COLUMBIA UNIVERSITY | MAILMAN SCHOOL of PUBLIC HEALTH

CLIMATE AND HEALTH PROGRAM

Department of Environmental Health Sciences

NEWSLETTER Volume 7, Issue 1 *Fall 2017*

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.

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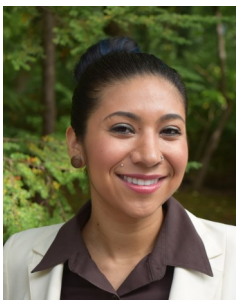
New faculty member—Professor Micaela Martinez



Dr. Martinez, Assistant Professor of Environmental Health Sciences, joined the Climate and Health Program on September 1st. She is an infectious disease ecologist. Her primary focus is understanding the drivers that shape seasonality in infectious disease systems, with particular interest in the impact of biological rhythms (i.e., circadian and circannual rhythms) on disease. Her current projects aim to inform vaccination policy by revealing how demographic, physiological, and environmental factors intersect in epidemic-prone disease systems, including poliomyelitis, measles, and chickenpox. Dr. Martinez also conducts research on maternal immunity in infants and is building a statistical inference pipeline for studying vaccine modes of action. She utilizes cutting-edge statistical inference techniques and mathematical models to couple disease incidence data with clinical data to gain insight into the transmission dynamics of disease.

For some recent news on Dr. Martinez, you can read a discussion (including debate) of her work calling for a National Vector Surveillance System, recently published in The Atlantic. She also recently published a paper in PLoS Biology proposing that the risk of congenital Zika infection can be reduced by taking advantage of a window of opportunity for conception that will align sensitive periods of gestation with the low-transmission season.

Successful thesis defense by PhD candidate, Eliza Little

Eliza Little defended her dissertation titled "The Influence of Climate and Socio-Ecological Factors on Invasive Mosquito Vectors in the Northeastern US: Assessing Risk of Local Arboviral Transmission" in June under the guidance of her advisor, Professor Jeffrey Shaman. Broadly, this dissertation explored the ecological underpinnings of two important mosquito vectors in the northeastern US. The overarching goal was to use empirical model-based predictions to anticipate changes to local mosquito populations and associated risks of arboviral transmission. This dissertation brought together three main research projects. The first was the development and validation of a climate-based ensemble prediction model for West Nile virus infection rates in *Culex* mosquitoes, Suffolk County, New York with coauthors J. Shaman and S. Campbell. The second investigated the socio-ecological mechanisms supporting high densities of Ae. *albopictus* in Baltimore, Maryland with coauthors S. LaDeau, P. Leisnham, S. Wilson, R. Jordan, and D. Biehler. The third project explored local environmental and meteorological conditions influencing the invasive mosquito *Ae. albopictus* and arbovirus transmission risk in New York City with coauthors W. Bajwa and J. Shaman.

Eliza now works at the Center for Vector Biology & Zoonotic Diseases at the Connecticut Agricultural Experiment Station as a post doc with funding from the CDC Northeast Regional Center for Excellence in Vector-borne Diseases. She is currently working on spatiotemporal dynamics of *Ixodes scapularis* ticks and Lyme disease in Connecticut over the past 21 years.

Faculty in the news

Professor Jeffrey Shaman was interviewed on the WNYC Only Human podcast Flu-dunnit? The story follows the staff of Only Human for 10 weeks as they participate in a respiratory virus study that combines elements of the Virome of Manhattan project and Professor Rumi Chunara's (NYU) GoViral project.

Listen to the podcast here.

Professor Marianthi-Anna Kioumourtzoglou was interviewed on New Republic in an article titled, "Air Pollution Denial Is the New Climate Denial." She discusses the challenges researchers face in studies on air pollution impacts on health that could potentially lead to the misunderstandings shared among air pollution deniers in understanding the air pollution burden on human health.

Read the article here.

Professor Darby Jack was featured in the New York Times for his study on monitoring air pollution exposure among bike commuters in New York City. Collected data will be used to develop a street-level pollution map and an app that will help bicyclists choose less polluted routes.

Read the article here.

Professor Jeffrey Shaman talked about climate change and human health for StatNews. In the video, he discusses how human civilization and development have relied on and been the beneficiaries of a relatively stable period of climate. But the climate system is now shifting radically and will profoundly affect human health and wellbeing.

Watch the episode here.

Darby Jack, recipient of Dean's Initiative Pilot Award

Professor Darby Jack was recognized at the State of the School Assembly for receiving the Dean's Initiative Pilot Award. These awards from the Dean's Office fund proposal that assist in the preparation of applications of NIH R01 grants or equivalent. Jack's project for this award is titled, 'Metagenomic analysis of the bacteriome associated with pneumonia in the Ghana Randomized Air Pollution and Health Study (GRAPHS).'

New doctoral students

Stephen Lewandowski

Originally from Ohio, Stephen received a Bachelor's degree in Environmental Science from the United States Military Academy in 2002 and a commission in the US Army as a Medical Service Corps officer. In 2011, he competed a Master's degree in Environmental Health at Harvard School of Public Health with an emphasis on exposure science, epidemiology, and risk assessment. At Columbia, Stephen is interested in assessing environmental hazards that impact human health, focusing on urban populations and exposures encountered during military service.

Tory Lynch

Tory received her Master's degree in Epidemiology of Microbial Disease from the Yale School of Public Health and her Bachelor's in Environmental Biology from Georgetown University. Her Master's research focused on the association between seasonal climatic factors and typhoid fever. At Mailman, she hopes to study how extreme climatic events influence the spread of water-borne infectious diseases.

Sebastian Rowland

Originally from Maryland, Sebastian received his Bachelor's degree in biology from University of Pennsylvania in 2012 and a Master's degree in Environmental Epidemiology from Harvard University in 2017. Between schooling, he worked as an agriculture researcher, an LSAT teacher, and an asbestos inspector. In previous research, he has investigated risk factors of underground natural gas storage facilities and the impact of ozone on mortality. At Columbia, he is interested in using novel epidemiologic and exposure methods to study the relationship between energy systems, climate change, and population health.

New staff as of spring 2017

Marta Galanti
Postdoctoral Research Scientist

Marta completed her PhD research in Complex Systems and Mathematical Physics in a shared program between University of Florence (Italy) and University of Orléans (France). Her previous research focused on the analysis of diffusion-reaction processes in biological and industrial media in non-ideal conditions (complex geometries and crowded environments). At Columbia, her research focuses on respiratory virus transmission with the aim of incorporating antigenic information of rapidly evolving viruses into real-time forecasts of influenza.

Brittany Shea
Project Director

Brittany is the Project Director for the Global Consortium on Climate and Health Education (GCCHE). She received a Master's degree in Sustainability and Environmental Management from Harvard University where she completed her thesis on water quality issues associated with hydraulic fracturing. Before starting at GCCHE, Brittany was a Project Coordinator for the Columbia Center for Children's Environmental Health. She also worked at Harvard University's David Rockefeller Center for Latin American Studies in Santiago, Chile on strategy and development projects.

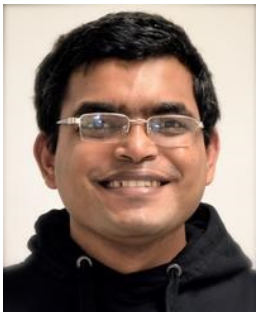
Atinuke Shittu
Study Coordinator

Atinuke obtained her medical degree from the University of Ibadan, Nigeria. She completed her medical internship at the University College Hospital, Ibadan, after which she worked as a community physician in Ilesa, a town Southwestern Nigeria. In 2016, she completed her MPH degree in the Health Policy and Management at the Columbia University. She is currently a Study Coordinator for Professor Jeffery. Shaman's study, "The Virome of Manhattan: A Testbed for Radically Advancing Understanding and Forecast of Viral Respiratory Infections."

Eudosie Tagne
Study Coordinator

Eudosie holds a medical degree from the University of Bamako in Mali, and a MPH degree in Epidemiology from Columbia University. As a physician in Africa, she served the medically disadvantaged population, and had been interested in preventive medicine with a focus in infectious diseases. Over the years, she worked on different projects targeting infectious diseases such as poliomyelitis, malaria, HIV, and Tuberculosis. She is currently working as a Study Coordinator on Professor Jeffrey Shaman's study, "The Virome of Manhattan: A Testbed for Radically Advancing Understanding and Forecast of Viral Respiratory Infections."

New staff as of spring 2017



Minhaz Ud-Dean
Postdoctoral Research Scientist

Minhaz studied Biotechnology at University of Dhaka, where he developed a biophysical model for the stability of airborne virus. Later, he completed an Erasmus Mundus joint Master's program at Delft University of Technology and the University of Jena. His doctorate was in Chemical Engineering on inferability and inference of gene regulatory networks at ETH Zurich. Further, he contributed to the interpretation and standardization of metabolomics data at Tuebingen University. At Columbia, Minhaz is developing multi-factorial models for transmission of airborne virus.

Staff transitions

Zachary Burt
Postdoctoral Research Fellow

Zachary Burt received the Fulbright-Nehru research fellow for India for the 2017-2018 academic year. He will spend 9 months in India collecting data and collaborating with researchers at the Indian Institute of Technology Bombay. Zach's project will focus on urban and peri-urban water and wastewater systems, including municipal and non-municipal sources. He will analyze risk, equity impacts, public health and the incorporation of climate information in the current systems, with the goal of building a framework and ultimately a policy tool for evaluating proposed future expansions and improvements.

Staff transitions

Melissa Gervais
Postdoctoral Research Fellow

Melissa received her PhD from the Department of Atmospheric and Oceanic Sciences at McGill University. At Columbia, she investigated the development of a region of cooling in North Atlantic Ocean temperatures and its impact on atmospheric circulation and variability in future global climate model simulations. Melissa will continue to explore topics related to Arctic climate change and atmospheric variability at Pennsylvania State University as a tenure-track assistant professor in the Department of Meteorology and Atmospheric Science.

Julia Reis
Postdoctoral Research Scientist

While working with Professor Jeffrey Shaman, Julia studied outbreaks of respiratory viral infections. Using data managed by the CDC, she tested climatic associations with respiratory syncytial virus (RSV) outbreaks, and generated simulations and the first forecasts of RSV outbreaks. Starting in September, she will begin her second postdoc position, working with Professor Julie Shortridge at Virginia Tech in Biological Systems Engineering.

CERTIFICATE NEWS

MPH'17 graduates—where are they now?

Christina Olbrantz is an Environmental Health & Safety Consultant at Triumvirate Environmental in Astoria, NY. She works with clients in the health care and life science sectors to ensure compliance with environmental health and safety regulations by conducting inspections, writing organizational policies, and training staff members. She also works with clients on sustainability initiatives to reduce their environmental footprint.

Second years' summer practicum experiences

Sonia Dattaray spent her summer in New York City, where she completed her practicum at EcoHealth Alliance. As a summer research intern, she conducted research and modeled future values for the social cost of carbon in South East Asia. Her research will support a larger project to create a land-use change and economic model for predictions of emerging infectious diseases.

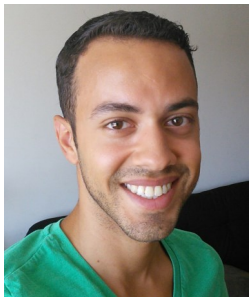
Second years' summer practicum experiences

Adriana Garcia worked at the National Center for Disaster Preparedness, which is part of Columbia University's Earth Institute. As a Graduate Research Assistant, she primarily focused on supporting the policy and advocacy arm of the Resilient Children/Resilient Communities Initiative. She also co-wrote grants for post-disaster economic recovery trainings.

Claire Wang worked at Batey Relief Alliance (BRA), a non-profit organization based in Santo Domingo that provides development and relief services to marginalized communities in the Dominican Republic. During the summer, she conducted a process evaluation of BRA's Clean Water For All project, through which the organization distributed flocculant-disinfectant water purifiers to rural communities lacking a reliable potable water supply. Claire made several trips to the project sites to conduct surveys, interviews and focus groups as part of this evaluation.

RESEARCH

Fieldwork



During the week of February 20, Professor Darby Jack and Daniel Carrión, PhD candidate, visited the Kintampo Health Research Centre (KHRC) in Ghana. This trip was part of an ongoing and longstanding research collaboration between the Department of Environmental Health Sciences and KHRC. The research team met to plan the details of Jack's NIH-funded R01 project, a randomized controlled trial that studies the adoption and sustained use of clean cookstoves. Carrión traveled to Kintampo again in June to work with field staff on the pilot project and collaborated on data analysis for stove use monitors.

Zach Burt, post-doctoral fellow, traveled to Marrakech, Morocco in early March to launch a pilot program of water Conservation Savings Credits (CSC). With CSCs, utility customers receive cash for each cubic meter of water usage reduction. In contrast to raising utility prices, CSCs avoid political backlash and minimize negative impacts on affordability through monetary rewards while encouraging conservation. Collaborators include Professor Peter Rogers of Harvard University, social-enterprise start-up AquaShares, and the Marrakech water utility. Burt traveled to Marrakech again in July to set up recruitment; their goal is to recruit 500 participants in the program, which will run for 12 months.

Zachary Burt, post-doctoral fellow, traveled to Rwanda in May to work with Pivot Works, a local start-up generating revenue from resource reuse in the sanitation sector. He helped design a willingness-to-pay study for fecal sludge collection services and collected data for a lifecycle assessment of greenhouse gas emissions associated with the sanitation process. He plans to collaborate with researchers from NYU and UC Berkeley to create a framework for an optimization model of non-sewered sanitation.

BiteBytes: a mosquito-reporting smartphone application

Julia Reis, post-doctoral research scientist, in collaboration with Professor Jeffrey Shaman and Eliza Little, PhD'17, developed BiteBytes, a smartphone application for citizens to report mosquito activity. Crowd-sourced mosquito identification can serve as an additional source of mosquito surveillance data that can be used for forecasting mosquito abundance as well as allow cities to target key areas for mosquito abatement. In addition to data collection, the app offers educational information on mosquitos, such as diseases mosquitoes transmit and ways to control mosquito habitat. The app is currently available on iPhones only.

West Nile Virus forecast

Nicholas DeFelice, postdoctoral research scientist, led the launching of a West Nile virus (WNV) prediction website (http://cpwnv.iri.columbia.edu/), which presents weekly forecasts of Culex mosquito WNV infection rates and human cases of West Nile illness in Chicago. This effort builds off the development and publication of a model-inference system for generating probabilistic WNV forecasts for Suffolk County, New York. DeFelice and Professor Jeffrey Shaman have been collaborating with the Chicago Health Department to provide these real-time forecasts publicly.

Publication:
DeFelice NB, Little E, Campbell SR, Shaman J. Ensemble forecast of human West Nile virus cases and mosquito infection rates. Nature Communications. 2017;8.

Proposals

Professor Darby Jack received an R33 award (Phase II) for his R21 (Phase I) from the NIH on Potential Inhaled Dose of Particulates, Biking and Cardiovascular Indicators. The initial feasibility phase tested their techniques for measuring personal exposures during bike commutes and improved estimates of real-time inhaled dose. The second phase entails deploying MicroPEMs in urban cyclists, also equipped with devices to measure black carbon exposures and vitals.

Professor Darby Jack and **Carlos Gould**, doctoral student, along with local collaborators in Ecuador, received a grant from the Clean Cooking Implementation Science Network hosted at the Fogarty Institute. They will conduct a year-long study to evaluate household energy consumption and national energy transitions (initially from woodfuels to liquid propane gas, and now to induction electric cooking) in Ecuador.

Professor Darby Jack received a new R01 from the NIH titled, "Child Lung Development Following a Cookstove Intervention: Evidence from GRAPHS." Jack will serve as the principal investigator of the project with Professor Alison Lee as the principal investigator at Mount Sinai.

Recent finding

Defining and Predicting Heat Waves in Bangladesh

Affiliated Investigators: Katrin Burkart
Journal: American Meteorological Society

This paper proposes a heat wave definition for Bangladesh that could be used to trigger preparedness measures in a heat early warning system (HEWS) and explores the climate mechanisms associated with heat waves. The proposed definition requires elevated day- and night-time temperatures over the 95th percentile for three consecutive days. Heat waves are associated with an absence of normal pre-monsoonal rainfall occurring over a background of drier-than-normal conditions, with below-average precipitation and soil moisture from April through June. Low soil moisture increases the odds of a heat wave for 10 to 30 days, indicating that sub-seasonal forecasts of heat wave risk may be possible by monitoring soil moisture conditions.

Other recent publications

Kioumourtzoglou MA, Power MC, Hart JE, Okereke OI, Coull BA, Laden F, Weisskopf MG. The Association Between Air Pollution and Onset of Depression Among Middle-Aged and Older Women. American journal of epidemiology. 2017 Mar 29;185(9):801-9.

Tamerius J, Ojeda S, Uejio CK, **Shaman J**, Lopez B, Sanchez N, Gordon A. Influenza transmission during extreme indoor conditions in a low-resource tropical setting. International journal of biometeorology. 2017 Apr 1;61(4):613-22.

Wylie BJ, Ae-Ngibise KA, Boamah EA, Mujtaba M, Messerlian C, Hauser R, Coull B, Calafat AM, **Jack D**, Kinney PL, Whyatt R. Urinary Concentrations of Insecticide and Herbicide Metabolites among Pregnant Women in Rural Ghana: A Pilot Study. International Journal of Environmental Research and Public Health. 2017 Mar 29;14(4):354.

Rosenthal J, Balakrishnan K, Bruce N, Chambers D, Graham J, **Jack D,** Kline L, Masera O, Mehta S, Mercado IR, Neta G. Implementation science to accelerate clean cooking for public health. Environmental health perspectives. 2017 Jan;125(1):A3.

Karimi M, Vant-Hull B, Nazari R, Mittenzwei M, Khanbilvardi R. Predicting surface temperature variation in urban settings using real-time weather forecasts. Urban Climate. 2017 Jun 30;20:192-201.

Birger RB, Le T, Kouyos RD, Grenfell BT, Hallett TB. The impact of HCV therapy in a high HIV-HCV prevalence population: A modeling study on people who inject drugs in Ho Chi Minh City, Vietnam. PloS one. 2017 May 11;12 (5):e0177195.

Kandula S, Yang W, Shaman J. Type-and Subtype-Specific Influenza Forecast. American Journal of Epidemiology. 2017 Mar 1;185(5):395-402.

Ban J, Xu D, **He MZ**, Sun Q, Chen C, Wang W, Zhu P, Li T. The effect of high temperature on cause-specific mortality: A multi-county analysis in China. Environment international. 2017 Sep 30;106:19-26.

Anthony SJ, Johnson CK, Greig DJ, **Kramer S**, Che X, Wells H, Hicks AL, Joly DO, Wolfe ND, Daszak P, Karesh W. Global patterns in coronavirus diversity. Virus Evolution. 2017 Jan 1;3(1).

Fu C, Shen J, Lu L, Li Y, Cao Y, Wang M, **Pei S**, Yang Z, Guo Q, **Shaman J.** Pre-vaccination evolution of antibodies among infants 0, 3 and 6months of age: A longitudinal analysis of measles, enterovirus 71 and coxsackievirus 16. Vaccine. 2017 Jun 10.

Li R, Bai Y, **Heaney A, Kandula S,** Cai J, Zhao X, Xu B, **Shaman J**. Inference and forecast of H7N9 Influenza in China, 2013 to 2015. Eurosurveillance. 2017 Feb 16;22(7).

Carter E, Norris C, Dionisio KL, Balakrishnan K, Checkley W, Clark ML, Ghosh S, **Jack DW**, Kinney PL, Marshall JD, Naeher LP. Assessing Exposure to Household Air Pollution: A Systematic Review and Pooled Analysis of Carbon Monoxide as a Surrogate Measure of Particulate Matter. Environmental Health Perspectives. 2017 Jul 28;125.

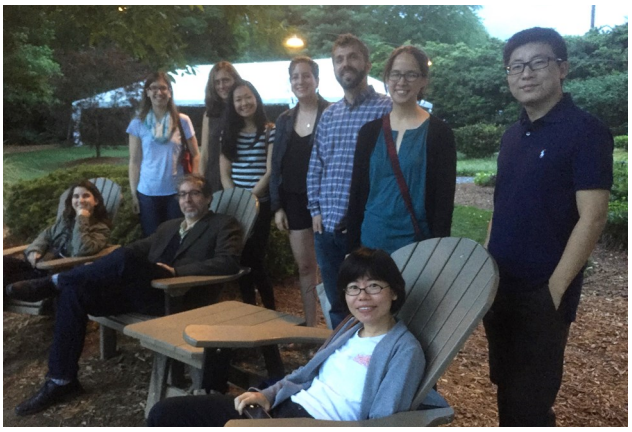
Quinn AK, Ayuurebobi K, Kinney PL, Kaali S, Wylie BJ, Boamah E, Shimbo D, Agyei O, Chillrud SN, Mujtaba M, **Jack DW**. Ambulatory monitoring demonstrates an acute association between cookstove-related carbon monoxide and blood pressure in a Ghanaian cohort. Environmental Health. 2017 Jul 21;16(1):76.

Yang W, Wen L, Li SL, Chen K, Zhang WY, **Shaman J**. Geospatial characteristics of measles transmission in China during 2005– 2014. PLoS computational biology. 2017 Apr 4;13(4):e1005474.

PAST EVENTS

Models of Infectious Disease Agent Study meeting

Twelve members of Professor Jeffrey Shaman's lab group members attended the annual Models of Infectious Disease Agent Study (MIDAS) meeting in Atlanta, GA on May 22-24. Sen Pei gave an oral presentation on a new method for forecasting the spatial movement of infectious diseases. Sasi Kandula spoke about our operational, real-time influenza forecast website. Ruthie Birger, Nick DeFelice, Julia Reis, Teresa Yamana, and Wan Yang gave poster presentations on various modeling and forecasting topics (respectively: Hepatitis C virus/HIV, West Nile virus, respiratory syncytial virus, influenza, and measles).



CDC Influenza Forecast Meeting

Professor Jeffrey Shaman and several of his staff and postdoctoral research scientists participated in the 2016-17 Influenza Forecast Challenge hosted by the CDC. Last month, Teresa Yamana, postdoctoral research scientist, and Sasi Kandula, staff associate, attended a meeting at the CDC in Atlanta, Georgia, to review results from the challenge and discuss related work.

Ecology of Evolution and Infectious Disease

Ruthie Birger, postdoctoral research fellow, attended the Ecology and Evolution of Infectious Disease conference at UC Santa Barbara from Jun 24-27, and presented a poster titled "Asymptomatic summertime shedding of respiratory viruses."

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.