

# Yale Center on Climate Change and Health

## Annual Report Summary

### July 1, 2021 to June 30, 2022

*The Yale Center on Climate Change and Health is led by Dr. Robert Dubrow, Faculty Director, and Dr. Martin Klein, Executive Director, in collaboration with YCCCH staff and faculty, Advisory Board, 51 Affiliated Faculty members from across the University, and with the support of Student Assistants.*

## YCCCH Structure and Administration

- **University Center:** The Yale Center on Climate Change and Health (YCCCH) is a provost-approved university center, with a four-year [strategic plan](#) (2020-2024).
- **YCCCH Core Team:** Robert Dubrow (Faculty Director); Martin Klein (Executive Director), Kai Chen (Director of Research), Laura Bozzi (Director of Programs), Jodi Sherman (Director of Program on Healthcare Environmental Sustainability), Daniel Carrión (Director of Education), and Mauro Diaz-Hernandez (Program Administrator).
- **New hire:** In January 2022, as the result of an international search, YCCCH welcomed Dr. Daniel Carrión as a new Assistant Professor of Epidemiology (Environmental Health Sciences) and inaugural YCCCH Director of Education.
- **Advisory Board:** The YCCCH [Advisory Board](#) includes students, faculty from other universities, and representatives from government and non-profit organizations.
- **Affiliated Faculty:** As of June 2022, we had 51 [Affiliated Faculty](#), 29 with primary appointments at YSPH and 22 with primary appointments in other schools or departments.
- **Communications:** We maintain a [YCCCH website](#) within the YSPH website. We also have an active Twitter account (@cchyle) with over 1,000 followers and a new [YouTube page](#). Our monthly newsletter reaches approximately 3,500 recipients, with an impressive open rate of approximately 45%.

## Program Accomplishments

### Research

#### Core Research Program

- The core research program is led by Dr. Kai Chen, the YCCCH Director of Research. Through this program, we are building a vibrant community of doctoral students, postdoctoral researchers, and collaborating faculty who apply multidisciplinary approaches – including climate and air pollution sciences, exposure assessment, mathematical and statistical modeling, and environmental epidemiology – to investigate a) interactive effects on human health of ambient temperature, air pollution, extreme weather events, demographic factors, and social determinants; b) future climate change impacts as determined by modeling of alternative scenarios; c) health co-benefits of climate change mitigation and adaptation measures and related policies; d) effects of mitigation and adaptation policies on reducing disparities in environmental exposures and their adverse health effects; and e) adaptation strategies, especially to extreme heat. The program aims to produce policy-

relevant knowledge that can be used to advance climate change mitigation and adaptation in a manner that promotes health and protects vulnerable populations. During the 2021-2 academic year, the core research program was composed of Dr. Chen, Dr. Dubrow, Dr. Carrión, two postdoctoral researchers, four doctoral students, two master's students, and two undergraduate students.

- **Ongoing research:** The core faculty continued the following funded research projects: (1) *Effect of air pollution reductions on mortality during the COVID-19 lockdown: A natural experiment study* (funded by Health Effects Institute). (2) *Associations between extreme precipitation, floods, or drought and childhood diarrhea in low- and middle-income countries* (funded by the Reckitt Benckiser Global Hygiene Institute). (3) *Ethane cracker plants in the United States: emissions and community vulnerability* (funded by the High Tide Foundation).
- **Research grant awards:** YCCCH core faculty were awarded a number of research grants, including four awarded through the [Yale Planetary Solutions Project](#) (PSP) Seed Grants: (1) *Heat-related mortality, air conditioning and inequality in the US*. Team: Kai Chen, Narasimha Rao, Robert Dubrow. Funder: PSP. One year award: \$80,000. (2) *Healthcare organization greenhouse gas emissions accounting tool for strategic management*. Team: Jodi Sherman, Michael Oristaglio, Robert Klee, Matthew Eckelman. Funder: PSP. One-year award: \$80,000. (3) *Activating tenants to advocate for energy justice: barriers and solutions*. Team: Annie Harper, Laura Bozzi, Krystal Pollitt, Narasimha Rao. One-year award: \$71,675. (4) *Building a digital repository to strengthen the structure for community-engaged research on people and the environment in New Haven*. Team: Kristin Barendregt-Ludwig, Laura Bozzi, Gerald Torres, Paul Sabin, Colleen Murphy-Dunning. One-year award: \$29,500. In addition, core faculty received the following awards: (1) *Yale-China Training Program in Climate Change and Health*. PIs: Kai Chen, Robert Dubrow. Two-year award: \$150,323. (2) *Environmental justice: tools, processes and protocols supporting credible measurement*. Yale team: Kai Chen, Robert Dubrow, Michelle Bell. 10-month award: \$100,000.
- **Lancet Countdown: Tracking Progress on Health and Climate Change:** The [Lancet Countdown](#) is an international collaboration that produces an annual report, published in *The Lancet*, that tracks indicators of global progress (or lack of progress) on climate change and health. Yale, represented by YCCCH, has been a member of the collaboration since 2018. Drs. Dubrow and Sherman were among the co-authors of the 2021 report, contributing indicators on (1) mitigation in the healthcare sector and (2) air conditioning: benefits and harms. Drs. Sherman and Bozzi served as reviewers for the ancillary [2021 Lancet Countdown on Health and Climate Change Policy Brief for the United States of America](#). YCCCH also hosted the [Yale Launch Event for the 2021 Report of the Lancet Countdown](#) in November 2021.
- **Conference on Climate Change and Health in Small Island Developing States: Focus on the Caribbean, held virtually October 5-8, 2021:** YCCCH has made the Caribbean our top global priority, with this conference being our first significant activity. YCCCH served as a lead organizer for the conference, in partnership with more than 25 international, U.S., and Caribbean organizations. More than 1,200 attendees from 84 different countries registered for the conference. The conference sessions were recorded and are available on the YCCCH YouTube page (links: [Day 1](#); [Day 2](#); [Day 3](#); [Day 4](#)). A primary output from the conference will be an action-oriented research agenda for climate change and health in the Caribbean that is being finalized by an entity that emerged from the conference organizing: the Research for Action on Climate Change and Health in the Caribbean Project, which includes YCCCH, Earth Medic / Earth Nurse (a non-governmental organization based in Trinidad), the Pan American Health Organization, The University of the West Indies, and Emory University.
- **Dr. Chen awarded the YSPH Research Award: Early Career Investigative Award:** In May 2022, Dr. Chen received this award for the paper in *Nature Communications* entitled "[Role of meteorological factors in the transmission of SARS-CoV-2 in the United States](#)," which set the standard for research examining the relationship between meteorological variables and SARS-CoV-2 transmission.
- **Research publications:** Nineteen relevant articles were published by core program faculty during the period of this annual report, including in high-impact journals such as *The Lancet* and *Nature Communications*.

## Yale Program on Healthcare Environmental Sustainability

- The [Yale Program on Healthcare Environmental Sustainability](#) (Y-PHES), led by Dr. Jodi Sherman, is housed within YCCCH. The health sector is a leading emitter of greenhouse gas and non-greenhouse gas pollution. Y-PHES seeks to improve the environmental performance of the healthcare sector by a) quantifying its environmental impacts to aid decision-making and b) designing and testing interventions to reduce unnecessary resource consumption, waste, and greenhouse gas emissions. The program is a partnership among the Schools of Public Health, Nursing, and Medicine, working in close collaboration with Yale-New Haven Health System.
- **Care Without Carbon – The Road to Net Zero Healthcare: Measure, Manage, Lead:** The second annual Yale University sustainability in healthcare symposium was co-hosted by Y-PHES and Yale Center for Business and the Environment.
- **Lancet Planetary Health Commission on Sustainable Healthcare (LPHCSH):** The [LPHCSH](#) is a global commission dedicated to facilitating a rapid transition to low-carbon, sustainable, resilient health systems. It is led by a partnership between Y-PHES, Lancet Planetary Health, and the University of British Columbia Planetary Healthcare Lab.
- **Research publications:** Nine relevant articles were published by Y-PHES faculty during the period of this annual report, including in high-impact journals such as *BMJ* and *NEJM Catalyst*.

## Climate Change and Health Pilot Research Grant

- In 2022, one project was selected for a \$10,000 grant: *Ambient temperature during pregnancy and risk of childhood leukemia*. Co-PIs: Tormod Rogne, MD, PhD, Assistant Professor (Chronic Disease Epidemiology), YSPH; Xiaomei Ma, PhD, Professor (Chronic Disease Epidemiology), YSPH; Nicole Deziel, PhD, Associate Professor (Environmental Health Sciences), YSPH.
- The following publication has resulted from a pilot research grant issued to Drs. Michelle Bell and Joshua Warren in 2019: Heo S, Chen C, Kim H, Sabath B, Dominici F, Warren JL, Di Q, Schwartz J, Bell ML. [Temporal changes in associations between temperature and hospitalizations by greenspace: Analysis in the Medicare population in 40 U.S. northeast counties](#). *Environment International* 2021 Nov;156:1006737.

## Education

### Education & Training for Yale Students

- **Climate Change and Health Concentration for MPH Students:** 2021-22 was the second year of YCCCH's [Climate Change and Health Concentration](#) for MPH students. In May 2022, our first cohort of three concentration students graduated from YSPH. The concentration expanded fourfold with the acceptance of 13 students into the concentration from the Class of 2023.
- **EHS 547, [Climate Change and Public Health](#):** This course, offered by Dr. Dubrow, is the foundational climate change and public health course offered at YSPH and required for concentration students.
- **EHS 560, [Methods in Climate Change and Health Research](#):** This course, offered by Dr. Chen, is a required course for concentration students and an important component of the course sequence for doctoral students working with YCCCH faculty.
- **EPH 555, [Clinic in Climate Justice, Climate Policy, Law, and Public Health](#):** This course, an innovative collaboration between YSPH, Yale School of the Environment, and Vermont Law School, includes students from both Yale and Vermont Law School. In the course, interdisciplinary student teams carry out applied projects that incorporate elements of climate justice, climate policy, and/or law with public health, in

collaboration with a partner organization. YCCCH works to achieve real-world impact through clinic projects, with recent examples including: A 2019-20 clinic project, "[Scoping and recommendations for the development of a Connecticut Environmental Justice Mapping Tool](#)," in partnership with the Connecticut Department of Energy and Environmental Protection, informed [the funding to launch the development of the Tool](#) in 2021. In October 2021, a coalition of environmental justice, animal rights, and community organizations delivered to the California Air Resources Board a petition, [first drafted by clinic students in spring 2021](#), related to the Low Carbon Fuel Standard. In April 2022, Connecticut-based non-profit, Save the Sound, released "[Climate Action Plan 2022: cut emissions and build a healthy Connecticut](#)," a report originating from a 2020-21 clinic project.

- **EPH 570 and 571: Seminar in Climate Change and Health:** During the 2021-22 academic year, we continued to offer our speaker series as a not-for-credit seminar course meeting four times each semester. The seminar is a required course for concentration students and is open to the public.
- **Yale Global Initiative on Climate Change and Public Health Ethics:** Led by Affiliated Faculty member Dr. Laura Bothwell and sponsored by YCCCH, this seminar series hosted three speakers and discussed issues at the intersection of climate change and public health ethics.
- **YCCCH Student Associates:** Student Associates serve one-year terms as ambassadors for YCCCH while engaging with a diverse community of like-minded students. Associates gain broad exposure to issues of climate change and health through small, seminar-style discussions with field experts whom they help to select. Associates also participate in workshops and skill-based trainings, film screenings, and student-led presentations/discussions. There were 32 Student Associates in the 2021-22 academic year, representing the Schools of Public Health, the Environment, Medicine, and Nursing, as well as Yale College.
- **Summer Internships in Climate Change and Health:** The 2022 summer internship program was open to MPH students, YCCCH Student Associates, and undergraduate students in the Environmental Studies major. Through a two-step process, eligible students applied to be matched with one of the summer internship projects, and then the selected students applied for funding from sources including – but not limited to – YCCCH. YCCCH provided stipends to six students, while all other students secured funding from other Yale sources, which allowed us to expand our program's reach. We placed 13 students with the California Department of Public Health – Climate Change and Health Equity Unit, Connecticut Institute for Resilience and Climate Adaptation, Connecticut Department of Public Health, Dejusticia (Colombia), Minnesota Department of Public Health's Climate & Health Program, UNICEF, YCCCH, and Y-PHES.
- **Climate Change and Health Pre-Doctoral Fellowships:** Our first pre-doctoral fellow, Alyssa Parpia, graduated in May 2022 from the YSPH doctoral program in the Department of Epidemiology of Microbial Diseases; her dissertation advisor was Dr. Alison Galvani. Sappho Gilbert completed her fifth year, supported by a National Institute of Environmental Health Sciences pre-doctoral fellowship award; her dissertation title is "Mapping and monitoring community nutrition in transition in Nunavut, Canada," and her advisor is Dr. Dubrow. Lingzhi Chu, who completed her fourth year with advisor Dr. Dubrow, received support from a Dan David Prize Scholarship; her dissertation title is "Ambient temperature, humidity, air pollution and renal disease risk." Yiqun Ma completed her third year, funded by the China Scholarship Council and a graduate research assistantship on Dr. Chen's Health Effects Institute grant; in October 2021, her dissertation prospectus, "Intersection of air pollution, meteorological factors, and the COVID-19 pandemic: sensitivity and accountability," was approved with distinction. Chengyi Lin, who completed her second year, is interested in the health effects of air pollution. Dr. Chen is the advisor for Yiqun Ma and Chengyi Lin.

## Continuing Education

- **Online Certificate Program in Climate Change and Health:** YCCCH has continued to offer the well-regarded online [Climate Change and Health Certificate](#) program for working professionals. This 18-week program consists of three consecutive six-week courses: *Introduction to Climate Change and Health*, *Climate Adaptation for Human Health*, and *Communicating Climate Change and Health*. We offered the program in September 2021 (Cohort 7) and in March 2022 (Cohort 8). In student evaluations from both cohorts, 98% would recommend the certificate program to others and 94% rated the program as excellent or very good. We are planning a major overhaul of the certificate program in time for Cohort 9 in Spring 2023.
- **Coursera Specialization:** We offered the three-course Coursera Specialization, *Climate Change and Health: From Science to Action*, which is an abridged version of the online certificate program. Coursera is an online course platform with a large, global reach. In April 2022, YCCCH discontinued the Coursera Specialization because the content was becoming out-of-date.

## Public Health Practice

### Policy Impact Unit: Focus on Connecticut

- ***Climate Change and Health in Connecticut: 2020 Report:*** YCCCH continues to operate its Policy Impact Unit, launched in Fall 2020 to leverage YCCCH research and public health practice projects to inform climate policy. The initial focus of the unit, which is led by Dr. Laura Bozzi, YCCCH Director of Programs, is on [Connecticut climate mitigation and adaptation policies](#). In September 2020, we issued [Climate change and health in Connecticut: 2020 report \(2020 Report\)](#). In 2021-22, we continued to build upon this report by completing an issue brief series that aligns with the *2020 Report's* four domains, summarizing the key findings and extending them to include policy recommendations. The first two issue brief were released in 2020-21 followed by issue briefs on [Extreme events and health in Connecticut](#) and [Vector-borne diseases and health in Connecticut](#), which were released in October 2021 and May 2022, respectively. Each issue brief was distributed widely to state legislators and other local and state decision-makers. The *2020 Report* has become an important resource for the public and decision-makers in Connecticut; from January to July 2022, its webpage had been viewed over 600 times. YCCCH continues to share the report and issue briefs through engagement activities including public presentations, public comment on proposed policy, and media inquiries.
- ***Building Resilience Against Climate Effects (BRACE): Implementing and Evaluating Adaptation Strategies that Protect and Promote Human Health:*** In 2021, YCCCH collaborated with the Connecticut Department of Public Health (CT DPH) on a grant application to the Centers for Disease Control and Prevention's BRACE funding opportunity. [The application was successful](#), making Connecticut one of only 11 states and cities to be funded through this program. Over the 5-year grant period, YCCCH will work with CT DPH to launch and implement the state's first climate and health program. In December 2021, the program was expanded to an Office of Climate and Public Health by [Governor Lamont's Executive Order 21-3](#).

### Outreach

- YCCCH faculty and staff engaged in public speaking events and media appearances to educate about climate change and health and propel policy action, including presentations to: the Connecticut Public Health Association, all 1st year Quinnipiac University medical students, the Connecticut *Climate Change and Insurance Conference*, a forum sponsored by the North Haven Clean Energy Task Force, and third-year Yale medical students and graduating physician assistant students as part of Power Day. YCCCH co-sponsored the

*Yale Global Environmental Justice Conference* in October 2021; Dr. Bozzi organized and moderated the panel, "[Pathways to a green and just recovery for energy systems, housing, and communities.](#)" Mr. Diaz-Hernandez authored a [guest article](#) for the Universal Health Care Foundation of Connecticut in April 2022, which connected the history of Earth Day to today's struggle for climate, environmental, and health justice.

### Maximizing YCCCH's real-world policy impact

- In May 2022, YCCCH held a half-day day internal retreat to identify strategies to maximize the real-world policy impact of our work. Collectively, we identified three topic areas for focused agenda-setting work: (1) Sustainable and equitable cooling, (2) Equitable building electrification, and (3) Healthcare environmental sustainability. Each topic builds on the Center's research strengths and is an area where we believe there is important potential for policy change to improve health and reduce greenhouse gas emissions. We plan to develop our strategic approach for each topic and begin implementation in the 2022-23 program year, including by securing additional funds.

## Major 2022-23 Goals

2022-23 will focus on implementing the third year of our four-year strategic plan. Highlights include:

- **Expansion of the Yale MPH Concentration in Climate Change and Health**, with a goal to increase enrollment from 13 in the Class of 2023 to 20 in the Class of 2024
- **Major overhaul of the Online Certificate Program in Climate Change and Health** in time for Cohort 9 in Spring 2023, including updating the lectures with the most recent science and relevant reports and climate events, as well as incorporating a greater global focus into the lectures and other course materials
- **Conversion of the Student Associates Program into the YCCCH Fellows Program**, which will engage Yale students in climate change and health-related research, public health practice, communications, and operations through paid fellowship opportunities during the academic year. Fellows will work closely with YCCCH faculty and staff, as well as participate in community-building and educational activities.
- **Core research faculty will apply for major research grants**, including at least four National Institutes of Health R01 research grants, to support work on topics including health impacts of extreme heat, temperature and air pollution effects on dementia, and the health benefits of building electrification in low-income communities
- **Focused work across YCCCH faculty and staff to maximize our real-world policy impact in three areas: (1) Sustainable and equitable cooling, (2) Equitable building electrification, and (3) Healthcare environmental sustainability.** This will include engaging the YCCCH community (Affiliated Faculty, Advisory Board, certificate alumni, and others) in informing the strategy and building partnerships.
- **Fundraising to support our research-to-policy impact work**, including through strategic partnerships with non-governmental organizations
- **Fundraising to support core YCCCH operations and increase YCCCH's endowed funds** by securing major new grants or donations and by actively supporting efforts associated with Yale University's capital campaign