

# The Growing Threat of Wildfire Smoke



Sarah B. Henderson, PhD

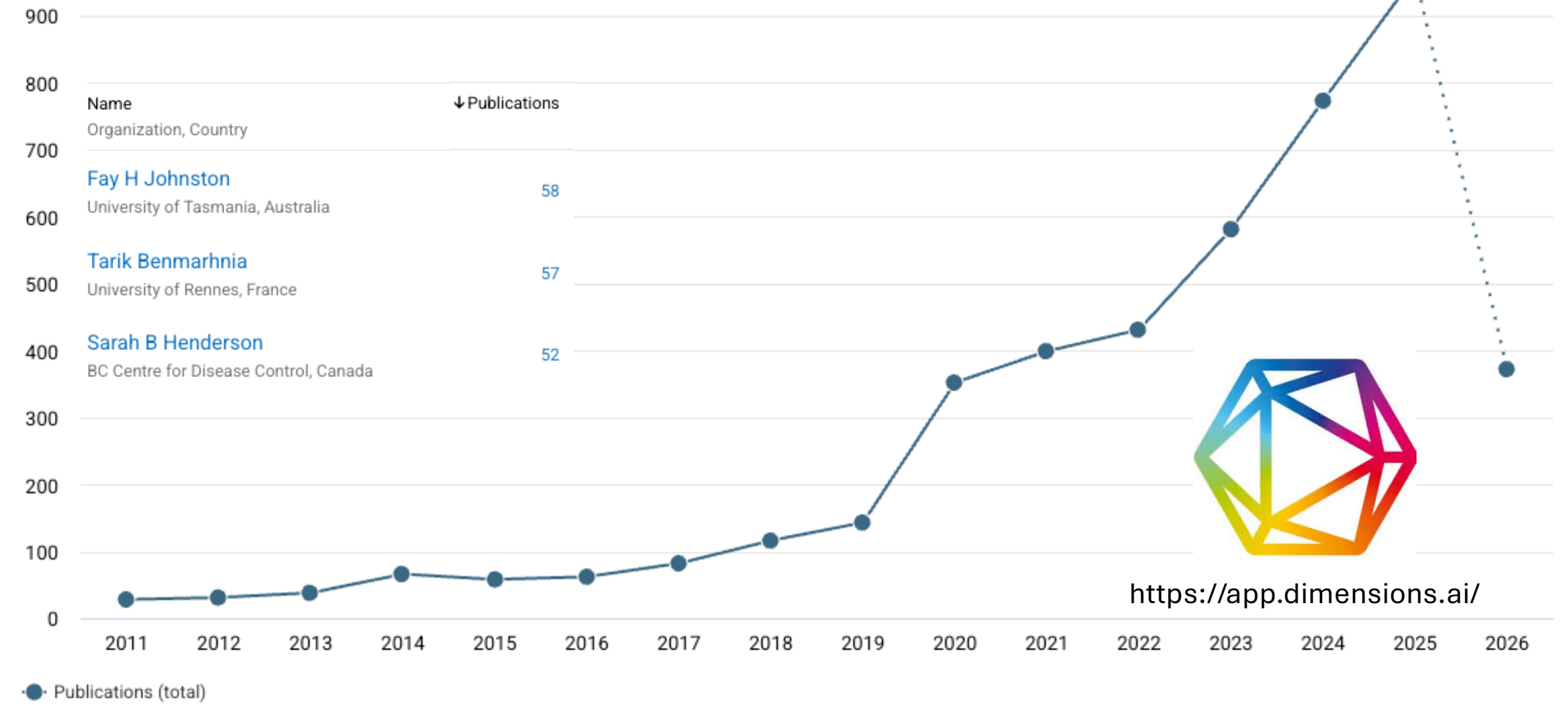
From Smoke to Solutions

Vancouver Summit


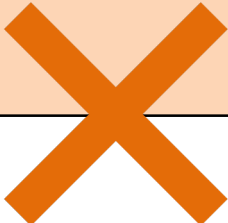
June 4, 2026

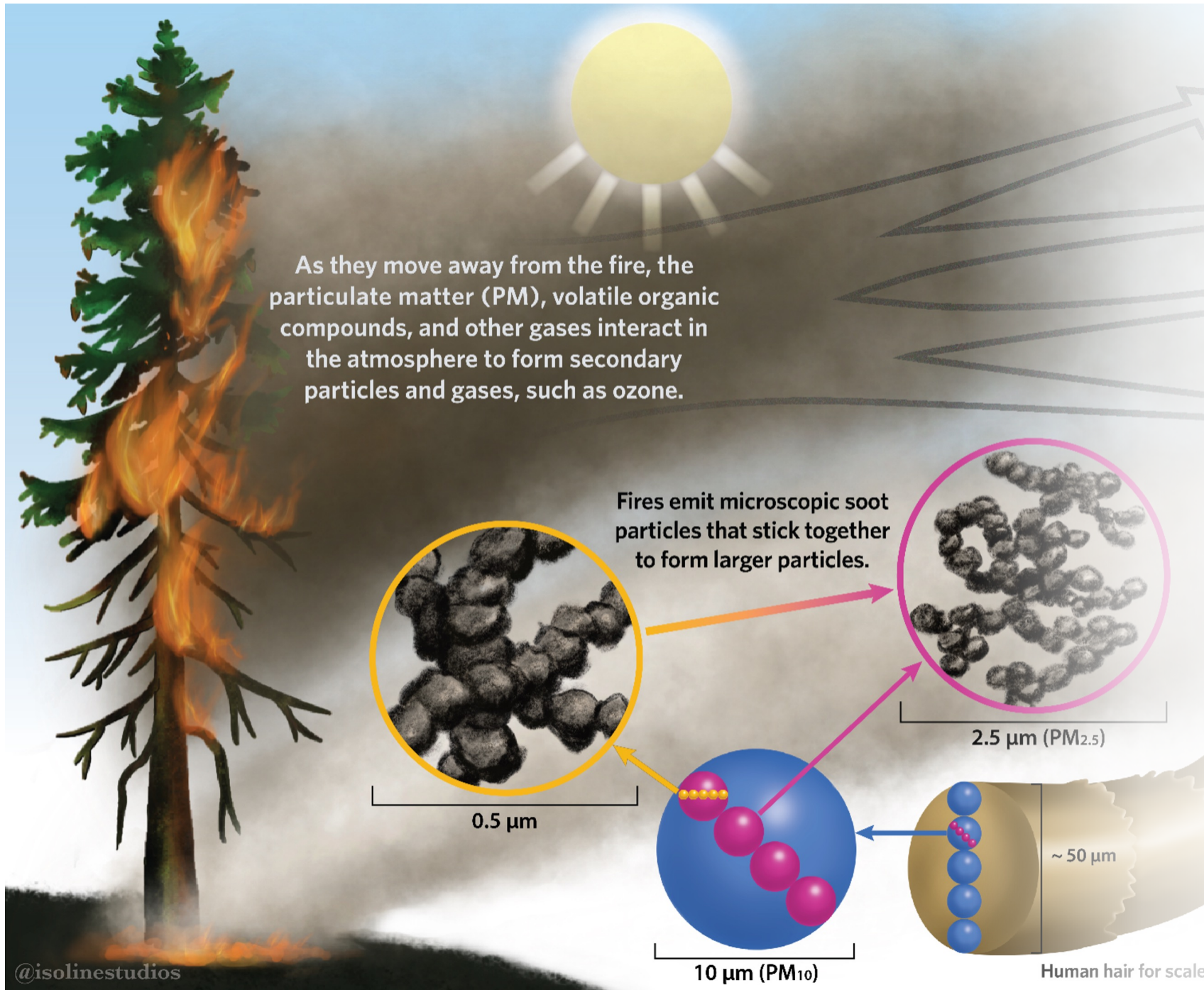


# Evidence on acute health effects has grown, and covers a wide range of outcomes



The ***acute*** effects of wildfire smoke are generally consistent with air pollution from other sources.

Same	Different
<ul style="list-style-type: none"><li>• Affects every organ system in the body</li><li>• Similar magnitude of effect for many outcomes</li></ul> 	<ul style="list-style-type: none"><li>• Very pronounced respiratory response</li><li>• Larger effects reported for some other outcomes</li></ul> 



As they move away from the fire, the particulate matter (PM), volatile organic compounds, and other gases interact in the atmosphere to form secondary particles and gases, such as ozone.

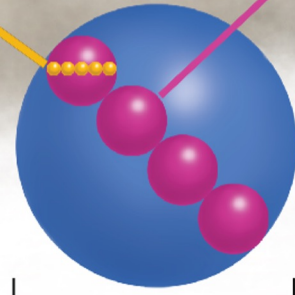
Fires emit microscopic soot particles that stick together to form larger particles.



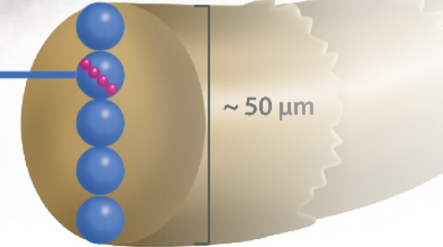
0.5 μm



2.5 μm (PM<sub>2.5</sub>)



10 μm (PM<sub>10</sub>)

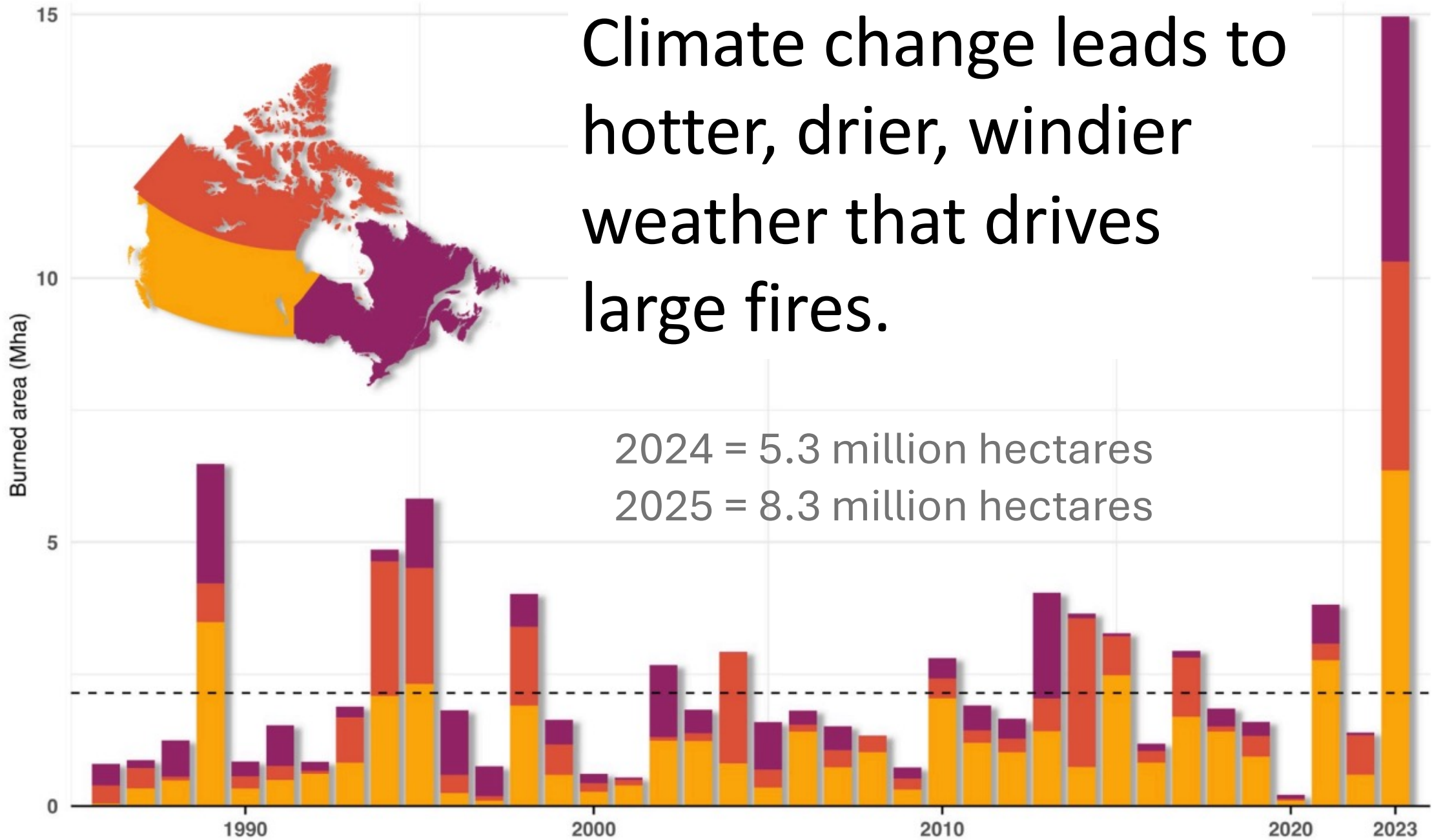


~ 50 μm  
Human hair for scale

# Why different?

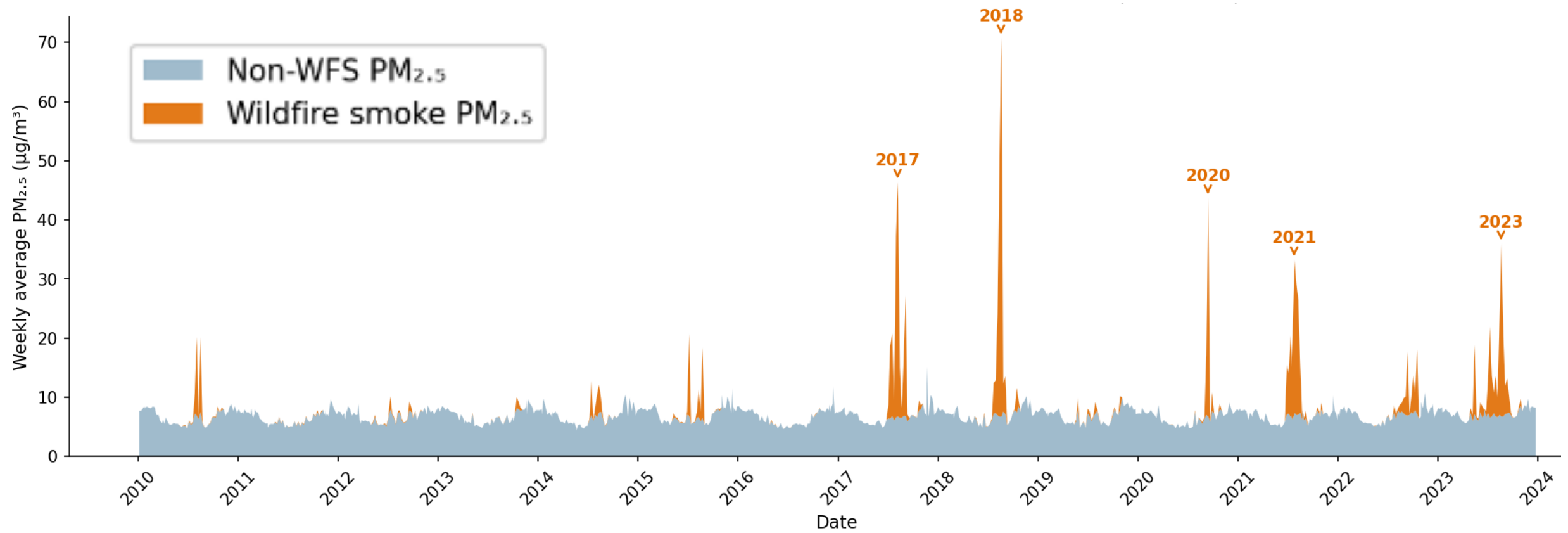
- Very complex type of air pollution
- Unmeasured co-pollutants
- Smaller particles, more per same mass
- Atmospheric aging effects
- Higher SA:V ratio for biological reactions
- Variable composition by fuel and fire

Climate change leads to hotter, drier, windier weather that drives large fires.



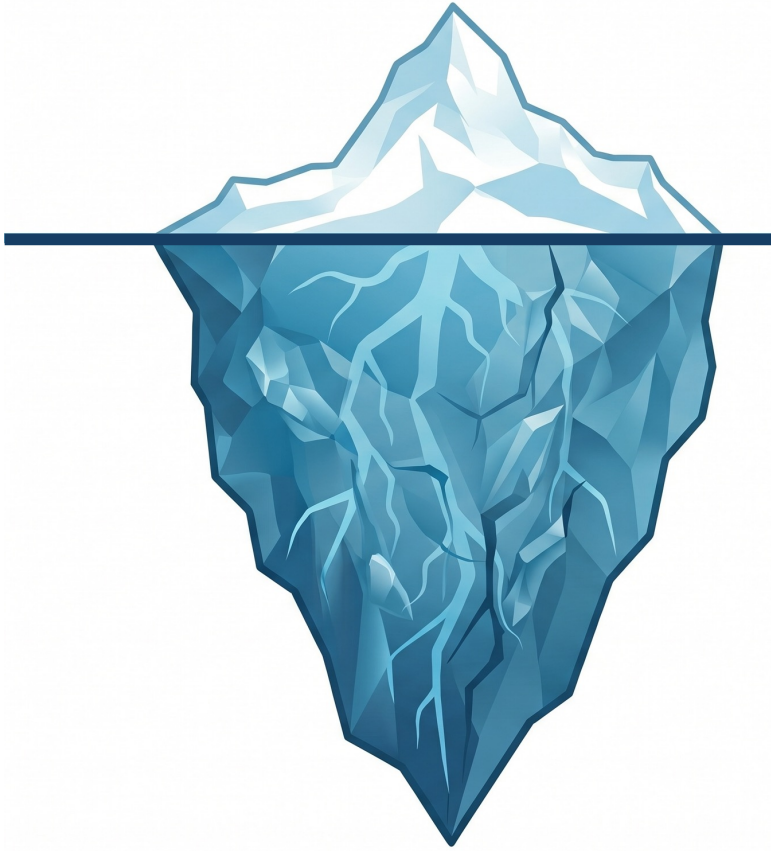
2024 = 5.3 million hectares  
2025 = 8.3 million hectares

Large fires are causing more frequent, longer, and more severe smoke episodes in BC and elsewhere, contributing to both acute and chronic illness.



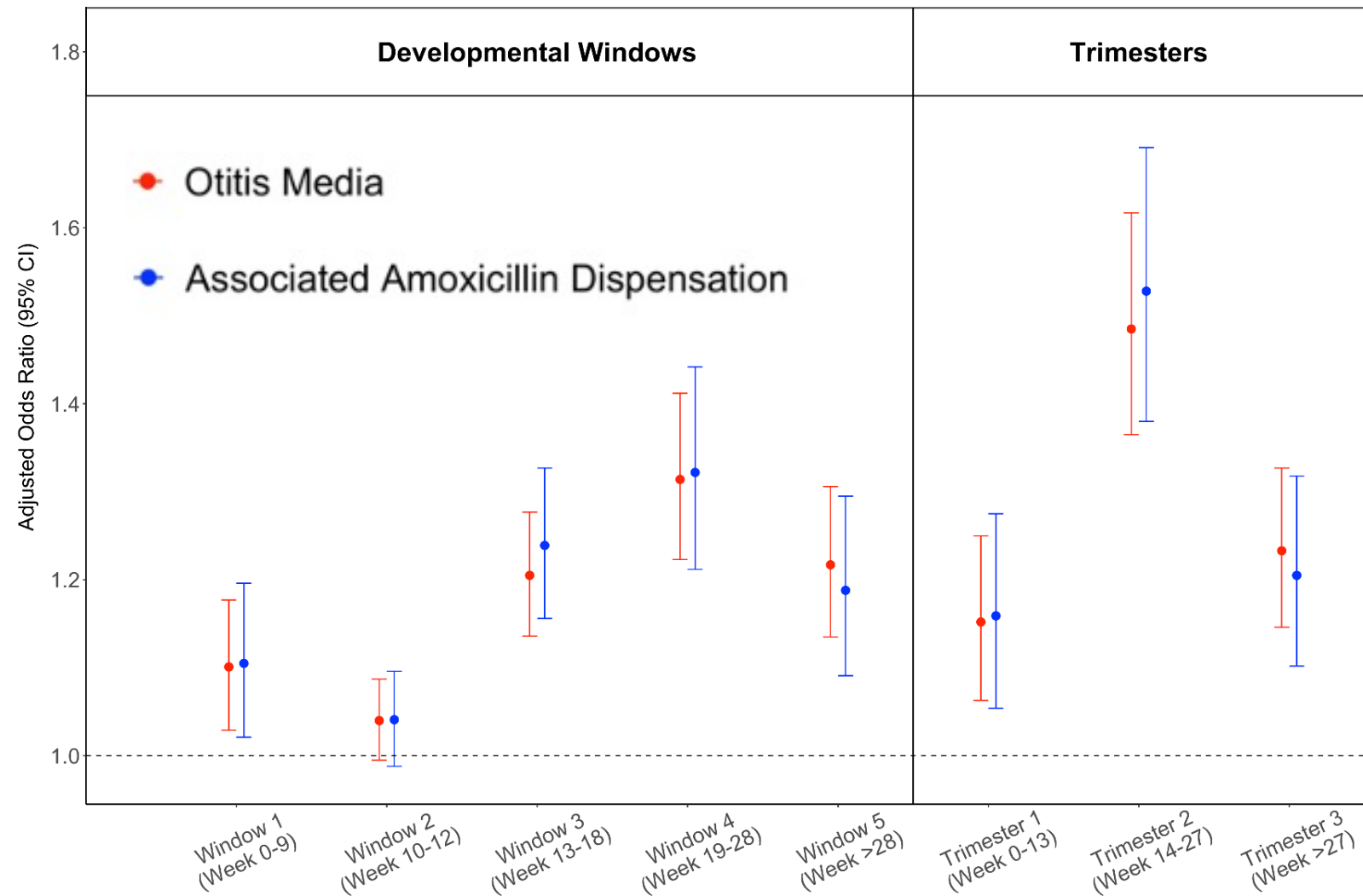
The burden of chronic illness attributable to air pollution and wildfire smoke is roughly an order of magnitude greater than the burden of acute illness.

Two studies on mortality in Canada attributable to smoke from 2023 fires.

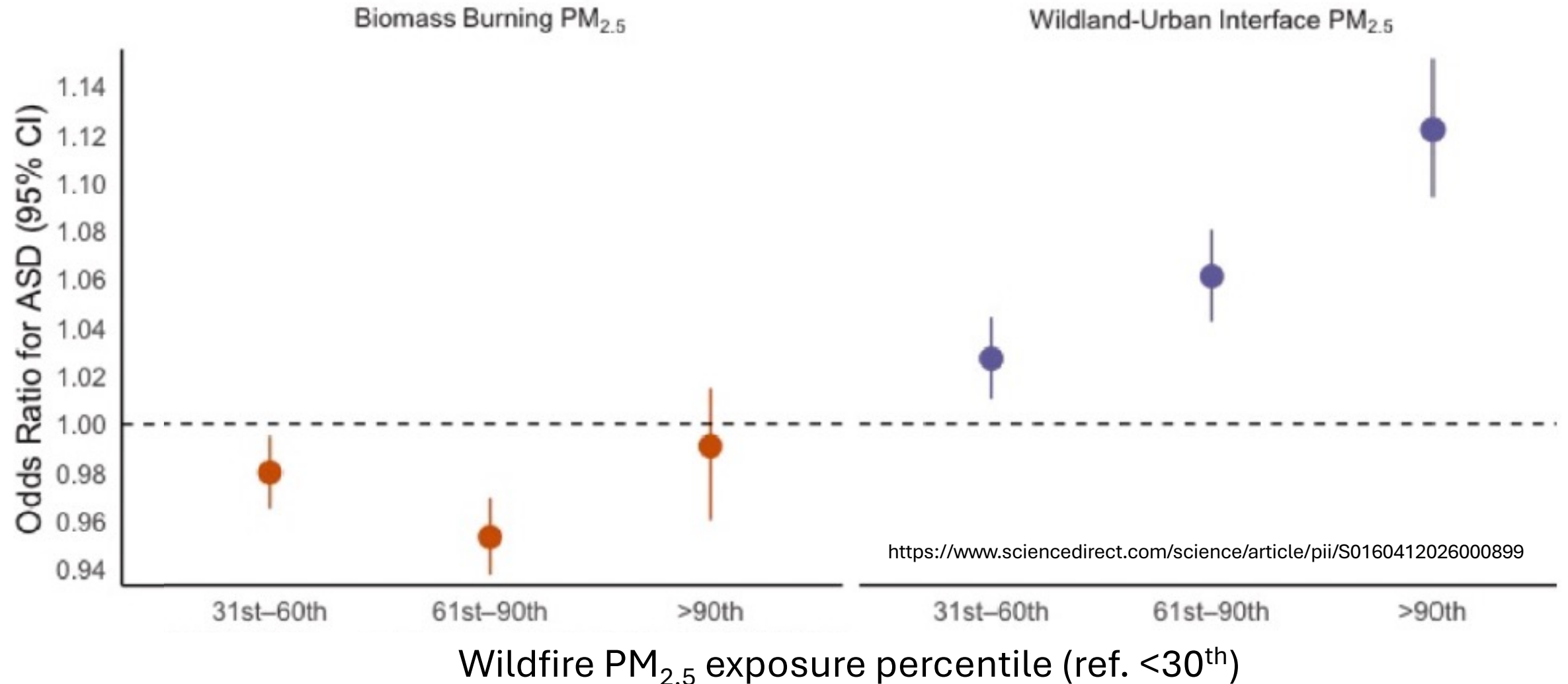


	<b>Acute Deaths</b>	<b>Chronic Deaths</b>	<b>~Ratio</b>
Zhang et al.	1,300	8,300	~1:6
Matz et al.	400	5,400	~1:13

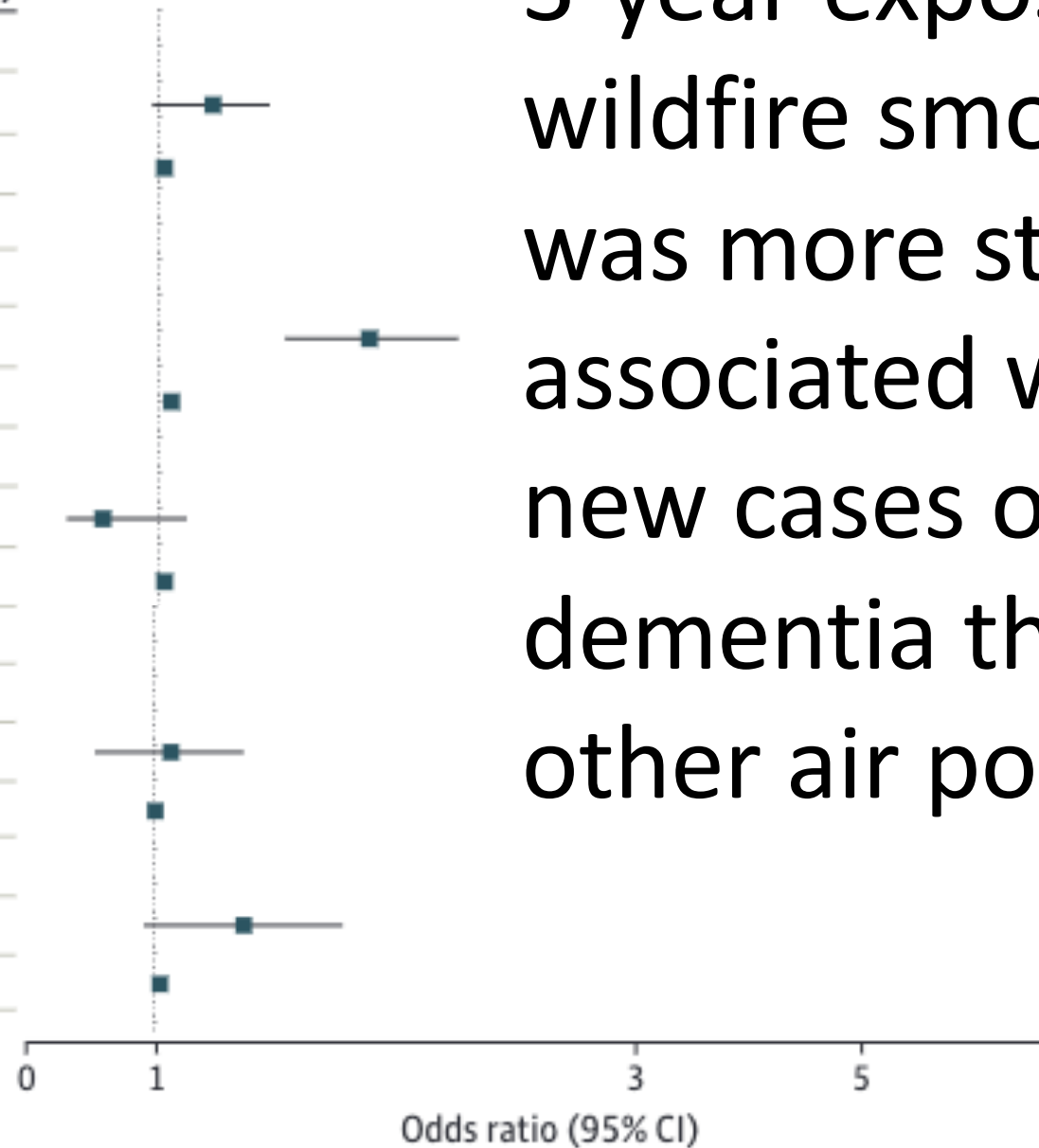
# Prenatal exposure is associated with adverse birth outcomes, and decreased health in childhood.



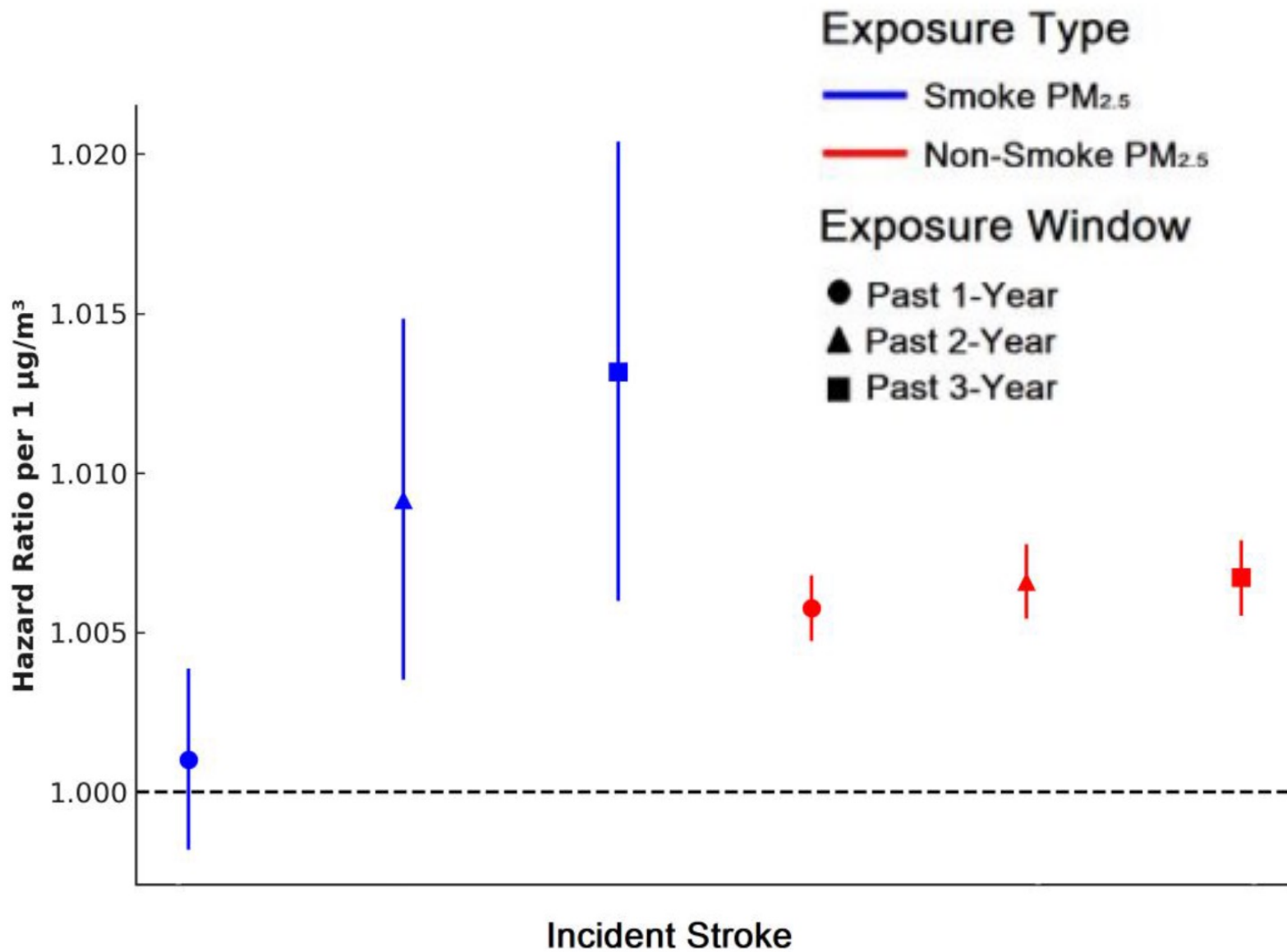
Smoke from different fuels can have different effects, and interface fire smoke is more toxic.



Category	Odds ratio (95% CI)
<b>Overall</b>	
Wildfire PM <sub>2.5</sub>	1.12 (0.98-1.28)
Nonwildfire PM <sub>2.5</sub>	1.01 (1.00-1.01)
<b>Age, y</b>	
<b>&lt;75</b>	
Wildfire PM <sub>2.5</sub>	1.59 (1.31-1.94)
Nonwildfire PM <sub>2.5</sub>	1.02 (1.01-1.02)
<b>≥75</b>	
Wildfire PM <sub>2.5</sub>	0.88 (0.73-1.06)
Nonwildfire PM <sub>2.5</sub>	1.01 (1.01-1.02)
<b>Area-level poverty</b>	
<b>Low</b>	
Wildfire PM <sub>2.5</sub>	1.03 (0.87-1.22)
Nonwildfire PM <sub>2.5</sub>	1.00 (1.00-1.01)
<b>High</b>	
Wildfire PM <sub>2.5</sub>	1.22 (0.97-1.53)
Nonwildfire PM <sub>2.5</sub>	1.01 (1.00-1.01)





3-year exposure to wildfire smoke was more strongly associated with new cases of dementia than other air pollution.



Similar results have now been reported for many chronic conditions, including stroke.

The ***chronic*** effects of wildfire smoke pose a significant threat to population health.

Same	Different
<ul style="list-style-type: none"><li>• Affects every organ system in the body</li><li>• Disproportionate impacts on susceptible populations</li></ul> 	<ul style="list-style-type: none"><li>• Larger effects across big studies, including:<ul style="list-style-type: none"><li>• Birth outcomes</li><li>• Heart failure</li><li>• Dementia</li><li>• Stroke</li></ul></li></ul> 

# Smoke deaths in the US under climate change

“When monetized, climate-driven smoke deaths result in economic damages that exceed existing estimates of climate-driven damages from **all other causes combined** in the US. Our research suggests that the health impacts of climate-driven **wildfire smoke could be among the most important and costly consequences** of a warming climate in the US.”

## Indoor air **can** be 90% of the solution...

- Resilient new buildings
- Smoke readiness plans for existing buildings
- Indoor air cleaning

## But equity **must** be considered...

- Low quality building stock
- Unhoused people
- Outdoor workers
- All higher susceptibility



**Thank you!**  
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BC Centre for Disease Control



National Collaborating Centre  
for Environmental Health

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Centre de collaboration nationale  
en santé environnementale



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