Science & Technology

How to Prepare for a "Megadisaster"

Submerged cities. Food shortages. Attacks on the electrical grid. Bioterrorism. It’s time to get ready for tomorrow’s catastrophes.

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Jeffrey Schlegelmilch, the director of Columbia’s National Center for Disaster Preparedness, discusses the cataclysmic events that may threaten our future and how planning and research can help save us.

What does your work entail?

The center's mission is to conduct research that helps the US prevent, prepare for, and respond to natural and human-driven disasters. Our faculty and staff investigate nearly all aspects of the country's capacity for dealing with disasters, from the readiness of governmental and nongovernmental organizations to the effectiveness of on-the-ground emergency-response strategies to public awareness of disaster risk.

Lately you've been concerned about the threat of "megadisasters." What is a megadisaster, exactly?

This is a topic I discuss in my recent book, *Rethinking Readiness*. Megadisasters are those that have society-altering potential. These are the ones that can overwhelm the very systems designed to respond to disasters. History has given us plenty of examples. Think of the Black Death in the Middle Ages, which wiped out as much as a third or more of Western Europe's population and reshaped its economic and political systems, or the Irish Potato Famine, which caused the largest mass exodus in the nation's history. Megadisasters don't have a temporary impact on society: they permanently alter the course of history.

How will disasters of the twenty-first century be different from those of the past?

We are already seeing large-scale disasters occur more and more frequently. This is because human activity is exacerbating both the underlying threats and our vulnerability to them. We are pumping pollutants into the atmosphere at unprecedented rates, leading to more extreme weather events. At the same time, we are building in flood zones, in forested regions susceptible to wildfires, and in other hazard-prone areas. This dynamic is not unique to climate change. Other disasters, like pandemics, have components where societal development is increasing both the threat and our vulnerability. New diseases are emerging because we're encroaching into wildlife areas and coming into closer contact with animals that harbor exotic pathogens, and the diseases are spreading faster through human populations because of our global connectedness.

What types of potential megadisasters do we face?

In my book, I discuss five broad categories of risk: climate change; biological perils, including bioterrorism and emerging diseases; failures of critical infrastructure; cyberthreats; and nuclear conflict.

Is COVID-19 a megadisaster?

As COVID-19 was starting to circle the globe, I was reviewing the proofs for my book. It was eerie reading the section on pandemics. Experts I interviewed in 2019 warned that the international community had failed to create surveillance networks to detect and contain new diseases. They said that we lacked the medical supplies necessary to handle a pandemic. COVID-19 will certainly leave scars on our society for generations, but we still have time to mitigate some of the long-term impacts it could have on our society. The scale of the pandemic is larger than it should have been, but how the episode is written in the history books will be determined in part by the choices we make today.

Many people would say that climate change is the gravest threat we face this century, casting its shadow over all others. Would you agree?

Climate change certainly poses extraordinary dangers, in part because of how its effects can cascade. For example, it seems increasingly likely that prolonged droughts will eventually cause widespread food and water shortages in many parts of the world, which in turn could lead to massive human migration, regional instability, and armed conflicts. Meanwhile, warming temperatures are expanding the habitats of mosquitoes and other disease-carrying insects, which is making more people sick. But I think that asking which type of disaster is the most dangerous is the wrong question, since they're intertwined. I also believe that they share the same root cause, which is that human societies do not adequately invest in the future. That's evident in our failure to cut greenhouse-gas emissions to safe levels but also in our chronic underfunding of public-health initiatives and critical infrastructure projects. The good news is that by adopting more sustainable health and development policies, we can reduce our vulnerability to many of these disasters.

You argue in your book that America's physical infrastructure is in worse condition than most people realize.

The American Society of Civil Engineers gave the country a C− on its most recent Infrastructure Report Card, finding that 46,000 of our bridges and more than 2,300 of our dams are structurally deficient. And 20 percent of dams in populated areas don't have emergency plans in place in the event of a major problem. But the US electrical grid is perhaps our most worrisome vulnerability: it is aging, overloaded,

and quite susceptible to breakdown. It's not inconceivable that a rogue nation or terrorist organization could seek to exploit this weakness. We are also seeing that our physical infrastructure is increasingly vulnerable to extreme weather events, such as when a pair of severe winter storms deprived millions of people of electricity in Texas this past winter. Another example was when Hurricane Maria hit Puerto Rico in 2017, causing a nearly yearlong power outage. But even relatively short outages can lead to fatalities when health-care centers, pharmacies, food-distribution networks, and social-service organizations lose electricity.

How did the world's wealthiest nation find itself in this predicament, with such rickety infrastructure?

Maintenance isn't very sexy. People love to build new things, cut ribbons, and debut the future. Maintaining existing infrastructure is expensive, time-consuming, and generally less compelling to the public and politicians.

The National Center for Disaster Preparedness is known for taking a broad perspective on its field of study.

Yes, whereas many other academic centers in the field of disaster science focus on more narrowly defined aspects of crisis management, like how health systems or social-service organizations can best contribute to relief efforts, our center has always taken a holistic approach. And part of that approach is exploring how disasters might be prevented in the first place. Our affiliation with Columbia's Earth Institute is important in this regard. Our center's researchers, many of whom are experts in crisis management, routinely collaborate with environmental scientists, economists, urban planners, sociologists, psychologists, and others to answer questions like: What types of public policies reduce our vulnerability to large-scale disasters? What factors influence people's attitudes about disaster risk and prevention? And how can experts most effectively communicate with people about these issues?

Our researchers also study the nuts and bolts of disaster response. For example, we've made important contributions to understanding how health-care organizations can ensure that their employees are able to continue working safely during pandemics and other emergencies. But I think that our center is unique in that we're always looking at the big picture and trying to raise cultural awareness about how human decisions can either mitigate or exacerbate the risks we face.

Jeffrey Schlegelmilch

Your center is also known for highlighting the long-term human toll of disasters.

Especially on children. This is a legacy of our founding director, Irwin Redlener, a pediatrician and child-welfare expert who stepped down from his leadership post last summer and still oversees our Pandemic Resource and Response Initiative. Irwin has helped oversee a number of groundbreaking studies that have followed children whose families were displaced by Hurricane Katrina in 2004, the Deepwater Horizon oil spill in 2010, and Superstorm Sandy in 2012. He and his colleagues have found that children whose lives are disrupted by disasters are much likelier to suffer anxiety and depression, to display behavioral problems, and to struggle in school for years afterward. It's a devastating example of a much larger problem, which is that many people who are affected by disasters endure lasting physical-health and mental-health consequences. When a disaster strikes, donations pour in, and we may all feel like we've made a difference. But after the TV-news crews and the emergency workers leave, the survivors cannot just move on. Some get stuck in a perpetual cycle of loss.

To address this challenge, our center is developing more forward-looking strategies that government agencies and nonprofit organizations can use to improve the resilience of vulnerable populations like children, the elderly, the poor, and people with chronic medical conditions and special needs. As individuals, we can all maximize the impact of our generosity by supporting organizations that help strengthen at-risk populations, like the nonprofit Children's Health Fund, which Irwin, his wife, Karen, and the musician Paul Simon created in 1987 to provide free health care to low-income youths and their families.

Has the practice of disaster response evolved much over the years?

The modern era of disaster relief and preparedness in the US really began in the early 2000s, after 9/11 and Hurricane Katrina. Those events showed us just how complex disaster situations can be and how we need to engage entire communities in relief efforts and in preparing for such scenarios. A lot of progress has been made since then. For example, we've learned that the strength of social bonds among neighbors is one of the strongest predictors of how well communities recover from disasters, because in the aftermath of catastrophes ordinary people are often relying on each other for help. There are now pilot programs in the US that promote this kind of collective resilience by hosting block parties where people can learn about disaster preparedness while socializing.

We've also learned how to coordinate relief efforts more effectively. One interesting area of research involves the incorporation of artificial intelligence into emergency managers' decision-making tools. Disaster scenes are chaotic environments, and emergency managers often must make life-or-death decisions — like whether to evacuate or deploy first responders to particular areas — on the basis of incomplete, uncertain, and rapidly changing information. I am currently involved in efforts to adapt business-intelligence systems and planning tools developed by the US military for use in complex humanitarian emergencies. The idea is to create software that would automatically sift through huge amounts of information drawn from the scene and highlight the data points that emergency managers need to make crucial decisions.

Has the US committed any major missteps in its disaster planning over the past few years?

Preparedness for biothreats is one area where I think we've failed to protect ourselves, despite considerable efforts to do so. This includes acts of bioterrorism as well as naturally occurring diseases. The anthrax attacks after 9/11 led to some of the largest investments in public-health preparedness in our nation's history, with hundreds of billions spent on biodefense and health-security capabilities at the federal, state, and local levels. Unfortunately, the funding spike that followed 9/11 wasn't sustained, and now our biodefense programs, like most of our public-health initiatives, face chronic budgetary shortfalls. Meanwhile, advances in gene editing and synthetic biology are opening up new possibilities for nefarious actors to weaponize pathogens.

You devote an entire chapter in your book to nuclear war. Why?

Because it's important. There is this belief that the need to prepare for nuclear conflict went away with the collapse of the Soviet Union. But the threat just changed form. In fact, new rivalries among China, Russia, and the US and the emergence of additional nuclear powers, including rogue nations like North Korea, have increased the potential for smaller-scale nuclear conflict and nuclear terrorism. The use of nuclear weapons may be more likely than ever before, but it is also much more survivable than in the height of the Cold War. It's something we can and should prepare for.

What should people do to prepare themselves for megadisasters?

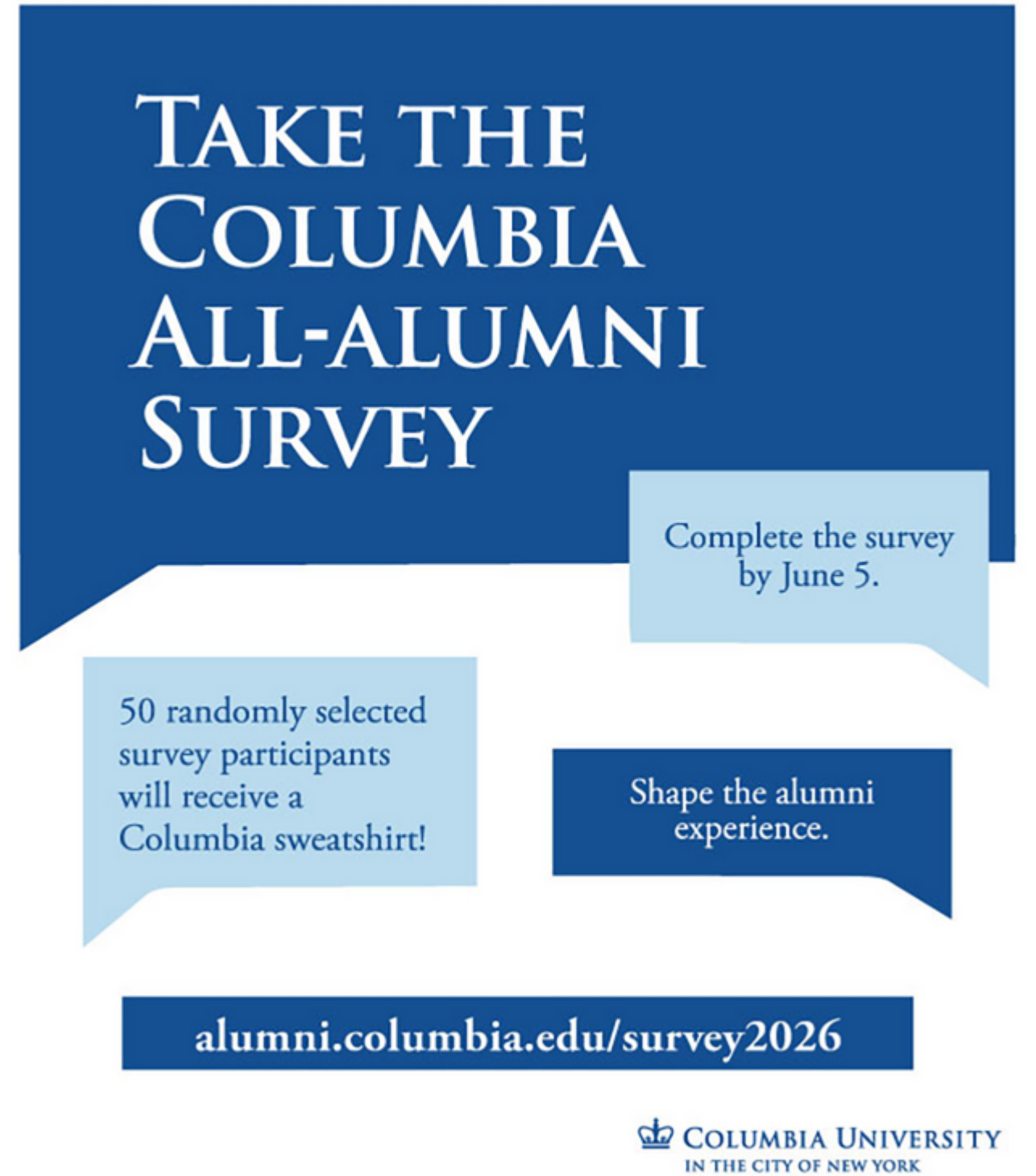
I always say that no matter what kind of disaster you might face, you're going to have to do one of two things: remain at home for a long time or leave immediately. So you should have two sets of supplies ready, with one already stuffed into a bag and ready to go. You should also have a plan for where you'll meet family members or loved ones in the event that communication networks aren't working. And you should ensure ahead of time that any essential documents, like property deeds or insurance papers, are digitized and uploaded to the cloud. For a more comprehensive list of precautionary steps and items to have on hand, people can visit the "preparedness wizard" we have on our center's website.

The most important thing we can do, though, is to demand that our elected officials invest in disaster prevention and preparedness. Studies have shown that voters tend to reward politicians for bringing in lots of relief money *after* disasters, but not for investing in preventive measures up front. This is unfortunate.

What steps would you like to see President Biden take to improve the country's resilience?

There is an urgent need to simplify disaster-management operations at the national level. Right now, as many as ninety different programs across twenty federal agencies can be involved. These programs are an uneven patchwork, leaving significant gaps in some areas and creating redundancies in others. The Biden-Harris administration should conduct a comprehensive review of these operations and better organize them so that people in need of emergency assistance can receive it faster. Another immediate priority should be mitigating the outsize impact that the COVID-19 pandemic is continuing to have on children. The recent stimulus package does include emergency relief for the daycare sector and a few other measures that address the needs of children. But most are temporary measures, not systematic changes. We need to do more. Perhaps most importantly, the federal government needs to increase funding for mental-health services for young people. We see that pediatric mental-health emergencies have spiked due to the pandemic but that only a small fraction of children are receiving the help they need.

Guide to school abbreviations



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