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Wildfire smoke impacts on children's health

California coastal wildfires burn in the sloping backcountry fanned by downslope offshore winds (Diablos in the North, Santa Anas in the South) with smoke blown towards the densely and diversely populated coast. Impacts of wildfire smoke on respiratory health, particularly on childrenâ€™s health, have been recently documented.

Aguilera, R., T. Corringham, A. Gershunov, S. Leibel and T. Benmarhnia, 2021: Fine Particles in Wildfire Smoke and Pediatric Respiratory Health in California. Pediatrics. In Press.

Aguilera, R., K. Hansen, A. Gershunov, S. Ilango, P. Sheridan, and T. Benmarhnia, 2020: Respiratory Hospitalizations and Wildfire Smoke: A spatio-temporal analysis of an extreme firestorm in San Diego County, California. Environmental Epidemiology, 4, doi: 10.1097/EE9.0000000000000114.

Leibel S., M. Nguyen, W. Brick, J. Parker, S. Ilango, R. Aguilera, A. Gershunov, T. Benmarhnia, 2020: Increase in Pediatric Respiratory Visits Associated With Santa Ana Wind-driven Wildfire and PM 2.5 levels in San Diego County. Annals of the American Thoracic Society, doi: 10.1513/AnnalsATS.201902-150OC.

Aguilera, R., A. Gershunov, S.D. Ilango, J. Guzman Morales and T. Benmarhnia, 2020: Santa Ana winds of Southern California impact PM2.5 with and without smoke from wildï¬□res. GeoHealth, 4, e2019GH000225. https://doi.org/10.1029/2019GH000225.

The following study presents the first evidence at the population level that wildfire smoke is more (up to ten times more) harmful to respiratory health than similar levels of fine particulate pollution (PM 2.5) from other sources.

Aguilera, R., T. Corringham, A. Gershunov and T. Benmarhnia, 2021: Wildfire smoke impacts respiratory health much more than fine particles from other sources: observational evidence from Southern California. Nature Communications. 12:1493, https://doi.org/10.1038/s41467-021-21708. https://rdcu.be/cggEV

Among major air pollution sources in California, wildfire smoke is the only one on the rise and expected to continue to increase with warming climate.

There is lots of synergy between smoke-health impact studies and energy applications. For example:

â€¢ Attenuation of solar radiation by smoke impacts ambient temperature. This hasnâ€™t yet been studied but was, for example, evident last September all over the

West Coast from Southern California to Washington State suggesting that besides reducing solar energy supply, the smoke reduced energy demand for cooling.
â€¢ Energy utilities are now shutting off power during Red Flag conditions to reduce the risk of powerline-related ignitions. However, this leaves many residents unable to run AC during potentially dangerous heat events caused by the same downslope winds that are a main ingredient in producing the Red Flag conditions.

Evidence that fall, winter and spring heat waves impact public health in coastal SoCal is provided in the following paper:

Schwarz L., B.J. Malig, J. Guzman Morales, K. Guirguis, A. Gershunov, R. Basu and T. Benmarhnia, 2020: The health burden of fall, winter and spring heat waves in Southern California and contribution of Santa Ana Winds. Environmental Research Letters. 15,054017.

These are primarily heat waves driven by the same Santa Ana winds that are responsible for spreading wildfire with smoke impacts on coastal residents. Ironically, efforts to reduce the risk of wildfire ignition may be increasing the risk of heat-health impacts.

None of these links between energy and public health connected via heat, wind, wildfire and smoke have been studied.

In particular, bringing together dynamical modeling and statistical techniques to model wildfire smoke and its impacts on temperature, energy and health, would result in useful real time prediction tools and effective early warning systems for air quality, health and energy applications.