

Part 1: Visualizing Climate and Health from the National to the Local Level

Anne Johnson: [music] This is Global Environmental Health Chat, the podcast that explores environmental health issues that transcend national boundaries. I'm your host Anne Johnson, and this podcast is produced by the National Institute of Environmental Health Sciences.

Climate change brings numerous health impacts around the world. It also could exacerbate many existing sources of environmental exposures, such as air pollution and deposits of industrial chemicals. The good news is that we actually have a lot of data that can shed light on these effects, and help us to prevent or mitigate them.

The trick is figuring out how to get the most useful information out of the data we have. By combining the right data sets and presenting them in useful formats, climate, environmental, and health data can help researchers, decision-makers, and everyday people know their risks and take action to reduce their vulnerability.

NIEHS's Climate Change and Environmental Exposures Challenge focused on creating data visualization tools and maps that connect current science on climate change to the exposure pathways for environmental hazards. The goal was to help decision makers and communities identify areas and people at greatest risk and help to prioritize protective actions. In this podcast, we take a look at two of the winning projects. In the second podcast of this two-part series, we'll hear about the other two winners.

Our first guest is Dr. Julia Gohlke, an assistant professor at Virginia Tech. With collaborators Samarth Swarup and Dawen Xie, Julia helped to develop a visualization tool that explores how the natural environment, the built environment, and human populations interact as extreme heat events are rapidly becoming more common. Their tool combines national data on power outages, air pollution levels, extreme heat and social isolation.

Julia Gohlke: It's essentially a map-based app in which you can explore these different data sets and overlay them. So, you can look at states, for example, that have lots of power outages and then you can drill down and say, "During those power outages, was there an extreme heat event?" and during that extreme heat event, were air pollution levels above a certain level that you may be interested in. And then you can lay, overlay, social isolation, and say, well, we've got exposure, and here are the census tracts that essentially have a higher percentage of folks that we believe would be socially isolated, and thus more vulnerable.

Anne Johnson: Most of us spend our time in climate-controlled environments, so we can just crank up the air conditioning during extreme heat. But of course, that changes when the power goes out; you open your windows to get some fresh air, and then you're overheated and potentially exposed to air pollution. Julia said that while all of these factors can be studied individually, a visualization tool helps to reveal how they interact.

Julia Gohlke: I think at this point it could be used by decision makers at the national level—and, actually, at the state and local level—for identifying locations in which you may want to make sure that resources

are available during a power outage. I also think that it has a lot of application in research, kind of characterizing, during power outages, what is actually going on, and then hopefully that would be developed into even more of a predictive tool.

Anne Johnson: One of the things that makes the tool particularly powerful is that it uses a synthetic population to assess where people might be most socially isolated, and thus most vulnerable during extreme heat events. The synthetic population was developed at the Network Dynamics and Simulation Science Lab at Virginia Tech, where Samarth Swarup and Dawen Xie work. It uses nationally representative survey data to reflect where people spend their time throughout the day.

This approach is typically used to track and predict the spread of infectious diseases. But it turns out to be a valuable window into social isolation, because you can see who tends to spend the majority of their time alone. It also could potentially be used to look at a variety of other risk factors and environmental exposures.

Julia Gohlke: I really do see some major utility, in particular in defining exposure, because you can actually track people across different environments through their daily activities. So as you can imagine, most people—even if you have the zip code where they live, they're not there all day. So you really can look at environmental exposures across different locations during a person's day.

Anne Johnson: One caveat, Julia said, is that the team's visualization tool doesn't have actual health data, but instead focuses on exposures. Going forward, they hope to incorporate health metrics to better define risk and help decision makers predict and prevent dangerous situations. [music]

Now moving on to our second project, we zoom in from the national level to the very local. This project comes to us from San Francisco. Cynthia Comerford manages health policy and directs the climate and health program at the city's Department of Public Health in the office of planning and policy. Over the past few years, San Francisco has done a great deal of research profiling how climate change could impact health across the Bay area. But the outcome of that work was initially a giant report.

Cynthia Comerford: To make this profile more engaging and more innovative, we decided to make an interactive website. And basically what we did is we took the information in the report and made it easy for people to use. So, we simplified the science around climate projections, we really articulated and visualized the health impacts, and then we made the information really localized, so specific areas within San Francisco, and specific populations.

Anne Johnson: The website has a ton of data on climate projections, health impacts, neighborhood-specific impacts, and maps of the city showing the resiliency of different areas, as measured by a resiliency index that includes 36 indicators in nine categories.

Cynthia Comerford: Our main objective is to educate people, and we've just been integrating this tool into all of our work. Anytime we go to the community, we use it to demonstrate the health impacts, whether we're going to commission hearings, it just really has become a great way for us to summarize all of the information that we've collected, and how we can make planning decisions. So our next step

internally is how do we prioritize resources for neighborhoods around climate change now that we're able to see which neighborhoods are more resilient, which ones are more vulnerable, what are the specific indicators that are making them more vulnerable and how can we target resources?

Anne Johnson: For example, one of the city's biggest challenges is around how increasing carbon dioxide and temperatures might impact asthma and other respiratory problems, which have been on the rise in some neighborhoods. Cynthia said one of the strengths of the tool is its ability to convey information about climate change and its health impacts to a broad range of people, from policy makers to community leaders and residents.

Cynthia Comerford: You know, I think some of the highlights have been just really simplifying the science. I think that's been really important for people to be able to very succinctly understand hazards from climate change and what the health impacts are. Traditionally, public health isn't seen as a leader in climate change, so we're still trying to use this tool to show why it's important to have public health departments involved in climate change and the resources that they can bring to the table.

Anne Johnson: As these two make clear, public health has a lot to bring to the table when it comes to climate change. Thanks to Dr. Julia Gohlke and Cynthia Comerford for sharing their work with us. You can find the links to their projects at our website, niehs.nih.gov/podcasts. There, you can also find part two of this podcast series, in which we hear from two other winners of the NIEHS Climate Change and Environmental Exposures Challenge. Those two are focused on the relationship between environmental exposures and flooding.

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