

Yale Center on Climate Change and Health Annual Report

July 1, 2019 to June 30, 2020

Executive Summary

During Year 5 (July 1, 2019 to June 30, 2020) of the High Tide Foundation grant to support the Yale Center on Climate Change and Health (YCCCH) at Yale School of Public Health (YSPH), we successfully implemented all major Year 5 planned activities and have planned a full set of activities for Year 6. In summary, our Year 5 accomplishments included:

- Designation by the Provost of YCCCH as an official Yale University center
- Development of a four-year strategic plan
- Recruitment of 17 individuals from universities, non-profit organizations, and government to serve on the YCCCH Advisory Board
- Recruitment of Mr. Mauro Diaz-Hernandez as Program Administrator
- A new core research program led by our new faculty member, Dr. Kai Chen
- Continued membership in the [Lancet Countdown: Tracking Progress on Health and Climate Change](#), with authorship of two indicators in the 2019 Report
- A new Program on Healthcare Environmental Sustainability
- Three prominent climate change and health researchers for our speaker series
- A pilot research grant to Drs. Michelle Bell and Joshua Warren for a project entitled *Exposure to Greenspace and risk of hospital admissions under a changing climate*
- Approval of the Climate Change and Health Concentration for MPH students
- Teaching a seven-session module on climate change and health in the required MPH core course, *Major Health Threats: Determinants and Solutions*
- Expansion of the one-semester practicum course into a two-semester *Clinic in Environmental/Climate Justice, Sustainability, and Public Health*
- Expansion of the YCCCH Student Associates program to 44 students
- Two offerings of our 18-week online Climate Change and Health Certificate program
- New Coursera Specialization, *Climate Change and Health: From Science to Action*
- Expansion of the summer internship program, with funding provided to four students
- Creation of a Mentorship Program, matching 12 Student Associates with mentors
- A fourth pre-doctoral fellow, funded by the China Scholarship Council
- A \$51,285 donation to support YCCCH research

YCCCH continues to receive strong support from the administration as evidenced by:

- An ongoing financial commitment to our pre-doctoral fellowship program
- Use of all net revenue from the online Climate Change and Health Certificate program to support YCCCH activities
- Funding by the Dean for Dr. Kai Chen as a core faculty member of YCCCH
- Purchase of YSPH-branded collapsible silicon ecoboxes, tumblers, and canvas bags for all incoming students, new faculty, and new staff
- Support by the Dean and the YSPH leadership team for a policy to eliminate single-use plastics (as well as other single-use items) at catered events
- Installation of living walls in the doctoral student and Office of Finance & Administration suites, as well as in some common space

YCCCH Structure and Administration

Transition to a Designated Yale University Center

In Fall 2019, we applied to the Yale Provost for designation as a Yale University center. This application was approved, and in January 2020, we were officially named the Yale Center on Climate Change and Health (YCCCH), the successor to the Yale Climate Change and Health Initiative. This designation upgrades our stature, expands our scope, and positions us to increase our local, regional, national, and international impact in the field of climate change and health. To support our expanded mandate, we have completed a strategic planning process, replaced our Executive Committee with an Advisory Board, and hired a Program Administrator.

YCCCH Core Staff

- **Dr. Robert Dubrow**, Faculty Director; Professor of Epidemiology (Environmental Health Sciences)
- **Dr. Martin Klein**, Executive Director; Senior Advisor, YSPH Dean's Office, Lecturer (Health Policy and Management)
- **Dr. Kai Chen**, Director of Research; Assistant Professor of Epidemiology (Environmental Health Sciences)
- **Dr. Laura Bozzi**, Director of Programs; Lecturer (Environmental Health Sciences)
- **Dr. Jodi Sherman**, Director of Program on Healthcare Environmental Sustainability; Associate Professor of Anesthesiology
- **Mr. Mauro Diaz-Hernandez**, Program Administrator

Strategic Plan

During the first half of 2020, we developed a four-year strategic plan for July 2020 through June 2024. The plan included a vision statement, mission statement, and commitment to diversity and inclusion:

Vision: A world with a stable and safe climate in which human health and diverse ecosystems can thrive.

Mission: The Yale Center on Climate Change and Health utilizes research, education, and public health practice to help safeguard the health of human populations from adverse impacts of climate change and human activities that cause climate change. To protect health, we work with academic, government, and civil society partners to utilize science to contribute toward sharply reducing greenhouse gas emissions and building resilience to the climate change impacts that continue to occur. We aim to make local, national, and international impact and to integrate social justice into all of our work.

Commitment to Diversity and Inclusion: The Yale Center on Climate Change and Health is committed to diversity of its staff, faculty, students, postdoctoral associates, and collaborators according to race, ethnicity, national origin, gender and gender identity, social class, sexuality, and religion. Because underrepresented groups are disproportionately impacted by climate change, inclusion of their perspectives is essential to YCCCH's success.

Advisory Board

We broadened our Executive Committee, which had only included Yale faculty, into a new [Advisory Board](#) that includes students, faculty from other universities, and representatives from

government and non-profit organizations. The following constitutes the Advisory Board membership:

- **John Balbus, MD, MPH**, Senior Advisor for Public Health, National Institute for Environmental Health Sciences; Director, NIEHS-WHO Collaborating Centre for Environmental Health Sciences
- **Michelle Bell, PhD**, Mary E. Pinchot Professor of Environmental Health, Yale School of the Environment
- **Holly Burrows, BSc**, Master's student, Yale School of Public Health
- **Jazmín Diaz Rivera, MPH**, PhD student, Yale School of Public Health
- **Tekisha Dwan Everette, PhD, MPA**, Executive Director, Health Equity Solutions; Assistant Clinical Professor in Social and Behavioral Sciences, Yale School of Public Health
- **Rebecca French, PhD**, Director, Office of Climate Planning, Connecticut Department of Energy and Environmental Protection
- **Howard Frumkin, MD, DrPH**, Professor Emeritus, Environmental and Occupational Health Sciences, University of Washington School of Public Health
- **Shelley Geballe, JD, MPH**, Assistant Professor of Public Health Practice, Yale School of Public Health; Clinical Lecturer, Yale Law School; Distinguished Senior Fellow, Connecticut Voices for Children
- **Mark Mitchell, MD, MPH, FACPM**, Associate Professor of Climate Change, Energy, & Environmental Health Equity, George Mason University; Co-chair, Commission on Environmental Health, National Medical Association
- **Michael Pascucilla, MPH, REHS**, Chief Executive Officer/Director of Health, East Shore District Health Department
- **Surili Patel, MS**, Director, Center for Climate, Health, and Equity, American Public Health Association (APHA); Deputy Director, APHA Center for Public Health Policy
- **Virginia Pitzer, ScD**, Associate Professor of Epidemiology (Microbial Diseases), Yale School of Public Health
- **Peggy Shepard**, Co-founder and Executive Director, WE ACT for Environmental Justice
- **Vasilis Vasiliou, PhD**, Department Chair and Susan Dwight Bliss Professor of Epidemiology (Environmental Health Sciences), Yale School of Public Health
- **Nick Watts, MD**, Chief Sustainability Officer, National Health Service, United Kingdom
- **Sacoby Wilson, PhD**, Associate Professor, the Maryland Institute for Applied Environmental Health and Department of Epidemiology and Biostatistics, School of Public Health, University of Maryland-College Park
- **Yawei Zhang, MD, PhD, MPH**, Associate Professor, Department of Surgery, Yale School of Medicine; Department of Environmental Health Sciences, Yale School of Public Health

[New Staff](#)

Mr. Mauro Diaz-Hernandez, the new YCCCH Program Administrator, joined YCCCH in January 2020. Mr. Diaz-Hernandez manages YCCCH activities including the Student Associates Program, the Climate Change and Health Concentration, and the Mentorship

Program. He also leads YCCCH communications activities, which has allowed for greater focus in this important area.

[Affiliated Faculty](#)

On June 30, 2020 we had 32 [Affiliated Faculty](#), 24 with primary appointments at YSPH and 8 with primary appointments in other schools or departments.

[Student Assistants](#)

Melpomene Vasiliou, a second-year MPH student in the Department of Environmental Health Sciences, served as the YCCCH Student Associate Coordinator. She managed the Student Associates program and organized the annual Advocacy Workshop. She also served as a Research Assistant for the YCCCH report on climate change and health in Connecticut.

Saskia Comess, an MS student in the Department of Statistics, served as a Research Assistant for a systematic review and meta-analysis of the effectiveness of air conditioning and other indoor cooling methods for reducing heat-related morbidity and mortality.

Elizabeth Edgerly, a second-year MPH student in the Department of Epidemiology of Microbial Diseases, served as a Research Assistant for the YCCCH report on climate change and health in Connecticut.

Melia Bernal, a first-year MPH student in the Department of Health Policy and Management, served as a Research Assistant for the YCCCH Program on Healthcare Environmental Sustainability.

Tiffany Hu, a second-year MPH student in the Department of Health Policy and Management, helped support the work of the YSPH Sustainability Committee

[Affiliations](#)

YCCCH has affiliated with the following organizations:

- [Global Consortium on Climate and Health Education](#)
- [Planetary Health Alliance](#)
- [US Climate and Health Alliance](#)
- [Lancet Countdown: Tracking Progress on Health and Climate Change](#)
- [Connecticut Governor's Council on Climate Change](#)

[Communications](#)

We continue to maintain a [YCCCH website](#) within the YSPH website. The website recently underwent a significant update to reflect the expansion to a Center. We also have an active Twitter account (@cchyale). We have worked closely with the YSPH Communications Office to produce news articles highlighting YCCCH efforts, including articles on the [expansion into a center](#) and on the Center's contribution to the [2019 Report of the Lancet Countdown on Health and Climate Change](#).

Program Accomplishments

Research

Core Research Program

This new program was established with the arrival in July 2019 of Dr. Chen, who leads the program. The program aims to build a vibrant community of doctoral students, postdoctoral researchers, and collaborating faculty who will 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. The core research program currently includes Dr. Chen, Dr. Dubrow, three doctoral students, and one master's student. In the fall of 2020, we expect two additional YSPH doctoral students, a visiting doctoral student, and a postdoctoral researcher to join the program. The following relevant articles were published by program faculty during the period of this annual report:

- **Chen K**, Breitner S, Wolf K, Rai M, Meisinger C, Heier M, Kuch B, Peters A, Schneider A. [Projection of temperature-related myocardial infarction in Augsburg, Germany](#). *Dtsch Arztebl International* 2019;116:521-527.
- **Chen K**, Peters A, Schneider A. [Burden of myocardial infarctions attributable to heat and cold](#). *European Heart Journal* 2019;40:3440-1.
- Rai M, Breitner S, Wolf K, Peters A, Schneider A, **Chen K**. [Impact of climate and population change on temperature-related mortality burden in Bavaria, Germany](#). *Environmental Research Letters* 2019;14:124080.
- Vicedo-Cabrera AM, **Chen K**. [Living in a highly polluted and warmer environment: challenges for cardiovascular prevention](#). *European Journal of Preventive Cardiology* 2020;27:511-512.
- **Chen K**, Schneider A, Cyrus J, Wolf K, Meisinger C, Heier M, Scheidt WV, Kuch B, Pitz M, Peters A, Breitner S. [Hourly exposure to ultrafine particle metrics and the onset of myocardial infarction in Augsburg, Germany](#). *Environmental Health Perspectives* 2020;128:017003.
- Wang C, Zhu G, Zhang L, **Chen K**. [Particulate matter pollution and hospital outpatient visits for endocrine, digestive, urological, and dermatological diseases in Nanjing, China](#). *Environmental Pollution* 2020;261:114205.
- **Chen K**, Wang M, Huang C, Kinney PL, Anastas PT. [Air pollution reduction and mortality benefit during the COVID-19 outbreak in China](#). *The Lancet Planetary Health* 2020;4, e210-e212.

- **Chen K**, Vicedo-Cabrera AM, **Dubrow R**. [Projections of ambient temperature- and air pollution-related mortality burden under combined climate change and population aging scenarios: A review](#). *Current Environmental Health Reports* 2020;7:243-255.
- Rocklöv J, **Dubrow R**. [Climate change: an enduring challenge for vector-borne disease prevention and control](#). *Nature Immunology* 2020;21:479-487.
- Watts N, Amann M, Arnell N, Ayeb-Karlsson S, Belesova K, Boykoff M, Byass P, Cai W, Campbell-Lendrum D, Capstick S, Chambers J, Dalin C, Daly M, Dasandi N, Davies M, Drummond P, **Dubrow R**, Ebi KL, Eckelman M, Ekins P, Escobar LE, Montoya LF, Georgeson L, Graham H, Haggard P, Hamilton I, Hartinger S, Hess J, Kelman I, Kiesewetter G, Kjellstrom T, Kniveton D, Lemke B, Liu Y, Lott M, Lowe R, Sewe MO, Martinez-Urtaza J, Maslin M, McAllister L, McGushin A, Mikhaylov SJ, Milner J, Moradi-Lakeh M, Morrissey K, Murray K, Munzert S, Nilsson N, Neville T, Oreszczyn T, Owfi F, Pearman O, Pencheon D, Phung D, Pye S, Quinn R, Rabhaniha M, Robinson E, Rocklöv J, Semenza JC, Sherman J, Shumake-Guillemot J, Tabatabaei M, Taylor J, Trinanes J, Wilkinson P, Costello A, Gong P, Montgomery H. [The 2019 report of *The Lancet Countdown* on health and climate change: ensuring that the health of a child born today is not defined by a changing climate](#). *The Lancet* 2019;394:1836-1878.
- Moore ERH, Smith MR, Humphries D, **Dubrow R**, Myers SS. [The mismatch between anthropogenic CO2 emissions and their consequences for human zinc and protein sufficiency highlights important environmental justice Issues](#). *Challenges* 2020;11:4.

[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. Since 2018, Yale, represented by YCCCH, has been a member of the collaboration. Drs. Dubrow and Sherman were among the co-authors of the [2019 report](#), contributing indicators on mitigation in the healthcare sector and air conditioning: benefits and harms. The 2020 report is scheduled to be published in December 2020. Drs. Sherman and Bozzi served as reviewers for the ancillary [2019 Lancet Countdown on Health and Climate Change Policy Brief for the United States of America](#).

YCCCH hosted a [Yale Launch](#) of the Lancet Countdown 2019 Report at the Yale School of Public Health on November 21, 2019. Dr. Nick Watts, Executive Director of the Lancet Countdown, welcomed the audience via live video. Dr. Dubrow presented the key findings of the report, and he and Dr. Sherman presented the Yale-produced indicators in greater depth. There were 76 in-person attendees, and 33 viewed the livestream video. See the Yale news article, [YSPH Professors Call for Action, Optimism in Addressing Climate Crisis](#), on the launch event.

[Yale Program on Healthcare Environmental Sustainability](#)

The [Yale Program on Healthcare Environmental Sustainability](#) (Y-PHES), led by Dr. Jodi Sherman, now 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. The following articles were published by program faculty during the period of this annual report:

- Ryan EC, **Dubrow R, Sherman JD**. [Medical, nursing, and physician assistant student knowledge and attitudes toward climate change, pollution, and resource conservation in health care](#). BMC Medical Education 2020;20:200.
- **Sherman J**, Thiel C, MacNeill A, Eckelman MJ, **Dubrow R**, Hopf H, Lagasse R, Bialowitz J, Costello A, McGain F, Stancliffe R, Anastas P, Anderko L, Baratz M, Barna S, Bhatnagar U, Burnham J, Cai Y, Cassels-Brown A, Cimprich AFP, Cole H, Coronado-Garcia L, Duane B, Grisotti G, Hartwell A, Kumar V, Kurth A, Leapman M, Morris D, Overcash M, Parvatker A, Pencheon D, Pollard A, Robaire B, Rockne K, Sadler BL, Schenk B, Sethi T, Sussman S, Thompson J, Twomey JM, Vermund SH, Vukelich D, Wasim N, Wilson D, Young SB, Zimmerman J, Bilec MM. [The Green Print: advancement of environmental sustainability in healthcare](#). Resources, Conservation, and Recycling 2020;161:104882.
- Sanchez S, Eckelman M, **Sherman JD**, [Environmental and economic comparison of reusable and disposable blood pressure cuffs in multiple clinical settings](#). Resources, Conservation & Recycling 2020;155:104643.
- Wood D, **Sherman JD**, Beers R, Hopf F. [Balancing sustainability and infection control: the case for reusable laryngoscopes](#). Anesthesia Patient Safety Foundation Newsletter 2020 Feb
- **Sherman JD**, Feldman J, Chesebro B. [Inhaled anesthetic 2020 challenge: reduce your inhaled anesthetic carbon emissions by 50%!](#) ASA Monitor, April 2020
- Lagasse R, **Sherman JD**. [Safety & sustainability: more than doing the right thing](#). ASA Monitor, April 2020
- Hopf H, Chesebro B., **Sherman JD**. [Healthcare sustainability science: the next frontier for clinician scientists in anesthesiology](#). ASA Monitor, April 2020
- **Sherman JD**, MacNeill A, Thiel C. [Reducing pollution from the health care industry](#). JAMA 2019;322:1043-1044.

Speaker Series on Climate Change and Health

During the 2019-20 academic year, we sponsored three events:

- Jason West, PhD: Professor in the Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill: [Connecting Climate Change, Air Pollution, Energy and Human Health](#)
- Leon Robertson, PhD: Professor Adjunct, Yale School of Public Health: *Global Warming and Road Deaths: Evidence for Amplifying Feedback of Warming and Vehicle Emissions*
- Lewis Ziska, PhD: Associate Professor, Environmental Health Sciences, Columbia University Irving Medical Center: [Climate, CO₂, Plants, and Public Health: Ignorance is NOT Bliss](#)

Climate Change and Health Pilot Research Grant

The purpose of this \$30,000 award is to catalyze climate change and health research among our faculty. The expectation is that the pilot project will allow faculty to gather preliminary data necessary to apply for federal or foundation grants. The 2019-20 award went to Principal Investigators Dr. Michelle Bell, Mary E. Pinchot Professor of Environmental Health, School of Forestry and Environmental Studies, and Joshua Warren, Associate Professor, Department of Biostatistics for a project entitled “Exposure to Greenspace and risk of hospital admissions under a changing climate.” The following is the project abstract:

The world is undergoing unprecedented urbanization with a growing fraction of the population living in cities, which contributes to an urban heat island effect. Simultaneously, climate change is increasing the overall temperature and temperature extremes (e.g., heat waves). Previous research indicates that greenspace improves health; however, little is known about the *temporal trends* in how greenspace affects health. Decisions made regarding urban greenspace in upcoming years will have impacts on health for many decades. To understand greenspace and health in a changing climate, scientific evidence is needed on how the health impacts of urban greenspace change over time within this complex system. We propose to: 1) estimate exposure to greenspace using satellite exposure at the ZIP-code level for 10 major United States (U.S.) cities, including how these exposures change over time; 2) develop a statistical model to estimate the temporal trend in the association between greenspace and risk of cardiovascular and respiratory hospital admissions for older persons in the U.S.; and 3) apply the exposure estimates from Aim 1 and modeling method in Aim 2 to estimate how the association between greenspace and hospital admissions changes over time. These findings will provide the preliminary data and methods to be used in an R01 to investigate the system of greenspace, temperature, climate change, and health, including temporal trends in health effects. Results from the pilot study and the larger project will inform city-level decision makers in developing the most effective climate change mitigation strategies.

Donation to support research

We received a \$51,285 donation to support YCCCH climate change and health research. We are applying these funds toward a postdoctoral associate for Dr. Chen.

Education

Climate Change and Health Concentration for MPH Students

YCCCH received approval from the YSPH Education Committee to create a [Climate Change and Health Concentration](#) for MPH students. Concentrations are cross-departmental programs, with specific requirements, that are open to all MPH students, regardless of department. Matriculation will begin in the 2020-21 academic year.

The Concentration course requirements are as follows:

- EHS 547, *Climate Change and Public Health*
- EHS 560, *Methods in Climate Change and Health Research*
- EPH 555, *Clinic in Climate Justice, Climate Policy, Law, and Public Health*
- EPH 570 and 571, *Seminar in Climate Change and Health*
- Two courses from an approved list of electives

It is also recommended that students complete a thesis with a substantive focus on climate change and health and a summer internship related to climate change and health.

Major Health Threats: Determinants and Solutions

As in 2018, Dr. Dubrow taught a seven-session module on climate change and health in the MPH core course, EPH 513, *Major Health Threats: Determinants and Solutions*. The following is the course description:

Modern innovation and lifestyle have had unintended consequences to public and global health. In this course students will explore three of these major health threats (MHT): Antimicrobial Resistance, Climate Change and Public Health, and Obesity. Using these topics, our goal is to achieve foundational knowledge of the ecological perspectives in human, animal and ecosystem health (one health), environmental factors in population health, biological and genetic factors that affect population health, as well as the impact of globalization and modernization on global disease burden. This course takes a modular format that includes lecture and breakout sessions. Small, cross-disciplinary groups will be used throughout the semester to actively apply concepts, hone data interpretation skills, as well as frame research, health solutions, systems thinking, and health communication.

See the [course syllabus here](#). All MPH students are required to take this course and therefore were exposed to the topic of climate change and health.

[Clinic in Environmental/Climate Justice, Sustainability, and Public Health](#)

This course is an expanded version of EPH 555, *Practicum in Climate Change, Sustainability, and Public Health*, which Dr. Dubrow has taught since 2017. The course, now called a clinic, is offered in both the fall and spring semesters, and most clinic projects that began in the fall semester continued in the spring semester. (Students could enroll in the course for one or both semesters.) The course was cross-listed with the School of Forestry & Environmental Studies and was co-taught by Dr. Dubrow, Dr. Bozzi, and [Ms. Marianne Engelman-Lado](#), a YCCCH Affiliated Faculty member and a lawyer with a long history working in the environmental justice movement. The following is the course description:

In this course, interdisciplinary student teams carry out applied public health research or practice projects in the areas of environmental/climate justice, climate change, sustainability, and public health. Each team works with a sponsoring organization (e.g., unit within Yale, local health department, state agency, community organization, other non-governmental organization). The course affords the opportunity to apply concepts and competencies learned in the classroom to these important areas of environmental/climate justice, climate change, sustainability, and public health. This course should be of interest to students across Yale School of Public Health, Yale School of Forestry & Environmental Studies, and the University, including Yale College juniors and seniors. In addition, this course is one of the options available to students to fulfill the practice requirement for the MPH degree.

Enrollment in the course is by application only. Twenty-two students took the course in the fall and seventeen in the spring term. Each student who enrolled became a member of a student team working on one of the following projects:

Title	Organizational Partner
Connecticut & Climate Change: Leader or Laggard? <i>(fall and spring semesters)</i>	Connecticut Fund for the Environment/Save the Sound
Connecticut Environmental Justice Tool <i>(fall and spring semesters)</i>	Environmental Justice Program, Connecticut Department of Energy & Environmental Protection
Health & Environmental Justice in Alabama: Pollution Impacts in Two Low-Income African American Communities <i>(fall semester)</i>	Ashurst Bar/Smith Community Organization (Tallassee), Tuskegee University (Tallassee), Black Belt Citizens Fighting for Health & Justice (Uniontown), the School of Public Health, University of Maryland-College Park (Uniontown), and the EJ Clinic at Vermont Law School
Managing Non-Communicable Diseases after Natural Disasters in the Caribbean <i>(spring semester)</i>	Eastern Caribbean Health Outcomes Research Organization
Countering Environmental Racism in Cosmetics: Research Support for the #BeautyInsideOut Campaign <i>(fall and spring semesters)</i>	WE ACT for Environmental Justice
Urban Forestry for Climate and Health <i>(fall and spring semesters)</i>	American Forests
Yale Food Cart “Green Certification” Initiative <i>(fall semester)</i>	Yale Sustainability Implementation Steering Committee

See the [fall semester syllabus here](#) and the [spring semester syllabus here](#).

The clinic will continue in the 2020-21 academic year under a new name: *Clinic in Climate Justice, Climate Policy, Law, and Public Health*.

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 additional programming such as workshops and skill-based training, film screenings, and student-led presentations/discussions. Melpomene Vasiliou, a second-year MPH student, served as the 2019-20 program coordinator. We have seen interest in this program grow significantly. For the 2018-19 program we received 60 applications for 20 spots. As a result, we doubled the size of the program in 2019-20, accepting 44 students from across the university, representing the Schools of Public Health, Forestry and Environmental Studies, Nursing, Medicine, Divinity, Architecture, and Engineering; the Jackson Institute for Global Affairs; and Yale College.

The Students Associates participated in seminars with climate scientist and environmental justice advocate Nicole Hernandez Hammer; The Nature Conservancy soil scientist, Dr. Stephen Wood; and Dr. Rebecca French, Director of Resilience for the Connecticut Department of Housing. The students also attended special Student-Associates-only discussion sessions with Dr. Jason West, Dr. Leon Robertson, and Dr. Lewis Ziska. Once the COVID-19 pandemic required the Student Associates Program activities to shift online, the group continued meeting. The students participated in a film discussion on “L'Eau est la Vie,” making use of the

[Environmental Film Festival at Yale's](#) shift to an online format. A sub-group also worked together to apply to the American Public Health Association Student Champions for Climate Justice competition, although the application was not successful.

To further support the Student Associates' academic and professional development in the field of climate change and health, we expanded the program to provide additional resources. First, we launched the Mentorship Program, pairing 12 students with experts in the field who we had recruited to participate. Second, we created a formal procedure for Student Associates to apply for conference funding, granting funds to one student to support her travel to Madrid, Spain to attend the United Nations Framework Convention on Climate Change (UNFCCC) annual Conference of the Parties (COP) 25. Finally, we expanded the Summer Internship Program eligibility to include Student Associates outside of YSPH.

Online Certificate Program in Climate Change and Health

YCCCH has continued to offer the well-regarded online [Climate Change and Health Certificate](#) program. The program prepares public health professionals and those in related fields to address the health impacts of climate change and is open to any qualified person in the world. This 18-week program consists of three consecutive six-week courses: *Introduction to Climate Change and Health* (instructor: Robert Dubrow), *Climate Adaptation for Human Health* (instructor: Kathryn Conlon, Epidemiologist, Assistant Professor, Department of Public Health Sciences, School of Medicine, University of California, at Davis), and *Communicating Climate Change and Health* (instructor: Connie Roser-Renouf, Associate Research Professor, Center for Climate Change Communication, George Mason University). While focusing on distinct topics, all three courses interweave common themes of climate change health impacts, vulnerability and health equity, and the health co-benefits of mitigation and adaptation.

The curriculum includes video-recorded lectures that students can view at their convenience, readings, quizzes and short assignments, weekly live discussion sessions conducted via Zoom, each with 15 or fewer students, led by a discussion leader (typically a doctoral student), and a concluding assignment. We offered the program in September 2019 (Cohort 3) and in February 2020 (Cohort 4). Cohort 3 included 73 students representing 15 countries; Cohort 4 included 86 students representing 8 countries. In student evaluations, 99% would recommend the certificate program to others and 97% rated the program as excellent or very good.

The alumni network has continued with active participation. The alumni meet regularly via Zoom, have a dedicated website, and share resources via an online platform. We also have begun to integrate the Certificate alumni into YCCCH programming, including by inviting select alumni to serve as mentors for Student Associates.

We charged \$2,000 for matriculation into the certificate program. Full scholarships, discounts for members of professional organizations, and financial aid were offered. YCCCH received a net income of \$155,730 from the certificate program to support YCCCH activities.

Coursera Specialization

In September 2019, we launched a three-course [Coursera Specialization, Climate Change and Health: From Science to Action](#). Coursera is an online course platform with a large, global reach. The Specialization is an abridged version of the online certificate program that better fits the needs of learners who want an introductory learning experience with a smaller time commitment or who are looking to complete the courses at their own pace. The cost is substantially lower: a three-month Coursera subscription costs \$147, and the courses also are free to audit (in this case, the learner does not receive a certificate of completion).

Select statistics and testimonials for each of the three courses, September 2019 – June 2020, are as follows:

Course (Instructor)	Enrollment Statistics			Average rating
	Visitors	Enrolled in course	Completed course	
<i>Introduction to Climate Change and Health</i> (R. Dubrow)	26,184	6,400	1,534	4.7/5 (based on 204 reviews)
<i>Climate Adaptation for Human Health</i> (K. Conlon)	6,308	1,146	190	4.6/5 (based on 34 reviews)
<i>Communicating Climate Change and Health</i> (C. Roser-Renouf)	7,240	1,235	158	4.6/5 (based on 24 reviews)

Student testimonials include:

- *Introduction to Climate Change and Health*: "This course was fantastic. Really opened up my eyes. I highly recommend as a tool for learning more about our planet and the effect we have on it. On the smallest scale, it's given me passion to pursue mitigation efforts to help lessen climate change personally, and on the largest scale, it's given me the knowledge and confidence to discuss climate change with friends and family, reconstructing their ideas about the reality of this problem and changing their responses for the better of the planet."
- *Climate Adaptation for Human Health*: "I am an undergraduate student in the University of Peradeniya, Sri Lanka. I am doing Environmental Science special degree currently and hoping to go for PhD in the near future. So the knowledge I got from this course is very useful. Thank you so much for offering this valuable course."
- *Communicating Climate Change and Health*: "Communicating climate change is a challenging endeavor. Professor Roser does a very good job breaking down the different aspects of communication that we have to consider as messengers. The methodology of segmenting the population to design different message strategies is well explained. I enjoyed learning about the 6 Americas framework. I would advise anyone interested in climate change and health to take this course."

Summer Internships in Climate Change and Health

In 2020, YCCCH revised its summer internship program to meet expanded interest in the field of climate change and health. First, we opened the program to not only MPH students but also to YCCCH Student Associates. Second, we created a two-step process in which students applied to be matched with one of the summer internship projects we had solicited from partner organizations, and then the selected students applied for funding from sources including – but not limited to – YCCCH. This revised process allowed us to continue building connections with key partner organizations, and it allowed us to expand our reach by leveraging other Yale funds to support the students. Through this process, we supported four student internships:

- Yihui Chen (YSPH): The Science Based Targets Network. Project: *Building Partnerships to Reduce GHG Emissions from Food Companies in China*
- Nicholas Elton (YSPH): Connecticut Department of Public Health. Project: *A Survey of Cooling Station Practices in Connecticut and Local Indicators of Climate and Health*

- Emily McInerney (School of the Environment & Jackson Institute): WE ACT for Environmental Justice. Project: *Cooling Center Audit*
- Zoe Novic (YSPH): Yale Equity Research and Innovation Center. Project: *A Plan to Reduce Non-Communicable Disease-Related Morbidity and Mortality After Natural Disasters*

Climate Change and Health Pre-Doctoral Fellowships

Our first pre-doctoral fellow, Alyssa Parpia, completed her fourth year in the YSPH doctoral program in the Department of Epidemiology of Microbial Diseases. She entered the program with an interest in the mathematical modeling of infectious disease risks in relation to climate change. However, over the past three years her interests have broadened to infectious disease modeling in general. One of her dissertation's three aims involves spatiotemporal analysis of climatic and socio-economic drivers of dengue incidence in Costa Rica. She has completed her three years of funding by YCCCH and is now funded by other sources. Her dissertation advisor is [Dr. Alison Galvani](#).

Sappho Gilbert, our second pre-doctoral fellow, completed her third year, during which her stipend and half her tuition was funded by a Fox Fellowship awarded by the Yale MacMillan Center. She is interested in the effects of climate change on food security in indigenous Arctic communities. Her dissertation title is "Mapping and monitoring community nutrition in transition in Nunavut, Canada." Her dissertation advisor is Dr. Dubrow.

Lingzhi Chu (funded by the China Scholarship Council) completed her second year. She is interested in the relationship between extreme heat, air pollution, and their interactions in relation to kidney disease. Dr. Dubrow is her advisor.

Yiqun Ma (funded by the China Scholarship Council) completed her first year. Dr. Chen is her advisor.

Chengyi Lin (funded by the China Scholarship Council) was admitted into the doctoral program and will matriculate in August 2020, with Dr. Chen as her advisor.

Jazmin Diaz Rivera (funded by a University Fellowship) was admitted into the doctoral program and will matriculate in August 2020, with Dr. Chen as her advisor.

Public Health Practice

Climate Change and Health in Connecticut: 2020 Report

Climate Change and Health in Connecticut: 2020 Report is slated for public launch in September 2020, the result of significant investment of effort during Year 5. The report tracks 19 indicators related to climate change and health in Connecticut in four domains: temperature, extreme events, infectious diseases, and air quality. Its purpose is to inform policymakers, health professionals, advocates, and residents about the impact of climate change, now and in the future, on human health in Connecticut. The indicators have been developed using publicly available data from state and federal agencies, peer-reviewed literature, and medical associations. Where possible, we directly tracked trends in health impacts (e.g., West Nile virus infections; emergency department visits and hospitalizations for heat stress). However, because of the relative paucity of Connecticut-specific data on health impacts associated with climate change, we also tracked environmental and climate conditions (e.g., drought; outdoor allergens) that can lead to adverse health outcomes. Finally, we tracked indicators related to the impacts

caused by the drivers of climate change (specifically, air quality impacts largely driven by fossil fuel combustion).

The report coincides with the Governor's Council on Climate Change (GC3) process to complete an updated *Adaptation and Resilience Plan* for Connecticut and the GC3's annual report on the state's climate mitigation progress. Dr. Bozzi is a member of the GC3 Public Health and Safety Working Group that is authoring a chapter of the *Adaptation and Resilience Plan*.

Advocacy Workshop

YCCCH organized and hosted the *Advocacy Training for Climate Action* workshop on January 31, 2020. The workshop was developed in collaboration with the Union of Concerned Scientists. Sessions addressed how to: (1) communicate a message in ways that motivate action; (2) employ social media and traditional media as effective advocacy tools; (3) build power through collective action by centering social justice in advocacy; (4) contact a legislator, write a public comment letter, and other individual advocacy actions; and (5) translate one's role as a scientist or other scholar into effective advocacy. The sessions were led by experts from the following local and national organizations: Collaborative Center for Justice, Union of Concerned Scientists, Connecticut Roundtable on Climate and Jobs, and Topos Partnerships. Approximately 20 students participated in the workshop.

Event Sponsorship

YCCCH co-sponsored four events related to climate change and health:

- [Yale Environmental Sustainability Summit](#) (November 1, 2019) sponsored at the Bronze Level
- [Lancet Countdown Washington D.C. 2019 Launch Event](#) (November 18, 2019)
- [2019 Northeast Multimodal and Transit Summit](#) (November 25, 2019) sponsored at "Paying-it-Forward" level
- [Environmental Film Festival at Yale](#) (March 31 to April 4, 2020)

YSPH Commitment

Pre-doctoral Fellowships

As committed, YSPH paid half the tuition and the full health insurance for our Climate Change and Health Pre-Doctoral Fellow, Sappho Gilbert.

Sustainability Committee

In 2015, YSPH established a Sustainability Committee, co-chaired by Dr. Dubrow and Heidi Richard (Chief of Staff, Office of the Dean). This is the Committee's vision: "We envision a YSPH in which the integral relationship between sustainability and health is seamlessly incorporated into our teaching, research, practice, operations, and culture." This is the Committee's mission: "the YSPH Sustainability Committee guides the School's efforts to implement its ongoing Sustainability Action Plan, which includes the areas of energy and greenhouse gas emissions; natural and built environment; materials management; food and well-being; and sustainability leadership and capacity building; the Committee's efforts at greenhouse gas reduction will be guided by both the Sustainability Action Plan and the school-

wide Climate Change and Health Initiative. The Committee collaborates with YSPH faculty, students and staff and the Yale Office of Sustainability to achieve its goals.”

The membership of the Committee for the 2019-20 academic year was:

- Dr. Robert Dubrow, Professor of Epidemiology (Environmental Health Sciences; (co-chair)
- Heidi Richard (Administrative Director, Office of the Dean) (co-chair)
- Dr. Paul Cleary, Professor of Public Health Policy
- Dr. Brian Weiss, Research Scientist in Epidemiology (Microbial Diseases)
- Dr. Debbie Humphries, Clinical Instructor in Epidemiology (Chronic Diseases)
- Dr. Peter Krause, Senior Research Scientist in Epidemiology (Microbial Diseases)
- Elizabeth Eocaci-Tucker, Senior Administrative Assistant
- Jennifer Farkas, Director of Financial Aid
- Elizabeth White, PhD student
- Cassie Clark, PhD student
- Tiffany Hu, second-year MPH student
- Nicholas Elton, first-year MPH student

The committee is guided by a [YSPH Sustainability Action Plan](#), developed in 2018 in coordination with the [Yale Sustainability Plan 2025](#). Our main accomplishment during the 2019-20 academic year was a commitment by YSPH to develop and implement a workable policy to eliminate single-use plastics (as well as other single-use items) at catered events starting with the fall 2020 semester. This commitment, which was announced on Earth Day 2020, was the culmination of a multi-year process that we started in the 2017-18, when we provided YSPH-branded reusable food and beverage containers (eco-boxes, tumblers, and sporks) to the entire YSPH community and then initiated a school-wide Bring Your Own (BYO) campaign. In 2018-19 and in 2019-20, we provided these items to all incoming students and to new faculty and staff, and we continued to promote the use of non-disposable items at catered events. We found accomplishing such a cultural/behavioral shift to be difficult and to require constant reinforcement. In 2019-20, we decided that an incremental approach was not sufficient, that bold action was needed, and that [YSPH needed to take a leadership role](#). We initiated a process of education of and consultation with students, staff, faculty, and the YSPH leadership team, and we also conducted a [survey](#). This process culminated in the [Earth Day announcement](#). Unfortunately, due to the Covid-19 pandemic during which almost all YSPH activities have been virtual and catered events have been banned, we are postponing implementation of this policy until YSPH returns to normal operations, hopefully in the fall 2021 semester.

Other accomplishments of the Sustainability Committee include:

- Installation of living walls in the doctoral student and Office of Finance & Administration suites, as well as in some common space. All of these spaces do not have windows. Living walls provide both mental and physical health benefits, especially in the context of spaces with no windows. These installations represented an expansion of a project that began in 2018-19 with the installation of six living walls in four basement classrooms.
- A [Climate Action Event](#) at YSPH that involved writing postcards to the governor and state legislators to urge them to declare a climate emergency, voter registration, and pledges to lessen one’s personal carbon footprint through specific actions.

- Two “Bring Your Own Container” Pie Days on [November 21](#) and [February 6](#), during which we served locally-baked pies, but only to people who brought their own reusable containers and silverware. The purpose was to promote use of reusable foodware.
- Purchase and distribution of YSPH-branded collapsible silicon ecoboxes, tumblers, and canvas bags for all incoming students, new faculty, and new staff for the 2019-20 academic year.

Other YSPH Support

- Use of all net revenue from the online Climate Change and Health Certificate program to support YCCCH activities.
- Full funding and a generous start-up package for Dr. Chen as a core faculty member of YCCCH.

Major Year 6 Goals

Year 6 will focus on implementing the first year of our four-year strategic plan. Highlights include:

- **Climate Change and Health Concentration for MPH Students.** During the fall 2020 semester, we will enroll students into the Concentration from the class of 2022. Our goal is for this inaugural cohort to include five students.
- ***Climate Change and Health in Connecticut: 2020 Report.*** We aim to publish and disseminate the report in the fall of 2020.
- **Policy Impact Unit.** We will launch a Policy Impact Unit, led by Dr. Bozzi, to maximize the policy impact of YCCCH activities. Its initial focus will be development of four issue briefs based on the *Climate Change and Health in Connecticut: 2020 Report*. The briefs will correspond to the four domains of the report: temperature, extreme events, infectious diseases, and air quality (including the health co-benefits of climate change mitigation). Each brief will include a summary of the relevant report findings, stories and photos from impacted Connecticut residents, and prioritized policy recommendations that can be accomplished through legislative, state agency, or municipal action. To develop the briefs and recruit residents to spotlight, we will work with our partners, including Save the Sound, East Shore District Health Department, Health Equity Solutions, and the American Lung Association.
- **Strategic International Collaboration.** We aim to develop one strategic international collaboration, most likely in the Caribbean. Although the Caribbean islands have made negligible contributions to the world’s greenhouse gas emissions, these low-lying, mostly underdeveloped islands, with very limited resources, are among the most vulnerable countries in the world to the adverse effects of climate change due to their propensity to be hit by hurricanes/typhoons, which are becoming more intense due to climate change, and accelerating sea level rise, also caused by climate change, posing many public health challenges.
- **Seminar in Climate Change and Health.** We will expand our speaker series, ongoing since 2015, into a not-for-credit seminar course that will meet four times each semester. The seminar will cover a wide variety of topics related to climate change and health, and will feature talks by Yale and non-Yale researchers, policymakers, and climate justice

advocates. The seminar will be a required course for students in the Climate Change and Health Concentration, but will be open to all members of the YSPH and Yale communities.

- **Fundraising.** We aim to secure at least two major new grants or donations. Funding the Policy Impact Unit is a high priority.