# Real time Estimates Wildfire Smoke Mortality in the U.S.

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#### **Mortality Estimation Tool**



https://wxmortality.rcc-acis.org





Research Article 🔂 Open Access 🛛 💿 🚯

#### Estimated Mortality and Morbidity Attributable to Smoke Plumes in the United States: Not Just a Western US Problem

Katelyn O'Dell 🔀, Kelsey Bilsback, Bonne Ford, Sheena E. Martenies, Sheryl Magzamen, Emily V. Fischer, Jeffrey R. Pierce

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#### https://www.ospo.noaa.gov/products/land/hms.html#maps







https://www.airnow.gov/?city=Ithaca&state=NY&country=USA







Seasonal Baseline PM2.5

- 1/1/2014 8/31/2023
- 24-hour-average PM<sub>2.5</sub>
- 4 Seasons (DJF, MAM, JJA, SON)
- Non-smoke Days
- 99<sup>th</sup> percentile

The 99<sup>th</sup> percentile was selected to reduce likelihood of overestimating wildfire smoke.







For each sensor and each day

WFS-PM<sub>2.5</sub> = Observed 24-hour average  $PM_{2.5}$  – Baseline non-smoke  $PM_{2.5}$ 

WFS-PM<sub>2.5</sub> = 0 if sensor not under a smoke plume

Concentrations were interpolated between monitors, and the county-average value was extracted.

























### 2024 Days with Wildfire-Smoke PM2.5 Concentration $\geq 1\mu g/m^3$





#### 2023 Days with Wildfire-Smoke PM2.5 Concentration $\geq 1\mu g/m^3$

























## 2019 Days with Wildfire-Smoke PM2.5 Concentration $\geq 1 \mu g/m^3$





#### Mortality Impact: 1/1/2019 - 12/31/2023





#### Highest WFS concentration day and location: Jefferson County, Oregon on 9/12/2020 (540µg/m<sup>3</sup>)

Yearly deaths across USA:

2018	662
2019	43
2020	1256
2021	967
2022	286
2023	2180
2024	228





# Caveats

- Data are provisional estimates
- Uncertainty is fairly high
  - Across ten estimates using five smoke-estimation methods and two health-impact functions, lowest value of 4 deaths and a highest value of 30 deaths statewide during a wildfire smoke wave.
- Average over 24 hours and counties
  - Miss the impacts of smoke events that are smaller in space or time. For example, a daytime prescribed burn
- Uncertainty is an acceptable level for emergency managers to take action





**Concluding Thought** 

## Extendable to other risks such as high heat

$$M_{c,d} = P_c R_c (1 - e^{-\beta [Heat \, Index_{c,d}]})$$





# **Questions?**

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