# ADAPTING TO

# CLIMATE CHANGE

The healthcare system is on the frontline of coping with illnesses caused by climate change. Yet, ironically, the system itself is a major contributor to the crisis.

**BY CHERYL ENGLAND**

**WHEN HURRICANE** Maria hit Puerto Rico in December 2017, she caused thousands of deaths and $91.8 billion in damage. But because Puerto Rico supplies 44% of the IV fluid for the United States, she also caused months-long shortages at hospitals across the country when the factory of a leading IV fluid producer was damaged. "We were rationing IV fluid," says Renee Salas, MD, MPH, MS, an emergency medicine physician at Massachusetts General Hospital and Harvard Medical School. "If people came in with symptoms of vomiting and diarrhea but did not meet certain other criteria, we gave them Gatorade."

"Those patients would look at me with dismay," she continues. "But we used it as an opportunity to educate our patients about climate change and how everything is interconnected. Once they saw the bigger picture, it brought the issue home for them."

**"There is a growing recognition among the healthcare community about the intersection between climate change and human health."**

## Making It Personal

Seventy-one percent of Americans say climate change is a reality, while only 9% say it is not; 19% are unsure, according to a November 2018 poll from the Energy Policy Institute at the University of Chicago and the AP-NORC Center for Public Affairs. Yet, ironically, only 49% of people say that climate change will harm them personally, according to a January 22 poll from Yale and George Mason University. "There's a disconnect," says Dr. Salas. "Most people don't feel climate change personally—even when it is directly impacting them."

Yet, as temperatures rise—annual average temperature across the contiguous U.S. has increased by 1.2°F from 1986 to 2016, according to the U.S. Global Change Research Program's "Climate Science Special Report,"—physicians are seeing longer allergy seasons, more tick- and mosquito-borne diseases and more heat-related illnesses among other conditions. Extreme weather events such as floods, hurricanes and wildfires are also becoming more frequent. Over the last 50 years, much of the U.S. has seen increases in prolonged periods of excessively high temperatures, heavy downpours, and in some regions, severe floods and droughts, according to the National Climate Assessment.

Peter Orris, MD, chief of occupational and environmental medicine at the University of Illinois Hospital and Health Sciences System, agrees. "In Chicagoland we are already seeing a changing picture of disease," he says. "We are seeing more traumatic injuries related to severe storms. There's more precipitation, and more extremes of heat and cold. Diseases that we already see, such as allergies or fungal conditions, are becoming more frequently diagnosed in more patients and are becoming more severe."

The "2018 Lancet Countdown on Health and Climate Change Brief for the United States of America" discusses the connection between climate change and human health and the impact on healthcare systems in the future. Dr. Salas, who is a also Burke fellow and affiliated faculty member at the Harvard Global Health Institute, was the lead author for the U.S. brief, which was sponsored by the American Public Health Association and released on November 28, 2018.

"There is a growing recognition among the healthcare community about the intersection between climate change and human health," Dr. Salas says. "We've been making strides but there

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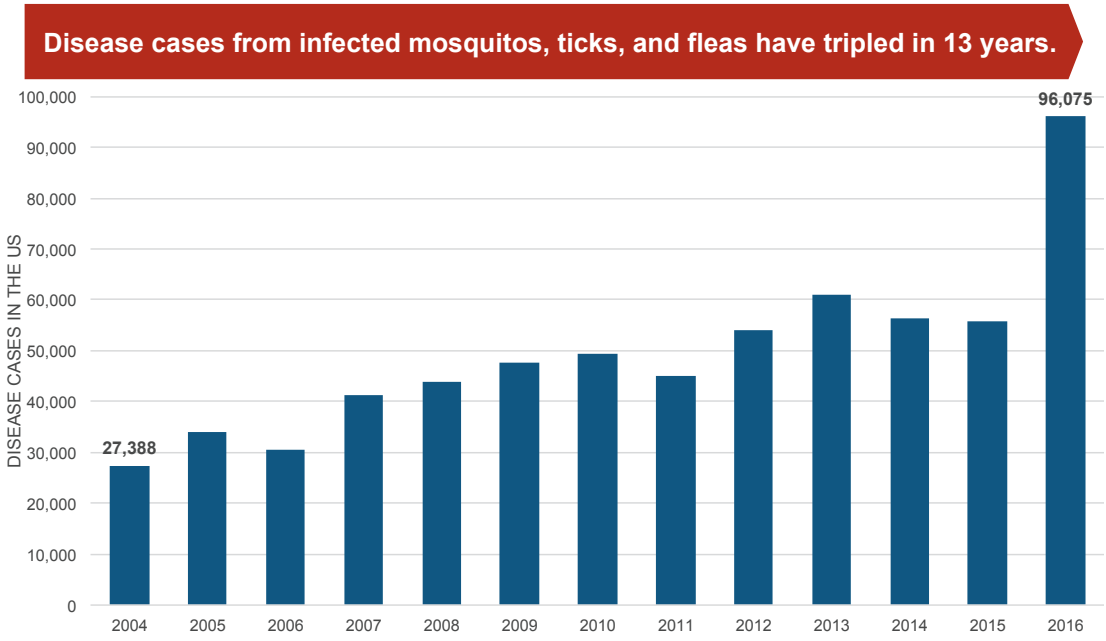


*Figure Source: Center for Disease Control and Prevention, 2018.*

is a significant way to go. The U.S. is the second largest carbon emitter from fossil fuels so we have a special obligation to minimize our impact, especially since the health impacts disproportionately affect people in developing countries."

The U.S. brief is drawn from a larger report, "The Lancet Countdown on Health and Climate Change: From 25 Years of Inaction to a Global Transformation for Public Health." Twenty-seven academic institutions, a collection of intergovernmental agencies, and the United Nations contributed to the global report.

## A Major New Report

The U.S. Lancet Countdown brief outlines three main ways in which a warming world will affect the health of Americans. For one, the higher heat and the increased intensity and duration of heat waves will make people sick, along with exacerbating existing conditions and reducing the productivity of workers, especially those in outdoor occupations such as farmers and construction workers. Second, the rising severity and frequency of extreme weather events will elevate threats to health, as well as threats to health systems that are not currently well-equipped to deal with these types of weather-related emergencies. Third, warmer seasons and warmer water mean the range for illnesses carried by ticks, mosquitoes and fleas will expand, exposing more Americans to diseases such as Lyme disease, West Nile, and possibly even Zika.

The report points to evidence already indicating links between hotter temperatures and mental-health and cognitive issues; increases in kidney diseases, preterm births, and respiratory diseases; heat exhaustion; and the advance of antibiotic-resistant bacteria. One estimate cited in the report finds that more than 3,000 additional people across the country will die prematurely because of higher temperatures by 2050. The report also cites data from the National Oceanic and Atmospheric Administration showing that there has been a steady rise in billion-dollar weather and climate disasters in the U.S. since 1980.

While the report focuses heavily on increasing heat, Dr. Salas points out that she and her co-authors are not overlooking threats from climate changes such as extreme cold (Polar Vortex) Chicago experienced this past winter, floods or wildfires. "We focus on heat for a few reasons," she says. "The Brief is an offshoot of a global report. Heat is a unifying climate exposure that nearly all people can understand. Not everyone has experienced a wildfire. We wanted to match people's personal experiences with this report since one of our main goals is to use the information to help shape policy and to engage the public."

While the report paints a grim portrait of the effect of climate change on healthcare, it does, fortunately, offer a list of recommendations to improve health and save lives. The list includes:

- Committing federal and state funds for improved preparations that will reduce the burden of disease from climate change.
- Creating robust U.S.-based climate and health research and education funding mechanisms.
- Creating local, regional, and state-level policies, combined with renewed federal leadership, to begin transitioning to renewable clean energy and reducing GHG emissions.
- Advocating for state laws that transition away from fossil fuels.
- Dedicating federal and state funding for climate change preparation to improve emergency preparedness, supply chain resilience, and protect vulnerable communities.
- Integrating climate change and health into U.S. health professional curricula.

Dr. Salas also notes that because physicians, especially primary care doctors, are among the most trusted sources among the lay public for information on health and climate change, they have a platform for creating a unified voice and educating their patients. "Physicians have the perfect chance to engage with their patients on the topic," she says. "For example, if a person presents with asthma in the spring, the physician could explain that climate change is creating higher pollen levels so that patient should, say, always check pollen levels before going for a run."

## Contributing to the Crisis

Ironically, while healthcare professionals are on the frontlines for taking care of the increasing health problems related to climate change, the healthcare profession itself is a major contributor to the crisis. How major? The Fourth National Climate Assessment (NCA) Report from the U.S. Global Change Research Program noted that the healthcare sector accounts for 10% of total U.S. greenhouse gas emissions. The environmental footprint of a hospital is vast, including the energy used to power emergency departments and inpatient rooms 24/7 and keep temperatures steady throughout the hospital. Large amounts of electricity are needed to heat water, procure and prepare food, and treat and dispose of waste.

One prominent group, Health Care Without Harm (HCWH), is working hard to greatly reduce the greenhouse gas emissions created by hospitals and health systems worldwide as well as help them prepare for the impact of climate change both now and in the future. "One of our key missions," says Sarah Spengeman, PhD, associate director of the Climate and Health Program for HCWH in the U.S. and Canada, "is to mitigate the effects of climate change by reducing the carbon footprint of hospitals and health systems. In the U.S., the industry is 18% of the GDP so we have the purchasing power to

**"The healthcare sector accounts for 10% of the total United States greenhouse gas emissions."**

push the market and the economy to clean energy."

HCWH has a solid track record to back up its aggressive goals. Dr. Orris, of UI Health, was one of the founders of the group when it started in 1996. "First we focused on dioxin emissions created by medical waste incinerators," he says. "At the time we had about 4,500 of these incinerators in the U.S.—now we have none."

The group has subsequently focused on initiatives such as eliminating the market for mercury thermometers in the U.S., environmentally preferable purchasing, and phasing out PVC medical devices among many others—all of which have made impressive progress. "The strategy for our initiatives is to get the healthcare industry as a whole to change their behavior in order to become models for the rest of the country," says Dr. Orris. "It's similar to the 60s when physicians and nurses stopped smoking."

Personally, Dr. Orris is actively involved in the "greening" of UI Health. "Effective changes have to be an institutional kind of thing," he says. "We have a Green Team with assigned staff from the hospital C-Suite and representation from each department to come up with practical solutions." Many of those solutions are quite simple and often end up saving the university money or benefitting its healthcare professionals. For example, the system is switching from fluorescent lights to LED lights and has plans to add switches that automatically turn off lights when no one is in a room. The group has also begun tailoring cafeteria menus for less food waste. "We also distribute excess food where it is needed," says Dr. Orris. "That's not only to food pantries in the community but also to our students—we discovered that many of our international and low-income students were food insecure."

**"In 2018, anesthesiology providers at Advocate Aurora reduced greenhouse gas emissions from waste gases by the equivalent of 6.8 million miles of driving."**

## Innovative Initiatives

For Advocate Aurora Health, sustainability has been a decades-long journey. "We've had passionate clinicians doing grassroots work at many hospitals for many years," says Katie Wickman, MS, RN, CIC, sustainability manager for environmental affairs and sustainability. "And at the corporate level we've had many discussions about who we want to be in terms of environmental stewardship. We realize that you can't have healthy people with an unhealthy earth."

The healthcare system has set a goal of powering its operations with 100% renewable electricity by 2030. Statistics provided by Advocate Aurora claim that will mean the reduction of annual carbon dioxide emissions by 392,657 tons, which is the equivalent of removing over 84,000 passenger cars from the road each year. "We started with the basics of energy and waste reduction," says Wickman. "Once you have a strong foundation, you can work on new things."

And they are off to a good start. In its Illinois facilities, Advocate Aurora has had an energy use reduction of 23% from 2008-2015. In 2017 alone, the system had a 2.9% energy consumption reduction, avoided 3,360 metric tons of carbon dioxide and saved $1.1 million, which was reinvested in their healing ministry. Waste savings included 82% of construction waste recycled and $2.1 million saved by reprocessing medical devices. The system even had wellness outcomes such as encouraging 91% of its workforce to become smoke-free.

But probably one of the most innovative initiatives that marks the system's passion for environmental stewardship is a simple tweak it did last year within its anesthesiology group. "Anesthesiology produces extremely potent greenhouse gases," says Wickman. "The practice of anesthesiology is choosing an agent and then choosing a speed at which to deliver it. Slower speeds produce less waste gas. Depending on the patient, a physician can deliver a different agent at a slower speed and get the same effects."

The group provided education and guidelines for the anesthesiologists and then left the clinical choice up to them. The result? In 2018, anesthesiology providers at Advocate Aurora reduced the greenhouse gas emissions from waste anesthetic gases by the equivalent of 6.8 million miles of driving (2,811 MtCO2e), while at the same time saving the organization over $520,000.

## Reducing Hospital Use

Ted Shieh, MD, FACEP, an emergency medicine physician at the DuPage Medical Group and a consultant to HCWH, takes a different approach to mitigating the effects of climate change in healthcare systems. At DuPage, one of the environmentally friendly areas he focuses on is reducing the number of patients who have to be in the hospital for care. "Healthcare systems and hospitals are incredibly energy consuming, yet we continue to build more of them to meet the increase in demand," he says. "So how can we deliver the same quality of acute care with fewer resources? One way is to focus on outpatient acute care instead of the ER."

"Eight years ago when I worked in the ED, I was looking at what we were doing," he continues. "I approached the hospital CEO with the idea that we needed outpatient acute care for non-critical patients. He looked at me like I was from Mars!"

Now, however, the DuPage Medical Group is extremely interested in sustainable healthcare—and one of those initiatives has been to create very intensive and collaborative outpatient centers. The DuPage Medical Group Immediate Care Centers are staffed by emergency physicians, have their own diagnostic imaging and labs, rapid access to multiple specialties, and are designed to deliver complex acute care. DuPage Medical Group Immediate Care started with a single clinic in 2012 and now has nine sites. "Most urgent care facilities are independent and do not have hospital-like

# Chicago by the Numbers

**THE CITY OF CHICAGO,** with a population of 2.7 million people, is the financial, industrial and cultural capital of the Midwest. While that fact makes Chicagoans proud, they may be less proud to know that Chicago is responsible for roughly 34.6 million metric tons of heat-trapping (greenhouse) gases, in CO2-equivalent terms, according to "Climate Change and Chicago," a 2008 report. Adding in the six surrounding counties in the Chicago area increases this to about 103 million metric tons per year. This region accounts for nearly half the total emissions of the state of Illinois, with emissions greater than the state totals of more than 30 individual states.

According to the report, Chicago's temperatures have risen by 2.6°F since 1980. Winters have warmed by almost 4°F since then as well. Winter ice coverage on Lake Michigan has decreased, several major heat waves—particularly those in 1995 and 1999—have occurred and the frequency of heavy rainfall events has doubled over the last hundred years.

## Predicting the Future

Although it is extremely likely that temperatures, both globally and in Chicago, will continue to rise over the coming decades, it is unpredictable just how much they will rise. Much of that depends on what is done globally to slow the progression of climate change. To that end, the authors of the report discuss two possible scenarios. In the higher emission scenario, Chicago and the rest of the world continues to depend on fossil fuels as their primary energy source, and atmospheric carbon dioxide levels rise from their present-day levels of 385 parts per million (ppm) to almost 1000 ppm by the end of the century. Under the lower emission scenario, a focus on sustainability and conservation results in atmospheric carbon dioxide levels rising to about 550 ppm by the end of the century.

So what does that mean for Chicago? When it comes to temperature, the report claims that Chicago could see substantial increases in annual and seasonal temperatures and extreme heat events, particularly under the higher emissions scenario. For example, by the end of the century, under lower emissions, temperature could increase by 3-4°F; under higher emissions, 7-8°F, with the greatest increases (up to 10°F) during summer. The number of very hot days (over 90°F) is very likely to increase as well, the report states. By the end of the century, very hot days are projected to increase from the present-day level of about 15 days per year to 5 weeks under the lower emissions scenario and 8 weeks under the higher. Proportionally, an even larger percentage increase is projected in extremely hot days (over 100°F), with more than 30 of these days projected to occur each year by end-of-century under the higher emissions scenario.

The projected increases in extreme temperatures over the coming century could have a number of adverse impacts on human health. Extreme temperatures and resulting decreases in air quality can lead to increases in both morbidity as well as mortality. Currently, just under 100 deaths in Chicago are attributed to extreme heat each year. An "analog city" analysis, which transposes the weather conditions from the European Heat Wave of 2003 (responsible for 40,000 deaths across Europe) to the city of Chicago, estimates that if a similar heat wave were to occur over Chicago, given its present-day infrastructure, demographics, and emergency preparedness, more than ten times the annual average number of heat-related deaths would occur in just a few weeks.

According to the report, shifting climate zones can also affect the frequency of vector-borne and water-borne disease outbreaks. Vector-borne disease in the Chicago area is currently at a low level but it is an on-going health concern that has increased over recent decades. For example, since 2002, the Cook and DuPage Counties have reported almost 1100 cases of human illness from West Nile virus. The bacteria that causes Lyme disease, carried by the deer tick, has emerged in the region recently.

Waterborne disease outbreaks from all causes in the U.S. are distinctly seasonal, clustered in key watersheds, and associated with heavy precipitation. Heavy precipitation events have already increased in frequency over the last century and are likely to continue to increase in the future, raising concern about the potential for future waterborne disease outbreaks. In Chicago, increases in winter and spring precipitation are likely, with projected increases of about 10% by mid-century and 20-30% by the end of the century under both the higher and lower emissions scenarios, according to the report.

resources," says Dr. Shieh. "Or they are owned by a hospital and want you to go to the hospital for diagnostics and treatment for anything but the most simple conditions."

The sites not only use far less energy than a hospital but they are also a hit with patients. "It's a less stressful environment for them," says Dr. Shieh. "We rarely have to convince patients to come in, we never slow down. We have patients who actually need to go to the hospital that come here first."

**"The DuPage Medical Group Immediate Care Centers are staffed by emergency physicians, have their own diagnostic imaging and labs and are designed to deliver complex acute care."**

## When the System Fails

Hospitals, however, will always be an indispensable part of the healthcare system—especially when it comes to extreme climate events. Yet, as those events become more frequent, hospitals need to adapt. "With events such as wildfires or extreme flooding, hospitals have the potential to deliver uninterrupted care," says Dr. Spengeman of HCWH. "But if the hospital community isn't resilient, then the hospital can't be either."

As an example, when Category 5 Hurricane Michael hit Florida in October 2018, roads were closed and vehicles were not being allowed through. "The healthcare system in Panama City resorted to Twitter to tell local police to let supply trucks through," says Dr. Salas. "That one example highlights how the system has vulnerabilities. We need to develop capacity and resiliency to continue to provide support under all conditions."

Hurricane Michael is far from being the only example of vulnerabilities in the healthcare system. On November 2, 2012 superstorm Sandy hit New York City. Two of the city's busiest medical centers—NYU Langone Medical Center and Bellevue Hospital Center—were forced to evacuate nearly 1,000 patients because their generators failed. While both hospitals put their generators on high floors, other critical components of the backup power system remained in basements just a block from the East River—and those basements flooded due to the tremendous force of the water. "This reveals to me that we have to be much more imaginative and detail-oriented in our planning to make sure hospitals are as resilient as they need to be," said Irwin Redlener, director of the National Center for Disaster Preparedness at Columbia University's Mailman School of Public Health in New York City in an interview by CBS News.

Neither example is unique. Power failures crippled New Orleans hospitals after Hurricane Katrina. When the Northeast was hit with a massive blackout in 2003, the backup power at several of New York City's hospitals failed or performed poorly.

## Legislative Efforts

While healthcare systems can do much on their own to offset climate change, making deeper inroads will require help at the federal and state levels with policies, regulations and funding. And advocacy is another area where Health Care Without Harm shines. "Hospitals and healthcare institutions have enormous credibility since their mission is to heal and be healers," says Dr. Spengeman.

That credibility is what HCWH puts to good use. The group's Health Care Climate Council consists of a group of 19 health systems (including Advocate Aurora) committed to climate-smart healthcare through mitigation, resiliency and advocacy. Members meet regularly with their state legislators to advocate for energy efficiency and increasing renewable energy in the U.S.

Two states—California and Massachusetts—have also formed healthcare climate alliances with HCWH. California's alliance, for example, has five members that bring healthcare expertise on policy, energy and hospitals to regulatory and legislative bodies, asking 'How can we work together to meet energy goals?' The alliances were just launched last year so specific successes are hard to pinpoint.

Yet last year, Massachusetts alliance health system CEOs wrote a letter to state legislators urging them to raise the state's Renewable Portfolio Standard (RPS). The letter emphasized the effects of climate change on health and healthcare delivery. State legislators told HCWH that the work of the alliance and their physicians to educate lawmakers about climate change's health impacts played a significant role in their decision to pass a bill raising the state's RPS.

While that might seem quite fast for a legislative victory, Dr. Spengeman notes, "The members of the alliances are health systems, such as Kaiser Permanente, that have been leaders in these states for decades so they have already built trust and strong relationships with policymakers. Both California and Massachusetts have ambitious climate goals. Because healthcare institutions are responsible for contributing 10% of the greenhouse gases nationally, then if policymakers want to meet their climate goals, they will need to work with healthcare institutions."

HCWH also works hard at the federal level. Last summer, 19 health systems signed the We Are Still In pledge to meet the goals set by the Paris Climate Agreement. The group is also testifying at the federal level about the Trump administration's rollback of the Clean Power Plan, which was an Obama administration policy aimed at combating climate change, and its replacement with the Affordable Clean Energy (ACE) rule. Without the Clean Power Plan, many experts believe that the goals set by the Paris Climate Agreement cannot be met.

## This Says It All

"It's important for those of us in the health sector to work together to help ease the effects of climate change," says Dr. Spengeman. "The fact that the healthcare industry contributes so heavily to the climate change crisis is at odds with the reason so many people become health professionals—to help people stay healthy."