Rainfall & Storms, Climate Change and Health

Climate change is altering precipitation patterns worldwide, and increasing the frequency of severe storms and flooding. Some areas are already experiencing "wetter wets" in the form of increased average rainfall, and more frequent and severe rainstorms and blizzards. From urban flooding to indoor mold to mudslides, this excess precipitation has negative impacts on health. In this brief we focus on the impacts of climate change and precipitation in California and the U.S.

Extreme precipitation impacts health in a variety of ways

- Severe storms result in injury and death due to trauma or drowning.
    - In 2012, SuperStorm Sandy caused the death of at least 177 individuals on the Eastern U.S. seaboard alone,[1] and damaged or destroyed more than 650,000 housing units in New York and New Jersey.
- Extreme weather causes disruption of medical care, particularly for those with chronic illness.
    - An estimated 40%-70% of those affected by Hurricane Katrina had a chronic illness, for which medication management was a key challenge during the days and weeks after the event.[2]
    - Two major hospitals had to be evacuated during SuperStorm Sandy, and the storm caused loss of significant bed capacity. A year after Sandy, several hospitals were still struggling to return to normal.
- Critical infrastructure is disrupted, including electricity, sanitation & water treatment, food refrigeration, health care, communications systems and transportation.[3]
    - After Hurricane Katrina, 20% of homes lacked water and 25% lacked electricity.
- Indoor air quality declines, as excess moisture from rainfall and flooding often results in increased mold production in the months after an extreme event.[4]
- Infectious disease risks increase, particularly with exposure to water-borne pathogens as sewage or water treatment systems overflow, or due to skin wounds and fungal infections.[5]
    - Diarrheal illness, acute respiratory illness, and skin infections have all been reported post-disasters.[6]
- Exposure to toxic chemicals increases, due to overflowing of toxic waste sites or chemical storage facilities.[7]
- Vector-borne disease: Floods and hurricanes are frequently followed by a proliferation of mosquitos, possibly increasing the risk of vector-borne illnesses particularly in warmer climates.[8]

FAST FACT:

Damage from severe storms and flooding has caused California to declare a disaster area six times since 2000.

DID YOU KNOW?

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- Displacement rises due to property loss.
    - An estimated 1.5 million fled their homes after Hurricane Katrina, and some estimate that hundreds of thousands of them were never able to return to their homes.[9]
- Mental health impacts
    - Flooding has been associated with post-traumatic stress disorder, anxiety, depression and other mental health problems.[10]
    - After Katrina, 47.7% of the adult population was classified as having PTSD symptoms and the prevalence of moderate-to-serious mental illness rose from 23.5% to 37.5% before and after the disaster, respectively.[11]

Climate change increases the risk of extreme storms and flooding in California

Although California is in the midst of an historic four-year drought, climate change is also causing increased rainfall, storms and flooding in some areas. As the atmosphere warms, it holds more water vapor, leading to heavier downpours.

- Scientists estimate that California will experience an almost 30% increase in extreme precipitation (rain or snow) days by the end of the century, as more "atmospheric rivers" reach the state.[12]

Climate change, extreme precipitation and health equity

Social and economic inequities, as well as individual characteristics, place some individuals and communities at greater risk than others for the effects of flooding and storms from climate change:

- **Failing public infrastructure:** Lack of investment in secure transportation or protective barriers, such as the levees in New Orleans during Hurricane Katrina, leaves residents vulnerable to flooding and poses barriers for evacuation. Inadequate or failing water treatment and sewage systems increase the risk of contamination after floods and storms.
- **Substandard housing:** Poor housing quality and ventilation increase the risk of indoor air pollution and mold from excess moisture. Lack of window and door screens exposes families to mosquitoes carrying vector-borne diseases.
- **Poverty:** Low-income or lack of financial resources make it difficult to absorb the impacts of extreme storms and flooding, resulting in displacement.
    - Low-income communities are disproportionately underinsured for extreme weather events and often lack access to emergency credit to recuperate from property loss. As climate change increases the frequency and severity of extreme weather events, insurance prices will rise and continue to move further out of reach for low-income individuals and communities.[13]
- **The Digital Divide:** Inequities in access and quality of information systems (including the Internet) as well as cultural and linguistic services, create a disadvantage for low-income communities non-English language speakers to prepare for extreme weather events.

FAST FACT:

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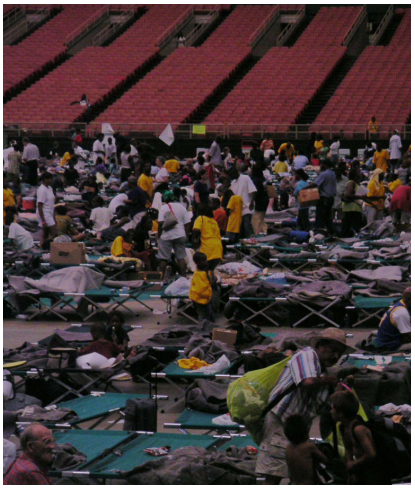

- **Chronic illness:** Individuals with asthma or other respiratory conditions are more vulnerable to indoor air pollution and mold that results from excess moisture or flooding.
- **Cognitive or physical impairments** impede safe evacuation during extreme storms or flooding.

What can physicians do to address the health impacts of extreme rainfall and storms due to climate change?

- Talk with patients about the health risks of extreme precipitation, floods and storms and how to stay safe and healthy.
    - Encourage individuals and families to create emergency response plans to be prepared in the event of flooding or extreme storms.
    - Advise families on food and water safety during and after floods and storms.
    - Educate individuals on the risks and symptoms of indoor mold exposure. Before a flooding event, provide information — especially to patients with asthma or other respiratory conditions — about where to get help with home clean-up and rehabilitation to prevent mold exposure.
    - Educate individuals on the increased risk of vector-borne disease following extreme rainfall advise them to make sure they do not leave standing water in their yards, and on protective measures. See Climate Change, Infectious Disease and Health.
    - Encourage patients and families to follow emergency communications in the event of anticipated extreme storms or flooding.
- Educate your colleagues and community on the links between climate change, extreme precipitation, and health, and what can be done to prevent negative health impacts.
- Work with your colleagues and hospital and clinic administrators to assess health care facility vulnerability to extreme weather events, and to develop and implement a plan to make sure that your facilities can remain operational during an extreme event.
- Promote mitigation and adaptation strategies related to climate change and extreme rainfall and storms.
    - Advocate for green infrastructure to reduce the risks of flooding.
    - Strengthen vulnerable public infrastructure in flood or storm-prone areas, including levees, water treatment and sewage facilities, transportation routes and power grids.
    - Advocate for stronger emergency response systems and resources for the most vulnerable communities, including closing the digital and communications divide.

- Support policies and programs in your community and in your health system that authentically engage and partner with community residents in addressing climate and health problems including the social and economic inequities that influence health and social outcomes after extreme storms and floods.
    - Promote access to disaster insurance for low-income communities, and allocation of disaster relief and assistance targeted to those communities.
    - Support funding for programs that assist low-income renters and homeowners in rehabilitation to prevent mold, and other protective measures such as screening on houses.
    - Advocate for targeted investments in low-income communities with aging infrastructure.

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For More Information

- CDC Flood information: http://emergency.cdc.gov/disasters/floods/index.asp
    - Preparedness: http://emergency.cdc.gov/disasters/floods/readiness.asp
    - Returning home: http://emergency.cdc.gov/disasters/floods/after.asp
    - Cleanup: http://emergency.cdc.gov/disasters/floods/cleanupwater.asp
- FDA Food and Water Safety during floods
    - English: http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm076881.htm
    - Spanish: http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm076935.htm

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Citations

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Center for Climate Change & Health

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