

Identifying and Preparing for the Mental Health Burden of Climate Change

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Climate change poses an unprecedented threat to human health.¹ Among the myriad likely human impacts of climate change, the potential for environmental stressors to undermine global mental health and emotional well-being is one of the most considerable. Relative to other topics, however, it is also one of the impacts that thus far has been understudied.¹

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Much of the literature related to climate change and mental health draws on previous bodies of work from clinical psychiatry and clinical psychology that show the direct toll of exposure to environmental stressors² on mental well-being and examines what these relationships can tell us about the risk of future climatic changes.³ And most empirical studies that do exist focus on data from local or regional contexts. Relatively few national—and even fewer global—investigations of the potential of climate change to impact mental health exist.

It is this relative gap in empirical knowledge that Nori-Sarma and coauthors⁴ aid in filling in this issue of *JAMA Psychiatry*. Their study provides to our knowledge the first US national clinical evidence that higher warm-season temperatures are associated with elevated risk of emergency department visits for any mental health condition and specific mental health conditions. The authors uncover a positive and increasing correlation between extreme heat and emergency department visits for substance use disorders; anxiety, stress-related, and somatoform disorders; mood disorders; schizophrenia, schizotypal, and delusional disorders; self-harm; and childhood-onset behavioral disorders.

There is much to like about the study by Nori-Sarma et al. The authors marshal novel large-scale, high-resolution, detailed data on specific daily mental health outcomes across the US over nearly a decade to investigate their relationship of interest. They break out their analysis by clinical diagnosis, which provides added insight into the disorders most related to heat stress. They also investigate heterogeneous implications of heat on mental health by demographic characteristics and by region. Such individual heterogeneity can provide direct insight into which populations may most need clinical assistance in response to acute environmental stress. All of these analyses represent best practices and illuminate important areas for future investigation.

Some of the limitations of the study we would like to highlight—which the authors note in their article—include a focus on only the hotter side of the temperature distribution in analysis, the inability of their data to capture subclinical mental health problems, certain causal inferential challenges associated with specific modeling choices made in their work, and

the difficulty of identifying the psychosocial and biological mechanisms that underpin the association they uncover.

First, we highlight the authors' focus on the hot side of the temperature distribution to make a more general point: this is an all-too-common—and we believe problematic—practice in the context of social climate impact studies, particularly in the realm of health (we ourselves have engaged in this practice¹). Although scientists should absolutely want to understand the association between mental health outcomes and heat stress, they should also equally desire to understand the relationship between cold temperatures and mental health.^{5,6} Researchers should consider the full distribution of temperature—and a full suite of other potentially confounding meteorological variables—in their analyses. After all, understanding the net effect of temperature change across the shifting distribution of temperature (climate change will produce warming across all seasons) is of great importance to understanding the consequences of climate change for mental health in the future.

Second, the data used by Nori-Sarma et al, though excellent, highlight an extant challenge in the empirical work on mental health and climate change: sound mental health represents a construct that extends far beyond clinical diagnoses.⁷ Understanding the full potential burden of climate change on human mental health means not only looking at extreme clinical outcomes, such as hospital admissions or suicides, but also creating ever-better measures of subclinical mental health statuses. Although some work has been done on day-to-day emotional states⁶ and self-reported mental health status,⁵ the frontier in such empirical work remains understanding what climatic stressors do to the mental health of the large percentage of the population that will rarely show up in clinical or hospital settings.

Third, markedly wide variance exists in the climate change and health literature with regard to modeling choices and statistical methods in existing work. Econometricians who have focused on the economic outcomes associated with climate change have developed detailed models and best practices^{8,9} regarding inference from climatic variables. Working to better standardize and harmonize statistical methodologic approaches across climate econometrics and climate epidemiology would be a useful advance and would enable better collaboration across disciplinary backgrounds.

Fourth, the potential causal mechanisms that link climatic stressors to mental health outcomes are notoriously difficult to statistically identify,⁹ though they are nonetheless vital to understand with respect to the development of potential interventions.⁷ If the association between extreme heat and

mental health emergency department visits is indeed caused by sleep disruptions,¹⁰ as Nori-Sarma et al suggest, policy interventions might target sleep quality. If, instead, the impacts run through a more direct physiological mechanism, interventions that target sleep may be misplaced. Work that tries to more carefully document such mechanisms is vital going forward.

Ultimately, the findings by Nori-Sarma et al correspond to—and extend—findings from past research¹¹ into heat and mental health hospitalizations across smaller geographic regions.¹² Furthermore, these findings correspond to empirical associations uncovered between heat and expressed emotional states,^{1,6} self-reported mental health status,⁵ and more extreme outcomes such as suicide.¹³ This added evidence advances the conclusion that hot temperatures are associated with worse human mental health and psychological well-being across the full observed distribution of severity, from subtle and day to day to life altering in nature. Their study represents a useful addition to the empirical literature that documents how climatic stressors might alter mental health outcomes. Such empirical impact studies tell us there is indeed a mental health threat posed by climate change. And—when done well—such studies can identify populations and periods of risk.

Yet, arguably, one of the most important questions regarding climate change and mental health remains one of the least researched. What types of clinical interventions and preven-

tative measures can reduce the mental health burdens associated with climate change? The development of interventions to interrupt the association between climatic stress and poor mental health quality is as critical as it is nascent. Scientists and clinicians are still in the early stages of identifying the precise nature of the potential risks. They are even earlier in developing solutions that respond to the empirical risks identified.

More work is certainly needed on both the impacts science and the interventions science. Who will be harmed most by climatic changes, when, and where? What do the subclinical impacts of environmental stress look like across additional measures of mental health quality? And—most critically—how can scientists and clinicians help those facing the greatest risks effectively cope with the future environmental disasters they will face? Given the limited mental health resources allocated across the globe, what are the best ways to build psychological resilience—in advance—to the inevitable climatic changes the earth will face?

Thus far the collective scientific and clinical knowledge is sparse relative to the specter of the coming threat climate change poses to human mental health. Ever-more mental health scientists and clinicians are needed to work on this topic. It is not overwrought to say it: humanity needs your help. As bad as certain climatic stressors already are, this truly is just the beginning.

ARTICLE INFORMATION

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