Columbia University
MAILMAN SCHOOL
OF PUBLIC HEALTH

Columbia Climate and Health Program

Department of Environmental Health Sciences

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The ***Columbia 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.

Student News

Successful thesis defense by Climate and Health DrPH candidate, Elisaveta Petkova

Elisaveta Petkova will receive her Doctor of Public Health degree from the Department of Environmental Health Sciences this semester, becoming the first doctoral graduate in climate and health since the Climate and Health Program was launched in 2008. Her dissertation entitled "Heat and Mortality in New York City: Past, Present and Future" explores the historical and future heat-related mortality in the City of New York, from the beginning of the 20th until the end of the 21st century. This is the first study to examine the historical and projected impacts of daily temperature on mortality in any large city over such a long period. Her work encompasses multiple domains of knowledge and involves several interdisciplinary collaborations, illustrating the essential role of trans-disciplinary research in addressing the emerging challenges of our time.

Since coming to Columbia, Elisaveta had the opportunity to participate in various interdisciplinary projects, developing a broad research expertise in global environmental health and policy. In addition to her research, she spent a year as an International Fellow at the School of International and Public Affair at Columbia University and a summer as a Council of World Women Leaders Health Policy Fellow at the German Federal Ministry of Health.

Elisaveta has written or co-authored four manuscripts while a student in the Program: Petkova et al., "Projected heat-related mortality in the U.S. Urban Northeast" published in 2013 the International Journal of Environmental Research and Public Health, Petkova et al., "Particulate matter pollution in African cities," published in 2013 in Air Quality, Atmosphere and Health, and Yang et al., "The 1918 influenza pandemic in New York City: age -specific timing, mortality, and transmission dynamics" in the Influenza and Other Respiratory Viruses, and Petkova et al., "Heat and mortality in New York City since the beginning of the 20th century," in press in Epidemiology.

Climate and Health Certificate Updates

Meet the four new Climate and Health Certificate students we welcomed this past fall.

Augusta Williams, from Copenhagen, NY, studied Biology and Atmospheric Sciences at Hobart and William Smith Colleges in Geneva, NY. Her various research projects focused on meso-scale convective thunderstorms and their interaction with the Great Lakes and winter bird migration over the Great Salt Lake, Utah. At Columbia, she is looking forward to utilize her education in atmospheric sciences to study how climate and weather patterns influence public health problems.

Melanie Valencia is a 2nd year EHS Masters student, originally from Ecuador. Her background is in environmental chemistry working in clinical research studies related to arsenicosis in Bangladesh and West Bengal. She is currently working as a Research Assistant for the Bill and Melinda Gates foundation funded project 'Fecal sludge to Biodiesel' based in Kumasi, Ghana and Columbia engineering laboratories. She is passionate about fostering partnerships for development practice and is serving as Co-President of the Earth Institute Student Advisory Council.

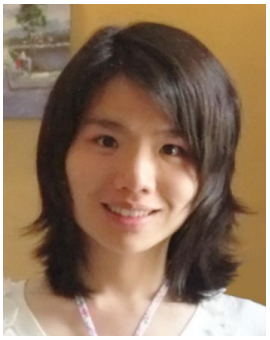
Erika Sita Eitland, from Andover, Connecticut studied Molecular and Cell Biology at the University of Connecticut. She enters Columbia with a unique perspective having lived throughout Asia, completed three years of stem cell research, and coordinated hunger and food access initiatives in Jamaica, Queens. She is interested in how low-income populations will be impacted by climate change and is excited to engage in climate research as a form of preventative healthcare.

Denise Patel, from Voorhees, New Jersey, recently left her position at the New Jersey Work Environment Council where she focused on occupational and environmental health to pursue her MPH at Columbia. She looks forward to combining her work on the hazards of chemical exposures with a new focus on climate and health.

Climate and Health Seminar Series

Our biweekly seminars this past semester included a mix of faculty and student research updates and journal clubs on current climate and health topics. Research topics included role of temperature in winter season mortality, cookstoves in Ghana to improve mother and infant health, and the association between air pollution and premature mortality. Journal club topics included EPA's new carbon pollution standards, urban heat islands and heat waves, and neighborhood microclimate and heat stress vulnerability. Our seminars continue this semester on alternating Thursdays in the EHS conference room at 2:30PM. Please let us know if you would like to have your name added to the seminar email list.

New Staff



Suijia Yang received her MPH degree from in the Environmental Health Sciences Department with a policy track in May 2013. She has a BS in chemistry from Beijing University. Her projects focus on the health impact assessment for $PM_{2.5}$–related mortality on the global scale. Her first project was an assessment of pre-mature mortality attributable to the $PM_{2.5}$ emission from aviation sector. Currently, she is exploring different methodologies to redistribute $PM_{2.5}$ modelling data to better capture exposure level at a finer scale using ArcGIS. Specifically, she is trying to characterize the relationship between population density and $PM_{2.5}$ concentration.

Dr. Diana Gómez-Barroso, researcher at the National Centre for Epidemiology, Institute of Health Carlos III, in Madrid Spain, spent three months at the Columbia Climate and Health Program working with Dr. Shaman. She is a geographer and obtained her PhD in epidemiology and public health. Her work here focused on the association between seasonal influenza and its relationship to climatic variables such as temperature and humidity in Spain. She used different statistical approaches and spatial models to explain this association. In the coming months, a manuscript will be submitted for publication. She is grateful for the warm faculty and staff of the Climate and Health Program as well as the opportunity to spend these months in New York.

Staff Updates

Dr. Ying Li's fellowship with the Earth Institute and the Climate and Health Program has been extended for eight months, until July 31, 2014. Over the past two years she has been working with Drs. Patrick Kinney and Darby Jack on a project aiming to develop improved decision support tools for air quality management in the U.S. For this project, they are collaborating with Dr. Daven Henze and his research group at the University of Colorado in Boulder, Colorado. Using their modeled air quality results, Drs. Li, Kinney, and Jack are quantifying the public health burden associated with exposure to fine particulate matter ($PM_{2.5}$) and its various chemical components in the U.S. They are currently preparing two journal articles from this work.

New Course: "Water, Sanitation, and Human Health"

Dr. Jeffrey Shaman is offering a new course this semester called "Water, Sanitation, and Human Health" on Wednesdays at 1PM. This course covers hydrologic cycle, the major causes of enteric morbidity and mortality, and the design, financing and implementation of sanitation systems in both the developed and developing worlds. It is designed for both engineering and public health students and intended to foster dialog between the two communities.

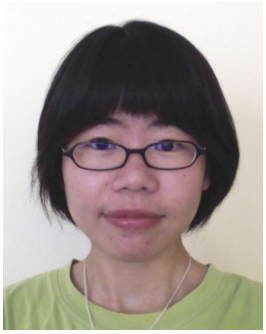
R Sorkshop

In October 2013, the Climate and Health Program and the EHS Department sponsored a 1.5-day introductory workshop on the statistical programming language, R. Zev Ross of ZevRoss Spatial Analysis (www.zevross.com), an environmental data analyst and R expert, led the workshop. Fourteen students participated, including members of the Climate and Health Program, other Environmental Health Sciences doctoral students, and members of Dr. Rachel Miller's lab. **Dr. Patrick Kinney** and PhD candidate, **Kate Weinberger**, organized the workshop.

Time Series Workshop Group

A group of Climate and Health program members began meeting weekly in November 2013 to learn how to build time series regression models using the book "Statistical Methods for Environmental Epidemiology with R: A Case Study in Air Pollution and Health" by Roger Peng and Francesca Dominici. This book guides the user through the model-building process using data from the National Morbidity, Mortality, and Air Pollution Study, a multi-city study of the effects of air pollution on human health. **Dr. Patrick Kinney** and Climate and Health PhD candidate, **Kate Weinberger,** are coordinating this working group.

Epidemics4 International Conference on Infectious Disease Dynamics



Drs. Jeffrey Shaman and **Wan Yang** attended the Epidemics4 International Conference on Infectious Disease Dynamics held on November 19-22, 2013 in Amsterdam, Netherlands. They presented papers on: 1) the real-time forecast of influenza; 2) a comparison of filter methods used to construct influenza forecasts; 3) an analysis of the 1918 influenza pandemic in New York City using daily mortality data; and 4) an epidemiological and immunological meta-analysis of whether frequent exposure to poultry, wild fowl and low pathogenic avian influenza confers immunity against high pathogenic avian influenzas such as H5N1. The conference was a great opportunity to interact with other infectious disease modelers and epidemiologists, as well as take in some Dutch art.

NYC Panel on Climate Change (NPCC) health group workshop

Dr. Patrick Kinney and **Haruka Morita**, MPH, organized a day-long workshop for the NPCC Health Group at the Mailman School of Public Health on December 13, 2013 to provide information supporting the development of a chapter on human health for an upcoming NPCC Report. Specific objectives of the workshop focused on highlighting impacts of heat waves, coastal flooding, and storms in NYC, such as population and infrastructure vulnerabilities, as well as identifying research needs and recommendations for climate-health preparedness for future events. Participants included experts in fields related to the focus of this workshop, including from the NYC Department of Health and Mental Hygiene, CUNY Hunter College, CUNY City College, Stevens Institute of Technology, NYC Office of Emergency Management, U.S. Center for Disease Control and Prevention, Con Edison, NYC Environmental Justice Alliance, and Columbia University. Based on knowledge gathered from this workshop, the Group is currently working on drafting a chapter for the upcoming NPCC Report.

International Society for Disease Surveillance (ISDS) annual meeting

Dr. Jeffrey Shaman attended the annual meeting of the International Society for Disease Surveillance (ISDS) in New Orleans on December 12-13, 2013. The ISDS presented Drs. Shaman and Karspeck (National Center for Atmospheric Research) the ISDS 2013 award for Outstanding Research Article in Biosurveillance in the Scientific Achievement Category for their article 'Forecasting Seasonal Outbreaks of Influenza,' published in the Proceedings of the National Academy of Sciences. Dr. Shaman delivered a keynote address on this subject at the ISDS conference.

IPCC Fifth Assessment Report (AR5) updates

The Intergovernmental Panel on Climate Change (IPCC) AR5 Working Group I report, entitled "Climate Change 2013: The Physical Science Basis," was released this fall. This report includes new chapters on sea level change, the carbon cycle, and climate phenomena such as monsoon and El Niño, as well as assessments on cloud science and aerosols. The Working Group II report, entitled "Climate Change 2014: Impacts, Adaptation, and Vulnerability" is expected to be approved in March 2014. **Dr. Patrick Kinney** is a lead author on Chapter 26 focusing on North America.

Proposals

Submitted:

- In May 2013, **Drs. Patrick Kinney and Jeffrey Shaman** submitted a T32 training grant application to the NIH for interdisciplinary training in climate and health. The proposal calls for funding for four PhD students and 2 postdocs each year. The proposal was reviewed in November 2013 and we await final word regarding possible funding.

- In July 2013, **Dr. Shaman** submitted a U01 grant application to the NIH further testing and validation of model-assimilation systems for the prediction of influenza and other respiratory pathogens, and the establishment of a dedicated site for the generation and dissemination of operational real-time respiratory disease forecasts. The proposal was reviewed in December 2013 and we await final word regarding possible funding.

Funded:

- In September 2013, **Dr. Shaman** received a supplemental award from the NIH and the Biomedical Advanced Research Development Authority (BARDA) to operationalize real-time influenza forecasting (cpid.iri.columbia.edu)

- In December 2013, **Dr. Shaman** received NSF funding for study of the seasonal and interannual dynamics linking El Niño-Southern Oscillation variability and Arctic snow cover with Mediterranean seasonal weather, as well as development of predictive models.

Recent Findings

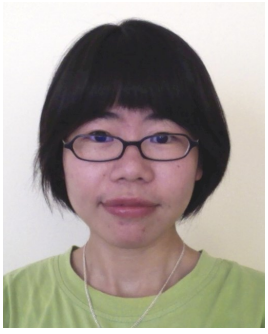
Projected Heat-Related Mortality in the U.S. Urban Northeast

Affiliated Investigator: Elisaveta Petkova and Patrick Kinney
Journal: International Journal of Environmental Research and Public Health

Heat-related mortality is projected to be one of the major human health impacts of climate change. The urban Northeast region of the U.S. is particularly vulnerable due to the urban heat island effect as well as large populations of vulnerable individuals. This study presents estimates of heat-related mortality in Boston, New York City, and Philadelphia based on downscaling of the new coupled global climate models and two of the Representative Concentration Pathways (RCPs) based on daily temperature and mortality data between 1985 and 2006. Heat-related mortality rates were highest in Philadelphia followed by New York City and Boston during this period. However, projected heat-related mortality rates in the 2020s, 2050s and 2080s were highest in New York City followed by Philadelphia and Boston. This information may be valuable in developing strategies for reducing future heat impacts and building climate change resilience in the urban Northeast region.
Learn more about the study here.

The 1918 influenza pandemic in New York City: age-specific timing, mortality, and transmission dynamics

Affiliated Investigators: Wan Yang, Elisaveta Petkova, and Jeffrey Shaman
Journal: Influenza and Other Respiratory Viruses



The 1918 "Spanish flu" pandemic resulted in 50 million deaths, and affected a disproportionately large number of young adults, compared to school-aged children and the elderly. This study sought to explore the dynamics of this pandemic by examining daily mortality data for the period between 1915 and 1923 in New York City. The onset and ending was determined for each pandemic and the total pandemic-related mortality of each 1-year age cohort was calculated. Further, the effective reproductive number (Re) for each cohort was calculated to examine potential differences in transmissibility among age groups. There were four pandemic waves between February 1918 and April 1920, and fractional mortality increase was highest among teenagers during the first wave, but was highest among 25 to 29 year olds in the following three waves. Re values decreased with time for all four pandemic waves. Further, the values at the beginning of each wave were similar, suggestive of the initial growth of each wave among the previously unexposed subpopulation for which susceptibility was high. The authors propose potential mechanisms underlying the pandemic dynamics and transmission patterns.
Learn more about the study here.

Real-time influenza forecasts during the 2012-2013 season

Affiliated Investigators: Wan Yang, James Tamerius, and Jeffrey Shaman
Journal: Nature Communications

Shaman and colleagues recently developed a seasonal influenza prediction system that uses an advanced data assimilation technique and real-time estimates of influenza incidence to optimize and initialize a population-based mathematical model of influenza transmission dynamics. This system was used to generate weekly real-time forecasts of influenza epidemic progression for 108 cities throughout the US during the 2012–2013 season. Results showed that these real-time forecasts accurately predicted local outbreak peaks up to 9 weeks in advance and corroborated the accuracy of the forecasts generated by this system compared to analogue predictions. This study demonstrated that real-time influenza forecasts can be generated with a dynamical model that has been optimized using real-time observations of influenza incidence and data assimilation methods.
Learn more about the study here.

Emerging Climate Findings

Check out our *Emerging Climate Findings* page for selected monthly papers on global, national, and local climate and health research findings.

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