Particulate matter emissions from wildland fire smoke have been linked to a variety of acute human respiratory and cardiovascular health effects. In a project sponsored by the National Institute of Environmental Health Sciences, the Wildland Fire Particulate Emissions to Health Outcomes: A Case study from San Diego County, 2007

1. Introduction

Smoke concentrations were modeled using a combined emissions-transport model. The Wildfire Emissions Information System (WFEIS) combines burn area, fuel loading, and fuel moisture to predict PM emissions estimates (see French et al. 2014). The Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model was spatially aggregated to produce daily wildfire emissions concentrations by zip code and by sub-regional area. Air quality data from California Air Resources Board (CARB) were used to calibrate emissions model inputs.

4. Modeling Respiratory Health Outcomes in a Changing Climate

Using the trained GAM model (see part 3) we evaluated respiratory health impacts under a set of “what if” scenarios. Regional climate model predictions showed wildfire fire risk for the next 80 years to be similar to the present; San Diego County should experience approximately two extreme fire seasons each decade to 2040.

A part of the research presented was supported through grant #1-RC1-ES018612 from the National Institute of Environmental Health Sciences under the NIEHS Interagency Working Group on Climate Change and Health Initiative.

Connecting Smoke Exposure to Syndromic Surveillance

Respiratory Health Data

The smoke concentration maps for San Diego (see part 2) were used to determine smoke exposure and the impact of wildland fires on respiratory health. logistic function for temperature and relative humidity:

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\text{logit}(p) = \log \left( \frac{p}{1-p} \right) = \beta_0 + \beta_1 \text{day} + \beta_2 \text{temp} + \beta_3 \text{rh} + \epsilon
\]

where p is the probability of seeking a visit for respiratory illnesses.

Estimated Odds Effect

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NEXT STEPS: Relating Modeled Smoke Concentrations to Health Outcomes in Medi-Cal Populations

The exposure maps are now being applied to a different and richer dataset of Medi-Cal (California Medicaid) patients:

- to characterize the burden of large wildland fires on public health;
- for a population with concentrated vulnerability factors, including low-income, children, pregnant women, seniors, adults with disabilities, and persons with chronic diseases;
- assessing respiratory, cardiovascular, and other health outcomes in vulnerable populations;
- impacts to the public health care system in outpatient visits, emergency and urgent care visits, and hospitalizations.

To assure findings can inform public health practice:

- exposure is treated as a categorical variable, based on Air Quality Index thresholds developed by USEPA;
- total medical encounters are evaluated, as well as those related to respiratory and cardiovascular indices described previously (Delfino et al. 2009);
- comparison periods are based on matched-day-of-week selections within a close time period of the same summer (Hoshiko et al. 2010).


This study protocol was supported by California’s Department of Health Care Services Data and Research Committee and the California Public Health Research Institute.

MTRI: Michigan Technological University Research Institute

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