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Future Wildfires and Flooding: Estimates of Increased Likelihood across the United States

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Will climate change increase the likelihood of wildfires and inland flooding across the United States? If so, how many people might be affected? Those are the questions posed by a new study in *Environmental Health Perspectives*, which estimates exposure to wildfire smoke and severe floods in 2050 and 2090 under moderate- and high-warming scenarios.[1]

The work, funded by the U.S. Environmental Protection Agency, used climate and population models to estimate future risk in terms of the number of people affected, assessed on a county-by-county level. The study did not, however, assess the public health burden of those exposures.[2,3]

"We understand the relationship between extreme events and human health outcomes, but we do not necessarily know the increased risk for the future," says Jesse Bell, the Claire M. Hubbard Professor of Health and Environment at the University of Nebraska Medical Center. "It is not about identifying the exact number of people who are going to die or get sick, but about the potential for more exposure and more risk. We need to understand how these risks are potentially changing with future climate change so that we can prepare and adapt." Bell was not affiliated with the study.

As of September 2018, atmospheric carbon dioxide levels were slightly above 405 ppm.[4] Preventing the global average temperature from increasing more than 2°C this century, relative to a preindustrial baseline, has emerged in recent years as a climate change benchmark.[5,6,7] To meet that goal, atmospheric carbon must remain below 550 ppm.

For the new paper, the researchers directly compared flood- and smoke-exposure projections between two climate scenarios: a "moderate" projected warming of approximately 2°C, and a "high" warming of 4°C, which corresponds with atmospheric carbon dioxide levels of roughly 940 ppm. They estimated that in both 2050 and 2090, an additional one-third of the country's population will live in areas affected by larger and more frequent inland flooding under the 4° versus 2° warming trajectory. "A warmer atmosphere can hold more water than a cooler atmosphere," says Cameron Wobus, a senior scientist with research firm Lynker Technologies, LLC, who modeled future flooding for the study. "As a result, every type of storm system can theoretically produce more precipitation and generate more flooding in a warmer world."

Modeling of wildfire smoke exposure was based on projected changes in vegetation cover combined with drought. The authors

In some areas, climate change will mean hotter, drier conditions—the perfect ingredients for a wildfire. Image: © lstimages/Shutterstock.

estimated that nearly 10 million more people will be exposed to smoke in 2090 under the high- versus moderate-warming scenario. This includes 1 million children aged 4 and younger, and 1.7 million people aged 65 and older. Both of these groups are considered particularly susceptible to the harmful impacts of smoke.[8]

These estimated risks are not distributed evenly across the country. For wildfire smoke, the authors predicted that exposure will be concentrated largely in the Southwest, due to greater fire frequency, and in the Northeast, as a function of population density. For extreme flood frequency, they predicted that the West and Southeast will see significant changes by 2090, particularly under the high-warming scenario. The data suggest that California in particular—and to a lesser extent, areas in the Northwest and southern Texas—may be hit hardest by flooding if emissions are not curtailed. The authors noted that many people are likely to experience multiple disasters.

Alexandra Jurgilevich, a doctoral candidate at the University of Helsinki who coauthored a systematic review of 42 climate risk and vulnerability assessments,[9] praises the authors for including the dynamics of exposure and risk across the population instead of projecting isolated hazard impacts, which is a more common approach. Jurgilevich, who was not affiliated with the research, also suggests that including other population growth scenarios in addition to the median projection might have made the findings more robust and usable in terms of adaptation and planning.

As such, the study could serve as a jumping-off point for other researchers and, Bell suggests, as a practical resource for cities, counties, and states nationwide in emergency response and health care preparedness. "Public health departments across the country are already looking at climate change," he says. "Studies like this can feed into public health departments and help them develop plans and understand what potential impacts will look like."

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