COLUMBIA | MAILMAN SCHOOL OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH SCIENCES

Climate & Health

The ***Climate and Health Program***, launched in 2008, has a mission to foster innovative scholarship on the human health dimensions of climate change impacts and vulnerabilities, and to provide information of direct value in climate adaptation and mitigation planning. We train PhD and DrPH students, and postdoctoral scientists in the design and conduct of cutting edge research on mechanisms linking climate to ill-health as well as on methods for assessing health impacts and benefits of future climate policy scenarios. We also offer the first ever MPH certificate in climate and health.

TABLE OF CONTENTS

Successful thesis defense by PhD candidate, Carlos Gould

Carlos Gould completed his PhD in Environmental Health Sciences in the Climate and Health Program in July 2021. His thesis, titled "As the smoke clears: assessing the air pollution and health benefits of a nationwide transition to clean cooking fuels in Ecuador," studies the impact of Ecuador's nationwide transition from biomass to gas cooking, facilitated by long-standing subsidies, on air pollution exposure and children's health. Weaving together tailored energy access surveys, state-of-the-science sensors, and administrative data, he shows that despite cheap and accessible cooking gas, a large portion of Ecuadorian households still use biomass for some of their daily cooking and heating needs, leading to air pollution exposure above health-based guidelines. Nonetheless, Carlos's research shows that Ecuador's investments in cooking gas subsidies over the last three decades have facilitated reductions in lower respiratory infection mortality among children under 5 years.

Throughout his time at Columbia, Carlos built a research agenda focused on the potential for household energy transitions to address climate change and improve health by reducing air pollution exposure. In particular, he studied the adoption and use of cooking gas in India and evaluated the impacts of clean cooking interventions on air pollution exposure and health in Ghana.

Carlos is now a Stanford Earth Postdoctoral Fellow, where he is investigating (1) the impacts of India's ongoing clean cooking transition on air quality, health, and climate and (2) the health and climate benefits of clean-to-cleaner fuel transitions (e.g., from gas to renewable-based electricity).

Successful thesis defense by PhD candidate, Israel Ukawuba

Israel Ukawuba completed his PhD in Environmental Health Sciences in the Climate and Health Program in July 2021. His thesis work, "Use of climate in a simple entomological framework to improve dynamic simulation and forecast of malaria transmission," developed a parsimonious, dynamical model for malaria transmission, with direct climate modulation of the ecology of the malaria parasite and vector. He identified important ecological pathways by which climate drives local transmission and used this climate-based model to explain malaria variability over several seasons across local communities in sub-Saharan Africa. He also developed a novel dynamical forecasting system for malaria incidence based on the climate-driven model and a highly promising forecasting framework. With this system, he generated real-time forecast of malaria incidence for 42 communities and 5 regions in a malaria endemic country.

Israel started a postdoctoral position in August at the Heller School, Brandeis University, where he is teaching and researching infectious disease epidemiology.

New faculty

Cecilia Sorensen, Director of the Global Consortium for Climate and Health Education and Associate Professor of Environmental Health Sciences

Cecilia conducts research on the links between climate change and health, including studies on how wildfire smoke is increasing ICU admissions, the links between heat stress and chronic kidney disease, and how climate change threatens to widen existing gender-based health disparities. In 2017, she was named the first Climate and Health Science Policy fellow through a joint program between the National Institute of Environmental Health Sciences and the University of Colorado. She earned her MD at Drexel University College of Medicine and completed residency training in emergency medicine at Denver Health.
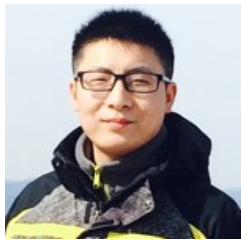
Sen Pei, Assistant Professor of Environmental Health Sciences

Sen studies transmission dynamics of infectious diseases using mathematical models and computational tools. His recent studies focus on the spatial spread of influenza, dengue, and COVID-19, as well as the transmission of antimicrobial-resistant pathogens in health care systems. His goal is to better understand the environmental, social, and ecological drivers of disease transmission, to improve surveillance, forecasting, and control of infectious outbreaks. Previously, he served as an associate research scientist in Jeffrey Shaman's lab. He earned his PhD from Beihang University in China.

New doctoral student

Brittany Shea

Brittany received a master's degree from Harvard University and bachelor's degree from Boston University. Previously, she was the Project Director for the Global Consortium on Climate and Health Education (GCCHE), based at the Mailman School. Brittany has worked to advance research on environmental health and climate change in other roles at the Columbia Center for Children's Environmental Health, Harvard University's David Rockefeller Center for Latin American Studies in Santiago, Chile, and Harvard Business School. Brittany has presented internationally on climate-health education and environmental health topics. As a PhD student, she is interested in conducting research on the health impacts of climate change, climate-health mitigation and adaptation strategies, and environmental justice.

New staff as of spring 2021

Jaime Benavides
Postdoctoral
Research Scientist

Jaime completed his PhD in environmental engineering at Polytechnic University of Catalonia in the department of Earth Sciences at the Barcelona Supercomputing Center. His doctoral research focused on the development and application of a street-level air quality model for Barcelona, Spain. His primary research interests are in understanding the link between environmental exposures and human health in urban settings. At Columbia, he is applying novel methods to find patterns in urban environmental exposure mixtures aiming to investigate the impact of these patterns on adverse health outcomes. He is also involved in improving air pollution exposure assessment for large-scale population-wide epidemiologic studies.

Jaime Cascante Vega
Staff Associate

Jaime is Colombian and received his MSc and BSc from the Biomedical Engineering Department from Universidad de los Andes. His research interests lie in the intersection with mathematical modelling as a tool for understanding complex ecological and epidemiological phenomena and deep learning and statistical techniques as a tool for extracting hierarchical features of different data-sources and infer key parameters of the models. His previous research focused on developing mathematical models to forecast community spread and mortality of SARS-CoV2. He has also worked on developing theoretical models to include mechanisms behind the role of behavior in traditional epidemiological models. At Columbia, he is working on understanding the time-space spread on antimicrobial resistant pathogens, specifically of Methicillin-resistant Staphylococcus aureus (MRSA) using mathematical models combined with inference to better prevent, control, and forecast this healthcare associated infections. He will also help in the simulation and forecast of the spread of SARS-CoV2 at population scales.

Tal Robin
Postdoctoral
Research Scientist

Tal received his PhD from the Department of Physical Chemistry at Tel-Aviv University for his work on stochastic approaches to the analysis of kinetic schemes. His previous work included models of enzymatic reactions, adhesion, and pollination with emphasis on intuitive modeling. His main interests are stochastic processes, agent-based modeling, and statistical inference. At Columbia, Tal is working on a network-based model of antimicrobial-resistant pathogens spreading within hospitals in an effort to extract accurate estimations of model parameters and identifying individuals with increased risk. This work's aim is to advance knowledge about specific infections as well as the methods themselves.

Faculty and staff in the news

Robbie Parks	[Mailman News](#) Mar 09: Tropical Cyclone Exposure Linked to Rise in Older Adult Hospitalizations
Marianthi Kioumour-tzoglou	[Health Day](#) May 18: Smoggy Air Might Raise Black Women's Odds for Fibroids
Frederica Perera	[Environmental Health News](#) Aug 06: How joining a climate program could save Western Pennsylvania kids' lives and lungs
Wan Yang	[New York Times](#) Mar 31: The New Normal in N.Y.: High Virus Rates and a Steady Stream of Cases
Lewis Ziska	[Gothamist](#) Jul 01: How Trees Act As NYC's "Natural Air Conditioning Units"
Joan Casey	[The Hill](#) Apr 15: Let's close the park equity divide [Mailman News](#) Apr 26: The Looming Threat of Fracking to Public Health [NPR](#) May 15: Growing Power Outages Pose Grave Threat To People Who Need Medical Equipment To Live [Salon](#) Aug 28: Planting trees to offset the legacy of racist housing policies
Jeffrey Shaman	[USA Today](#) Mar 04: Three vaccines. Increased manufacturing. How US will have enough COVID-19 vaccine for every US adult in May – or even sooner [Associated Press](#) Mar 12: COVID-19 deaths falling but Americans 'must remain vigilant' [NPR](#) Mar 24: The Future Of The Pandemic In The U.S.: Experts Look Ahead [New Yorker](#) May 08: When Will It Be Safe to End Coronavirus Lockdowns? [CBS Miami](#) Jun 14: South Florida's Steamy Weather Might Help Suppress COVID Spread During Summertime [Washington Post](#) Jun 15: NIH study suggests coronavirus may have been in U.S. as early as December 2019 [Newsweek](#) Aug 15: As U.S. COVID Cases Rise, Deaths Could Hit Some States Harder Than Others [Mailman News](#) Aug 26: One in Three Americans Already Had COVID-19 by the End of 2020

Second years' summer practicum experiences

Tanya Isaac worked remotely with the Ministry of Health and Family Welfare for the National Indian COVID-19 War Room as a research intern. She conducted an in-depth analysis on clinical management strategies, containment and surveillance, human resources augmentation, vaccination programs, and infrastructure strengthening that were implemented in other countries during the pandemic, which could be replicated in India in anticipation of the third wave of COVID-19.

Kendall Kruchten worked with Professor Julie Herbstman at the Columbia Center for Children's Environmental Health on a research project seeking to fill a gap in the existing body of research on children's cosmetic products. She helped to develop a survey that investigated demographics, purchasing patterns, and use of such products amongst children aged 0-12 throughout the United States. She then analyzed the data which will be made publicly available and potentially used in an effort to improve regulations.

Christina Ng worked as a graduate research assistant for the Eco-epidemiology Lab at the Dept. of Ecology, Evolution and Environmental Biology (E3B) at Columbia University under Professor Maria Diuk-Wasser. She worked on research projects concerning ticks and mosquitos on Staten Island. The main focus of her practicum was the NYC Ticks project, for which she conducted surveys with residents of Staten Island to investigate how their behaviors and perceptions impacted their risk of exposure to ticks and tick-borne illnesses. Tasks also included dragging for ticks, using special traps to collect animal hair, and setting up wildlife cameras to monitor fauna that may be potentially transporting ticks or serving as Lyme disease reservoirs. She also assisted in the lab performing species identification for tick specimens obtained in the field.

Second years' summer practicum experiences

Zoe Siegel interned with the CUNY Urban Food Policy Institute. The institute focuses on evidence to inform municipal policies that promote equitable access to healthy, affordable food. She worked closely with the policy researchers, helping track food policies changes in the local and regional areas of New York. She also spent most of her time qualitatively analyzing and coding various stakeholder interviews for the Regional Food Tracking Equity Program.

Zhiru Wang worked at Columbia Center for Children's Environmental Health (CCCEH) as Communications Intern for the Community Outreach & Translation Core. Her project involved assisting with data analysis and development of visual deliverables for the Environmental Health Justice (EHJ) Needs Assessment Report. She also created EHJ Public Service Announcements on topics including air pollution, BPA, and climate change, highlighting the Center's research and EHJ messages to improve dissemination. In addition, she posted CCCEH research, activities, and news on its social media platforms, and assisted the Coordinator with community outreach and communication activities.

RESEARCH

Awards

Professor Jeffrey Shaman was awarded a subcontract through CDC and Council of State and Territorial Epidemiologists (CSTE) for a project on 'Heterogeneous forecast and nowcast of COVID-19 at county scale.'

Professor Joan Casey was awarded an RF1 grant from the National Institute on Aging (NIA) on 'Short and long-term consequences of wildfires for Alzheimer's disease and related dementias.'

Association between county-level coal-fired power plant pollution and racial disparities in preterm births from 2000 to 2018

Affiliated Investigators: Misbath Daouda, Marianthi Kioumourtzoglou, and Joan Casey
Journal: Environmental Research Letters

Coal has historically been a primary energy source in the US. The byproducts of coal combustion, such as fine $PM_{2.5}$, have increasingly been associated with adverse birth outcomes. The goal of this study was to leverage the current progressive transition away from coal in the US to assess whether coal $PM_{2.5}$ is associated with preterm birth (PTB) rates and whether this association differs by maternal Black/White race/ethnicity. Using a novel dispersion modeling approach, we estimated $PM_{2.5}$ pollution from coal-fired power plants nationwide at the county-level during the study period (2000–2018). We also obtained county-level PTB rates for non-Hispanic White and non-Hispanic Black mothers. We used a generalized additive mixed model to estimate the relationship between coal $PM_{2.5}$ and PTB rates, overall and stratified by maternal race. We included a natural spline to allow for non-linearity in the concentration–response curve. We observed a positive non-linear relationship between coal $PM_{2.5}$ and PTB rate, which plateaued at higher levels of pollution. We also observed differential associations by maternal race; the association was stronger for White women, especially at higher levels of coal $PM_{2.5}$ (>2.0 µg m^{-3}). Our findings suggest that the transition away from coal may reduce PTB rates in the US.

Burden and characteristics of COVID-19 in the United States during 2020

Affiliated Investigators: Sen Pei, Teresa Yamana, Sasi Kandula, Marta Galanti, and Jeffrey Shaman
Journal: Nature

The COVID-19 pandemic disrupted health systems and economies throughout the world during 2020 and was particularly devastating for the US, which experienced the highest numbers of reported cases and deaths during 2020. Many of the epidemiological features responsible for observed rates of morbidity and mortality have been reported; however, the overall burden and characteristics of COVID-19 in the US have not been comprehensively quantified. Here we use a data-driven model-inference approach to simulate the pandemic at county-scale in the US during 2020 and estimate critical, time-varying epidemiological properties underpinning the dynamics of the virus. The pandemic in the US during 2020 was characterized by national ascertainment rates that increased from 11.3% (95% credible interval (CI): 8.3–15.9%) in March to 24.5% (18.6–32.3%) during December. Population susceptibility at the end of the year was 69.0% (63.6–75.4%), indicating that about one third of the US population had been infected. Community infectious rates, the percentage of people harboring a contagious infection, increased above 0.8% (0.6–1.0%) before the end of the year, and were as high as 2.4% in some major metropolitan areas. By contrast, the infection fatality rate fell to 0.3% by year's end.

Select recent publications

Rader B, White LF, Burns MR, Chen J, Brilliant J, Cohen J, **Shaman J**, Brilliant L, Kraemer MU, Hawkins JB, Scarpino SV. Mask-wearing and control of SARS-CoV-2 transmission in the USA: a cross-sectional study. The Lancet Digital Health. 2021 Mar 1;3(3):e148-57.

Lamb MR, **Kandula S, Shaman J**. Differential COVID-19 case positivity in New York City neighborhoods: Socioeconomic factors and mobility. Influenza and Other Respiratory Viruses. 2021 Mar;15(2):209-17.

Elser H, **Parks RM**, Moghavem N, Kiang MV, Bozinov N, Henderson VW, Rehkopf DH, **Casey JA**. Anomalously warm weather and acute care visits in patients with multiple sclerosis: A retrospective study of privately insured individuals in the US. PLoS medicine. 2021 Apr 26;18(4):e1003580.

Nunez Y, Gibson EA, Tanner EM, Gennings C, Coull BA, Goldsmith J, **Kioumourtzoglou MA**. Reflection on modern methods: good practices for applied statistical learning in epidemiology. International journal of epidemiology. 2021 Apr;50(2):685-93.

Martínez-Alés G, Pamplin JR, Rutherford C, Gimbrone C, **Kandula S**, Olfson M, Gould MS, **Shaman J**, Keyes KM. Age, period, and cohort effects on suicide death in the United States from 1999 to 2018: moderation by sex, race, and firearm involvement. Molecular psychiatry. 2021 Apr 7:1-9.

Elser H, Morello-Frosch R, Jacobson A, Pressman A, **Kioumourtzoglou MA**, Reimer R, Casey JA. Air pollution, methane super-emitters, and oil and gas wells in Northern California: the relationship with migraine headache prevalence and exacerbation. Environmental Health. 2021 Apr 17;20(1):1-4.

Kruczkiewicz A, Klopp J, Fisher J, Mason S, McClain S, Sheekh NM, Moss R, **Parks RM**, Braneon C. Opinion: Compound risks and complex emergencies require new approaches to preparedness. Proceedings of the National Academy of Sciences. 2021 May 11;118(19).

Riddell CA, Goin DE, Morello-Frosch R, Apte JS, Glymour MM, Torres JM, **Casey JA**. Hyper-localized measures of air pollution and risk of preterm birth in Oakland and San Jose, California. International Journal of Epidemiology. 2021 May 31.

Rowland ST, Parks RM, Boehme AK, Goldsmith J, Rush J, Just AC, **Kioumourtzoglou MA**. The association between ambient temperature variability and myocardial infarction in a New York-State-based case-crossover study: An examination of different variability metrics. Environmental Research. 2021 Jun 1;197:111207.

Zebrowski A, Rundle A, **Pei S,** Yaman T, **Yang W**, Carr BG, Sims S, Doorley R, Schluger N, Quinn JW, **Shaman J**. A Spatiotemporal Tool to Project Hospital Critical Care Capacity and Mortality From COVID-19 in US Counties. American Journal of Public Health. 2021 Jun;111(6):1113-22.

Ma Y, **Pei S, Shaman J,** Dubrow R, Chen K. Role of meteorological factors in the transmission of SARS-CoV-2 in the United States. Nature Communications. 2021 Jun 14;12(1):1-9.

Kandula S, Shaman J. Investigating associations between COVID-19 mortality and population-level health and socioeconomic indicators in the United States: A modeling study. PLoS medicine. 2021 Jul 13;18(7):e1003693.

Jack DW, Ayuurebobi K, **Gould CF**, Boamah-Kaali E, Lee AG, Mujtaba MN, Chillrud S, Kaali S, Quinn AK, Gyaase S, Oppong FB. A cluster randomised trial of cookstove interventions to improve infant health in Ghana. BMJ global health. 2021 Aug 1;6(8):e005599.

Pei S, Liljeros F, **Shaman J.** Identifying asymptomatic spreaders of antimicrobial-resistant pathogens in hospital settings. Proceedings of the National Academy of Sciences. 2021 Sep 14;118(37).

Nunez Y, Boehme AK, Li M, Goldsmith J, Weisskopf MG, Re DB, Navas-Acien A, van Donkelaar A, Martin RV, **Kioumourtzoglou MA**. Parkinson's disease aggravation in association with fine particle components in New York State. Environmental Research. 2021 Oct 1;201:111554.

NIEHS Paper of the Month

A publication in Nature Communications, titled 'Tropical cyclone exposure is associated with increased hospitalization rates in older adults,' by Robbie Parks, postdoctoral research scientist, and Professor Marianthi Kioumourtzoglou was recognized in the Global Environmental Health newsletter. Their study estimated that nearly 17,000 additional hospitalizations per decade were associated with tropical cyclone exposures. The findings demonstrate the need for targeted preparedness strategies for hospital personnel before, during, and after tropical cyclones.

Climate Justice Symposium for Transforming Education

Brittany Shea, Project Director of the Global Consortium on Climate and Health Education (GCCHE), presented on GCCHE at the conference, 'Climate Justice Symposium for Transforming Education,' hosted by University of California and California State University in April 2021.

29th Annual Joint Safety and Environmental Professional Development Symposium

PhD candidate, Stephen Lewandowski, attended the 29th Annual Joint Safety and Environmental Professional Development Symposium presented by the Naval Safety and Environmental Training Center in April 2021. He gave a talk on 'Heat Stress Illness Exposure –Lag – Response Associations among Active-Duty Service-members.'

Modeling Infectious Diseases in Healthcare Network Meeting

Tal Robin, postdoctoral research scientist, gave a talk at the MInD-Healthcare Network Investigator Meeting in June 2021 on 'Development and Testing of a Hospital-Based Network Model-Inference System for Bacterial Infections in NYC.'

ISEE

Carlos Gould, PhD '21, gave a talk at the International Society of Environmental Epidemiology 33rd annual conference in August 2021 on 'Integrating monitor wearing data to estimate household air pollution exposure parameters in the Ghana Randomized Air Pollution and Health Study (GRAPHS).'
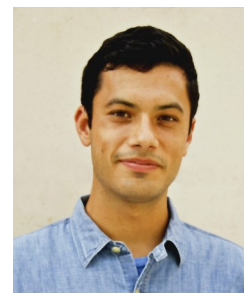
FEEDBACK

Please email the Program Coordinator, Haruka Morita, at hm2487@cumc.columbia.edu with questions or suggestions for future newsletter content. For more information about the Program, please visit our [website](#).