



## The Climate Crisis and Covid-19 — A Major Threat to the Pandemic Response

Renee N. Salas, M.D., M.P.H., James M. Shultz, Ph.D., and Caren G. Solomon, M.D., M.P.H.

**J**ust as an active 2020 Atlantic hurricane season is getting under way, the entire U.S. hurricane coast, from Texas to the Carolinas, is witnessing explosive outbreaks of Covid-19 cases in communities

where physical distancing restrictions have been eased. As an early wake-up call, Tropical Storm Cristobal made landfall in Louisiana on June 7, triggering coastal evacuation orders and a federal emergency declaration. Concurrently, temperatures continue to set records throughout the southern United States, while Arizona has been battling multiple historic wildfires that are also requiring communities to evacuate their homes. All this as summer had just begun.

These events suggest that the United States will increasingly face complex, challenging scenarios, given the confluence of our two most pressing global health threats — the rapid emergence of the Covid-19 pandemic and the

insidiously evolving climate crisis. Both these crises disproportionately harm the health of vulnerable and economically disadvantaged people, including those affected by structural racism. Understanding the challenges posed by this conjunction is essential if we are to devise effective and equitable strategies to protect and improve health. Attention must be directed toward key pathways through which the climate crisis threatens efforts to contain SARS-CoV-2 transmission and improve Covid-19 outcomes, which include difficulty maintaining physical distancing, exacerbation of coexisting conditions, and disruption of health care services.

The intensity, frequency, and duration of climate-related ex-

treme events — including hurricanes, wildfires, floods, heat waves, and droughts — are increasing, and these events often overlap temporally and geographically,<sup>1</sup> jeopardizing SARS-CoV-2 infection control. Both the Atlantic hurricane and western wildfire seasons are predicted to be worse than average in 2020. But proven standard disaster mitigation strategies — mass sheltering and population evacuation — increase the risk of viral transmission by moving large groups of people and gathering them close together. For example, evacuation orders were issued for more than 1 million people during Hurricane Florence in 2018. Covid-19 health risks are even greater when weather events are more intense, since widespread catastrophic damage results in mass displacement, which risks introducing the virus into new locales and clustering vulnerable survivors together in temporary accommodations.

No other year in recorded history has been as hot as the years between 2014 and 2019, and 2020 has a high likelihood of being the hottest year ever. Despite the hypothesis that higher temperatures and humidity might reduce SARS-CoV-2 transmission, Covid-19 cases are increasing rapidly throughout warm southern states, confirming expert predictions.<sup>2</sup> Extreme heat poses additional challenges to Covid-19 mitigation efforts. For example, wearing a face mask, especially an N95, is uncomfortable in high heat and humidity and may exacerbate risks for heat-related illnesses<sup>3</sup>; conversely, not wearing a mask increases the likelihood of spreading Covid-19. During heat waves, cooler indoor venues, including designated cooling centers, may become crowded with residents from households lacking air conditioning or facing heat-related electrical blackouts.

Cardiovascular and chronic pulmonary disease — recognized risk factors for severe Covid-19 — are closely linked to climate change, through effects including extreme heat, ground-level ozone, wildfire smoke, and increased pollen counts over longer seasons.<sup>4</sup> Moreover, fine particulate matter air pollution — linked to combustion of fossil fuels — increases the prevalence of both conditions. Marginalized groups are at higher risk than others for exposure to high levels of air pollution and associated chronic illnesses, as well as for Covid-19–related illness and death. Recent unpublished data have suggested direct associations between long-term exposure to particulate air pollution and risk of Covid-19–associated death.<sup>5</sup>

Climate change also complicates the ability of patients with

Covid-19 to gain access to and receive the best available health care services. Heat waves and climate-related disasters may generate a surge of “climate casualties” seeking care in facilities already filled with Covid-19 patients.<sup>4</sup> Conversely, health care access for these patients may be acutely compromised in the aftermath of climate-driven extreme events, owing to physical damage to facilities, power outages, supply-chain disruptions, and depletion of staff — leading to cascading disruptions of services.

Our responses in the United States to climate change over recent years and to the Covid-19 pandemic over recent months have been inadequate and dangerous, disproportionately harming the most vulnerable communities. Both responses have been characterized by delayed and disjointed government action, denigration of scientific evidence, distortion of truth, withdrawal from critical global alliances, and reliance on antiquated public health infrastructure and fragile health care systems. To effectively manage both crises, we need an integrated response, firmly grounded in science, that values health as a fundamental right for all. As we collectively reimagine an equitable, all-hazards-responsive health infrastructure, we will need to take concrete actions focused on the key intersections between climate change and the Covid-19 pandemic.

In the short term, to minimize the transmission of SARS-CoV-2 during climate-intensified extreme weather events, standard sheltering, evacuation, and related strategies will have to be modified (see box). Long-term actions, with implications for future re-

siliency, include prioritizing federal and state funding for mitigation plans to prepare for a future of climate-driven intensification of extreme weather and superimposed events, using an approach that takes all hazards into account.

During extreme-heat events, interventions are needed to ensure that the people who are most susceptible to both heat-related illness and severe Covid-19 disease can either remain at home safely or have safe cooling options. More sustained approaches include alterations in the built environment (e.g., expanding green space, making more roofs white) and community outreach programs for the most vulnerable.

Ongoing adaptations and transformations in health care delivery, prompted by the Covid-19 pandemic, can also be effectively applied to climate-driven extreme events. In particular, the expansion of telemedicine — in areas where computer or phone service is intact — and the use of community paramedicine services can improve our ability to address medical and psychological needs, and minimize SARS-CoV-2 exposure, for people who cannot readily obtain care. Investments in strengthening our health care infrastructure and delivery systems, such as supply chains, are also essential to ensuring resiliency during pandemic or climate shocks.

Though evidence-based guidance from federal agencies is important and would be welcome, implementation of strategies at the state and local levels requires capacity, coordination, and attention to subnational needs. Given that states were forced to reprioritize budget allocations because of the pandemic, facing the chal-

### Short-Term Strategies for Managing Climate-Related Extreme Events during the Covid-19 Pandemic.

#### Extreme events (e.g., hurricanes, wildfires): evacuation and sheltering

Communicate clearly to the public that the Covid-19 pandemic does not change the imperative to evacuate, given the substantial risks of remaining in place during extreme climate-driven hazards.

Use existing community pandemic-communication channels to disseminate critical information.

Increase the number of available shelter sites, with lower occupancy per site, more separated spaces within sites, and more space per shelter resident (e.g., using smaller “noncongregate shelters,” hotels).

Use standard shelter-registration information (name, contact phone number) for all persons entering, to facilitate contact tracing in case Covid-19 is diagnosed in persons who used the shelter.

Implement shelter protocols for infection control, including daily symptom checks, isolation of symptomatic persons, mandatory wearing of face masks, ample supplies of hand sanitizer, hand-washing stations, and meals provided in disposable containers.

Adapt guidance for minimizing Covid-19 viral transmission in mass care settings for use with in-home sheltering — because many evacuees shelter with family and friends.

#### Extreme heat: remaining at home and cooling locations

Provide electricity subsidies and extend moratoriums to prevent electricity and water shutoffs for people with pandemic-related unemployment and economic hardships to allow them to remain in their homes.

Ensure effective alternatives to minimize heat exposure if designated cooling centers or popular indoor, air-conditioned venues are closed.

Ensure that cooling centers follow guidelines similar to best-practice guidelines noted above.

Minimize transmission risks by limiting occupancy and providing or requiring masks and hand sanitizer in air-conditioned venues open to the public, such as malls or movie theaters.

Use phone text messages, as used for pandemic communication, for heat-health notifications.

Challenges ahead will require coordinated federal policy and dedicated funding.

In recent months, the increasing worldwide attention to the urgency of addressing climate change has been sidelined by the pandemic and the critically needed reckoning on racial inequity. Yet the interconnectedness of these challenges underscores the need for integrated policy initiatives. As emphasized in a letter from 40 million health professionals to G20 leaders, governments must prioritize investments in health,

clean air and water, and a stable climate in stimulus packages for recovering from the Covid-19 pandemic.

Reductions in greenhouse-gas emissions and air pollution that were observed while globally applied lockdown measures were in force to slow the spread of Covid-19 are proving to be temporary. Interventions to create sustained reductions in the use of fossil fuels can reduce the risks for multiple medical conditions — especially in vulnerable communities — by improving air qual-

ity and limiting the downstream health harms of the climate crisis.

Until the development and mass deployment of a safe and effective vaccine enables the United States to move past the Covid-19 pandemic, the climate crisis will challenge our pandemic responses; beyond the pandemic, the climate crisis will continue to pose existential risks. It is past time to implement robust and equitable responses to both.

Disclosure forms provided by the authors are available at NEJM.org.

From the Department of Emergency Medicine, Massachusetts General Hospital, Harvard Medical School, and the Center for Climate, Health, and the Global Environment, Harvard T.H. Chan School of Public Health, Boston (R.N.S.), and the Harvard Global Health Institute, Cambridge (R.N.S.) — all in Massachusetts; and the Center for Disaster and Extreme Event Preparedness, University of Miami Miller School of Medicine, Miami (J.M.S.).

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1. Zscheischler J, Westra S, van den Hurk BJJM, et al. Future climate risk from compound events. *Nat Clim Chang* 2018;8:469-77.
2. Baker RE, Wenchang Y, Vecchi GA, Metcalf CJ, Grenfell BT. Susceptible supply limits the role of climate in the early SARS-CoV-2 pandemic. *Science* 2020 May 18 (Epub ahead of print).
3. Li Y, Tokura H, Guo YP, et al. Effects of wearing N95 and surgical facemasks on heart rate, thermal stress and subjective sensations. *Int Arch Occup Environ Health* 2005; 78:501-9.
4. Salas RN, Solomon CG. The climate crisis — health and care delivery. *N Engl J Med* 2019;381(8):e13.
5. Wu X, Nethery RC, Sabath BM, Braun D, Dominici F. Exposure to air pollution and COVID-19 mortality in the United States: a nationwide cross-sectional study. April 5, 2020 (<https://www.medrxiv.org/content/10.1101/2020.04.05.20054502v2>). preprint.

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