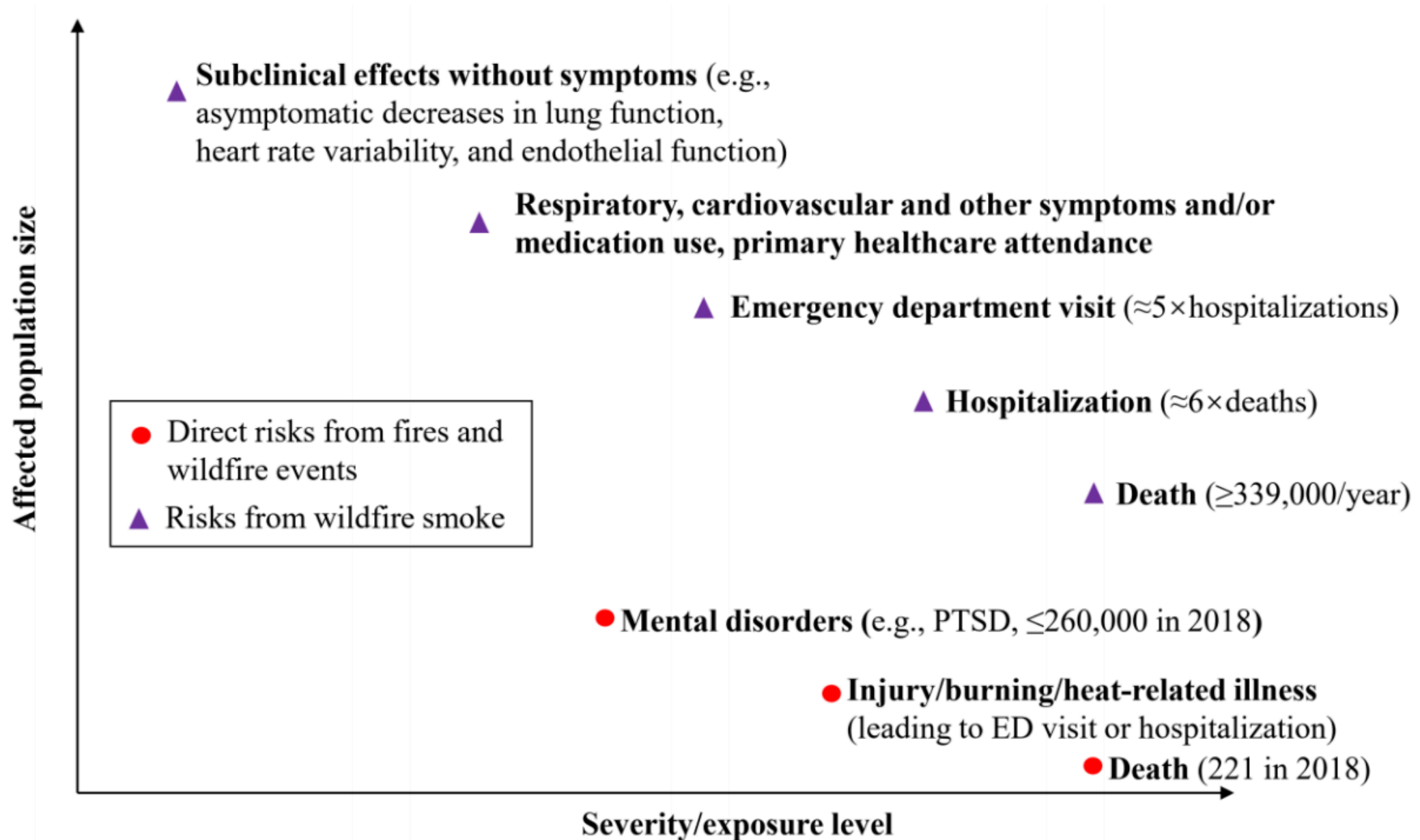
Credit: Gina Ferazzi / Los Angeles Times

Ash is larger and will settle to ground faster



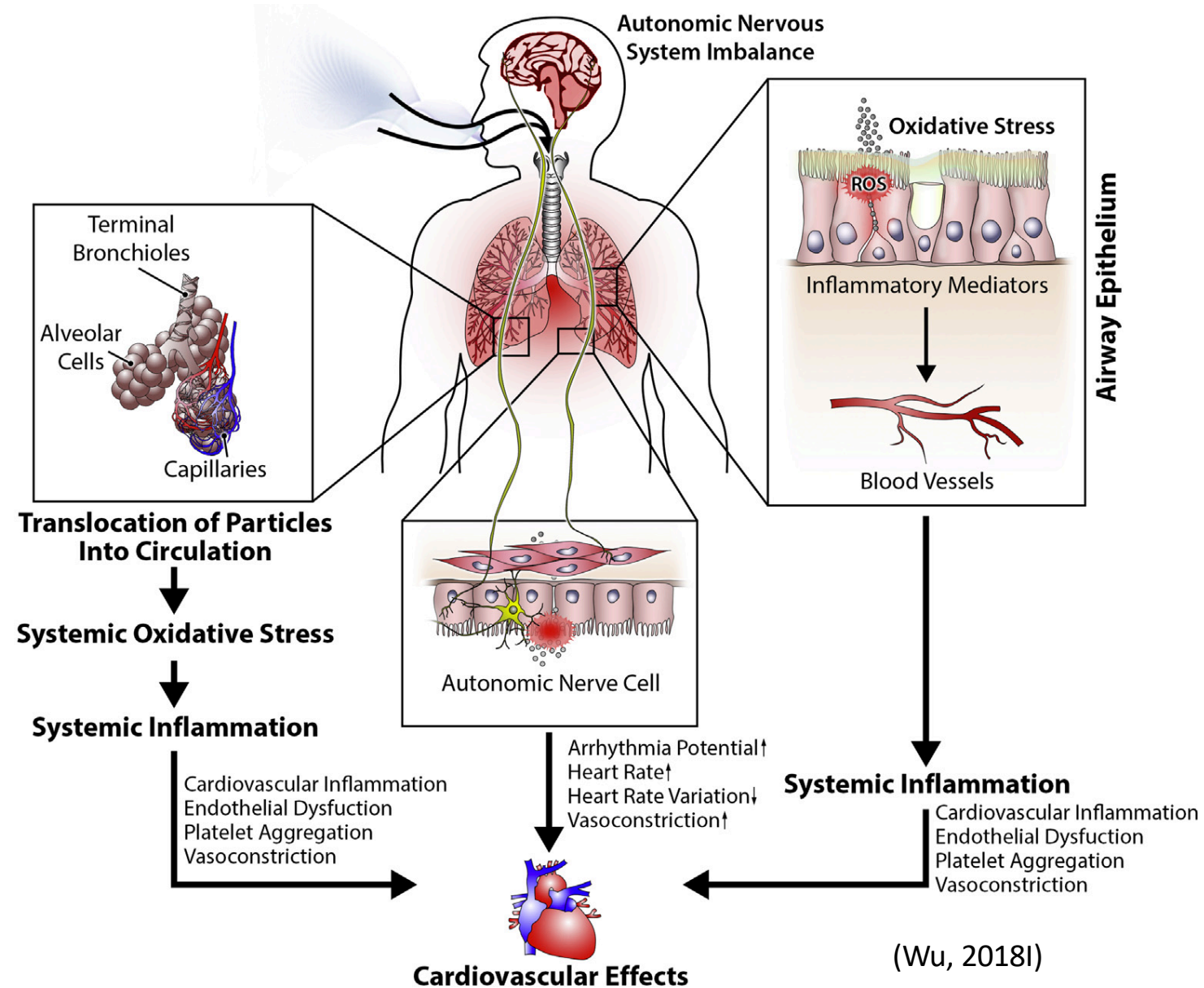
(Ferrari, 2019)

Population Health Risks Associated with Wildfires on a Global Scale

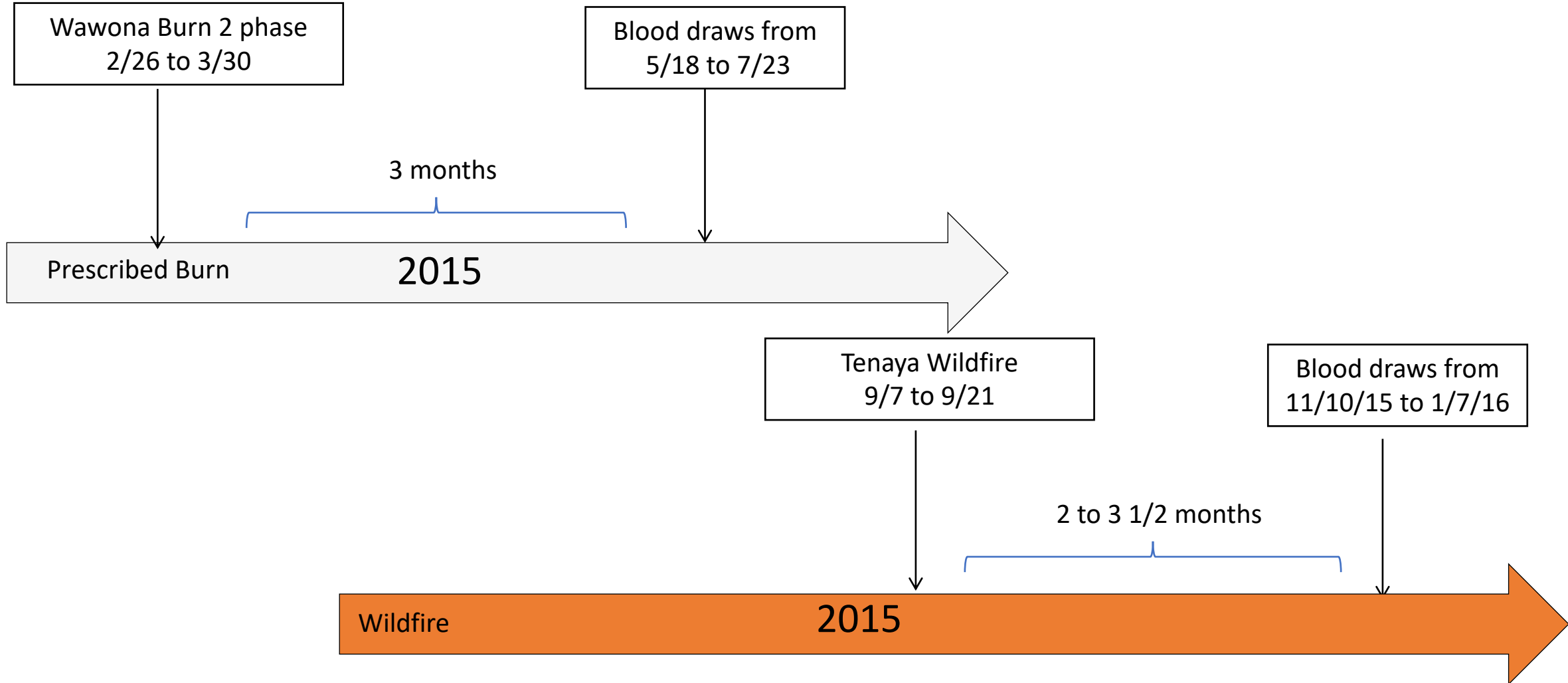


What are the effects of the PM_{2.5} once inside the body?

- Lung inflammation
 - 1.6 million COPD deaths
 - Asthma exacerbations
- Systemic inflammation
 - Cardiovascular system
 - 19% CVD deaths
 - 21% stroke deaths
 - Immune system
 - Allergies
 - Autoimmune disorders
 - Endocrine System
 - Diabetes
 - Brain
 - Alzheimer's
 - Lower child IQ
 - Autism
- Cancer
 - 500,000 lung cancer deaths
 - Bladder cancer
 - Childhood leukemia

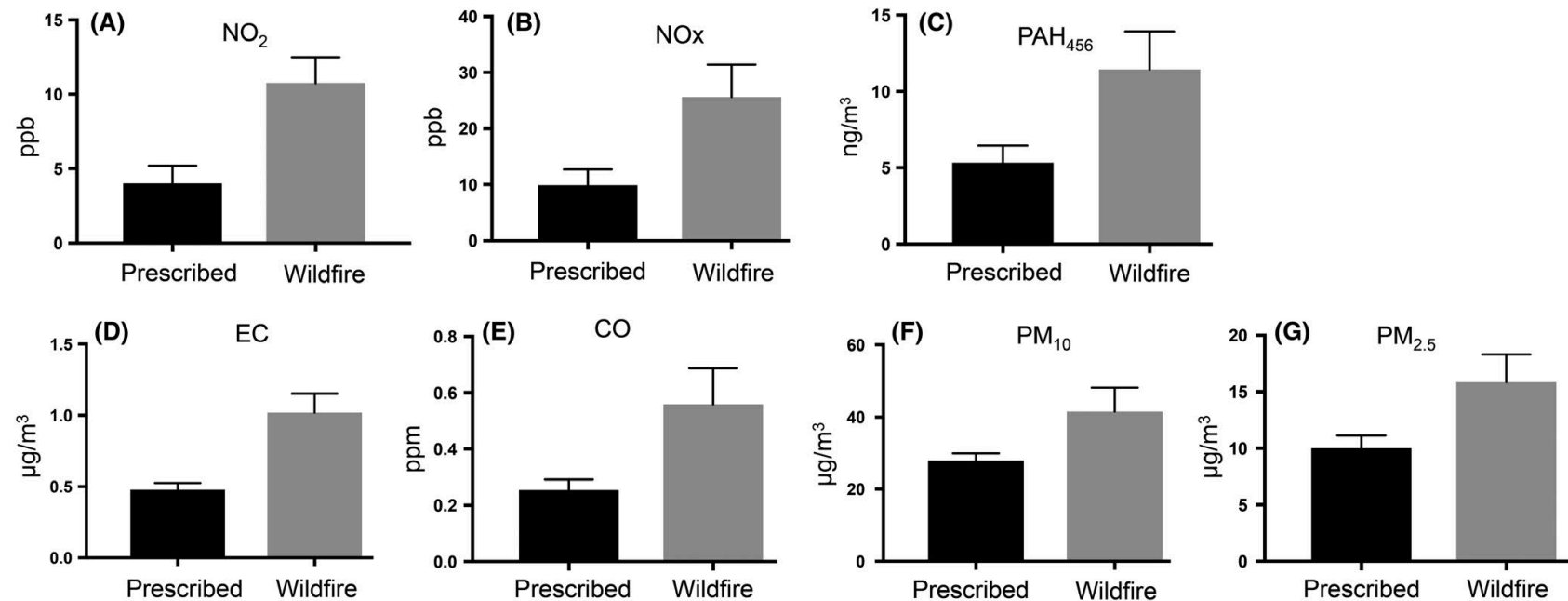


The impact of prescribed fire versus wildfire on the immune and cardiovascular systems of children



The impact of prescribed fire versus wildfire on the immune and cardiovascular systems of children

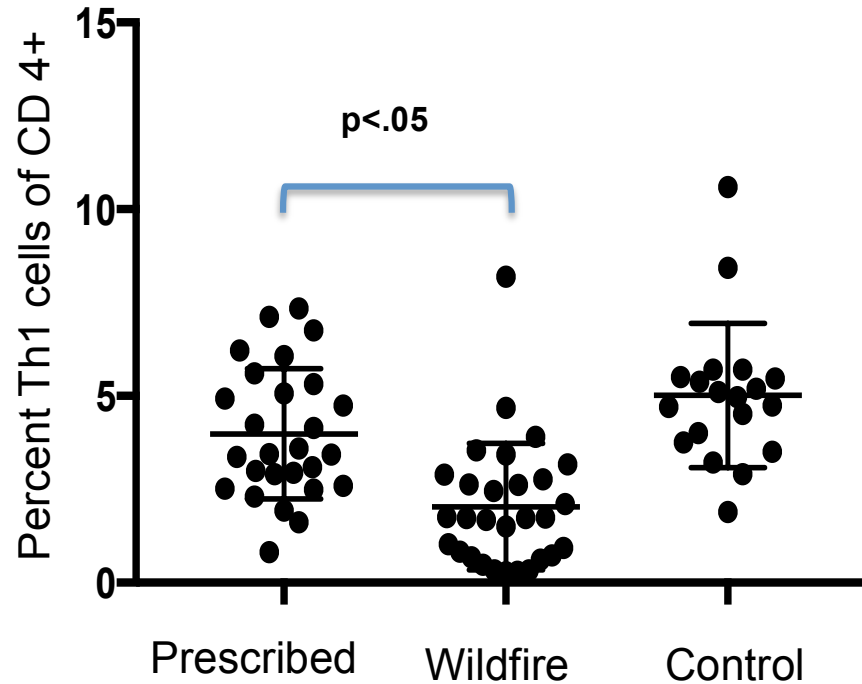
Demographic Variable	Prescribed Burn Subjects (n=32)	Wildfire Subjects (n=36)
% Female	40.6% (13/32)	41.7% (15/36)
% Asthmatics	37.5% (12/32)	25% (9/36)
Age	7.16 yrs	7.56 yrs
Period	May to July 2015	Nov 2015 to Jan 2016



Average levels of pollutants during the wildfire and prescribed fire. When comparing prescribed vs wildfire, $P < 0.0001$ for each pollutant shown.

The impact of prescribed fire versus wildfire on the immune and cardiovascular systems of children

Prescribed Burns vs Wildfires



Health Findings:

- Decreased Th1 cells in wildfire group
- Increased methylation in wildfire group
- Increased wheezing and asthma exacerbations
- Trend rise in pulse pressure in wildfire group

Th1 Cell percentage of CD 4+ cells for children 90 days after being exposed to a prescribed fire, wildfire or no exposure (1-way ANOVA, $p < .0001$).

Top five states for annual area burned for wildfires vs prescribed fires in 2017

Wildfires

State	Annual Area Burned (ha)	Month	Month Area Burned (ha)	Month PM _{2.5} Emitted (tons)	Maximum Daily PM _{2.5} Measured in the Month (µg/m ³ , 24-hr avg)
California	641,440	August	93,388	126,331	310
		October	151,492	106,657	215
Montana	584,527	September	222,497	158,647	550
Nevada	519,250	July	373,169	21,742	135
Oregon	381,294	August	152,505	142,845	314
Idaho	367,205	August	129,799	51,974	125
		September	80,922	93,048	361

Prescribed Burns

State	Annual Area Burned (ha)	Month	Month Area Burned (ha)	Month PM _{2.5} Emitted (tons)	Maximum Daily PM _{2.5} Measured in the Month (µg/m ³ , 24-hr avg)
Texas	632,470	February	143,468	12,807	29
Georgia	465,219	February	92,595	10,217	32
Oklahoma	449,616	March	140,656	18,615	49
Florida	386,518	February	90,367	8,733	30
Alabama	366,899	March	66,059	8,344	38

Prescribed Fires vs Wildfires

- Source/composition of pollutants
 - Wildland and vegetation vs structure fires
- Distance smoke travels
 - Short duration, dispersion planning vs Longer duration, higher intensity
- Timing
 - Planned vs unplanned
- Strategy
 - Strategic placement vs uncontained
- Interventions
 - Planned interventions vs unplanned event

Summary

- Wildfire smoke contains many toxins, but predominantly PM_{2.5}
- PM_{2.5} exposure has been associated with increased morbidity and mortality
- Wildfire smoke exposure causes health problems, including death (e.g. respiratory, cardiac and neurologic outcomes)
- Our study: Exposure to a wildfire is more detrimental to health than exposure to a prescribed burn in children
- Prescribed burns have many advantages over wildfires