Name(s)

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Project Number

S0915

Project Title

No Smoke Without Fire: The Impact of Wildfires on Exposure to Particulate Pollutants

Abstract

Objectives

To evaluate exposure to particulate pollutants from wildfire smoke, PM2.5, PM1, and black carbon (BC) concentrations were monitored during wildfires and after extinguishment. The infiltration of wildfire smoke pollution from ambient to indoor air was determined by concurrent measurement inside and outside a home. The composition of pollution and the impacts of meteorological conditions on exposure were also examined.

Methods

For PM measurements, DustTrak DRXII monitors (TSI Inc.) were used, and for BC, MicroAeth AE51 monitors (AethLab) were used. Monitors were programmed for 1 minute log intervals. Hourly and daily averages were found from the 1 minute average data. During the monitoring periods (first from July 29-Aug. 19, then from Nov. 16-23), PM2.5 levels were monitored by Real-time Air Advisory Network (RAAN) data from the Fresno and Clovis sites. Information on wildfires for the monitoring periods was obtained from the San Joaquin Valley Air Pollution Control District. Meteorological data was retrieved from the Fresno Yosemite Airport weather station.

Results

The average infiltration factor (IF) for the pollutants was about 28% in July-August and 36% in November. IFs for all pollutants were slightly greater during wildfires than after extinguishment in both monitoring periods. Indoor concentrations were consistently lower than outdoors. Average concentrations for all pollutants, in ambient and indoor air, were about 3-6.5 times greater during wildfires than after extinguishment. Standard deviations of all pollutant concentrations, indoors and outdoors, were significantly high during wildfires, showing high variability in exposure during wildfires. BC constituted <5% of PM2.5 and PM1 during wildfires and after extinguishment. PM1 constituted about 98% of PM2.5 concentrations.

Conclusions

Wildfires significantly elevate pollutant concentrations and thus, exposure and health risks. The IF is a specific characteristic of a building and seasonal activity because IFs did not significantly increase during wildfires and remained consistent for each monitoring period. Results suggest that strong gust wind and precipitation drastically decrease pollution and are a major factor in high variability in exposure. BC is a consistent component of PM. Much of the PM emitted during wildfires is PM1, implying further human health effects.

Summary Statement

Wildfires significantly increase exposure to the particulate pollutants of PM2.5, PM1, and BC without significantly changing the infiltration of pollutants and cause high PM1 content in exposure; exposure to particulates from wildfires can

Help Received

I received help from a professor at the University of the State of California, Fresno. He helped me gain access to and learn how to use the air pollution monitors in my project.