

## FROM THE CHAIR

So far 2010 has been a year of change, growth and accomplishment. As we embark on our 34<sup>th</sup> year as the Department of Environmental Health Sciences, welcoming new students, and continuing to chart new directions, we look forward to new potential, and the implementation of our goals, while continuing to enhance and preserve the integrity of our programs.

Evidence of our growth is the addition of new faculty member, Dr. Winnie Tang, who joins us as an Assistant Professor. Dr. Tang was recently awarded a K99/R00 Pathway to Independence award, entitled "Estrogen/xenoestrogens and epigenetic regulation of gene expression." Dr. Tang's contributions help to facilitate our ongoing commitment to creating and maintaining a challenging learning environment and platform for research in the emerging field of epigenetics.

Dr. Lynn Goldman, Professor of Environmental Health Sciences, has recently accepted the position of Dean of George Washington University School of Public Health in Washington. Dr. Goldman was the principal investigator of the National Children's Study Center here in EHS. We wish her our heartfelt congratulations on this appointment and much success in steering the GWSPH.

Our recent faculty awards during the graduation ceremony include Brian Schwartz as a recipient of the Golden Apple award for Teaching and Alison Geyh as an AMTRA award for her advising and mentoring. Jim Yager was awarded the Ernest Lyman Stebbins Medal for his contributions to the teaching programs of the School.

In this newsletter you will find current news and activities of the Department's faculty, students and alumni, highlights and accomplishments of the NIEHS Center in Urban and Environmental Health and other Centers within the Department impacting environmental and public health around the globe. We encourage you to provide feedback, suggestions and ideas for articles which we can include in future issues.

## FALL 2010

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## CENTER IN URBAN ENVIRONMENTAL HEALTH NEWS

### 2010 PILOT PROJECT AWARDS

The Johns Hopkins Center in Urban Environmental Health is a multidisciplinary Center funded by the National Institute of Environmental Health Sciences to integrate, coordinate and foster research related to the effects of urban environmental factors on human health. The mission of the Center is to identify environmental chemical exposures and susceptibility factors that alone or together increase risk for people living in urban environments, then to use these findings to develop prevention strategies to improve public health. The overall objective of the Center's Pilot Project Program is to fund innovative feasibility studies to assist investigators in the generation of preliminary data for inclusion in applications submitted to extramural agencies for research support.

In an effort to broaden the range and heighten the quality of investigators from various departments, divisions, and disciplines within the University interested in conducting research in fields associated with Environmental Health Sciences, the Center successfully extended its solicitation efforts, increased the amount of individual awards, partnered with other institutes, and created specialized scientific areas for each aware rather than one general pool. As a result, total applications were significantly increased and center members are very excited about the scientific merit of the awardees.

### \$100K NIEHS Center in Urban Environmental Health and the Institute of NanoBioTechnology

*"Influence of physicochemical properties and environmental processes on the toxicity of carbon nanotubes and nano-Ag"*

**PRINCIPAL INVESTIGATOR: Howard Fairbrother, PhD**, Professor of Chemistry in the Krieger School of Arts and Sciences **COLLABORATORS: Shyam Biswal, PhD**, Associate Professor of Environmental Health Sciences in the Bloomberg School of Public Health; **Ed Bouwer, PhD**, Professor of Geography and Environmental Engineering in the Whiting School of Engineering; **Kai Loon Chen, PhD**, Assistant Professor of Geography and Environmental Engineering in the School of Engineering; **Tom Sussan, PhD**, Research Associate in Environmental Health Sciences in the Bloomberg School of Public Health.

### 50K NIEHS Center in Urban Environmental Health Translational Research Award

*"DNA methylation and the association of cadmium exposure with chronic kidney disease in a population-based occupational study"*

**PRINCIPAL INVESTIGATOR: Ana Navas-Acien, MD, PhD**, Department of Environmental Health Sciences, Epidemiology and Clinical Research in the Bloomberg School of Public Health

**COLLABORATORS: Eliseo Guallar, MD, DrPH**, Department of Epidemiology, Welch Center for Prevention, Epidemiology and Clinical Research and Department of Epidemiology and Population Genetics, National Institute for Cardiovascular Research, Madrid; **Rafael Guerrero-Preston, DrPH**, Department of Otolaryngology in the Johns Hopkins School of Medicine; **David Sidranski, PhD**, Department of Otolaryngology in the School of Medicine; **Virginia Weaver, MD, MPH**, Department of Environmental Health Sciences in the Bloomberg School of Public Health.

### \$25K NIEHS Center in Urban Environmental Health Research Awards

*"Characterization of exposures to particulate matter concentrations in a developing country/city undergoing a rapid epidemiological transition"* **William Checkley, MD, PhD**, Assistant Professor of Pulmonary and Critical Care in the cut JH School of Medicine

*"TRPV2 as a mediator of pathophysiological effects of airborne particulate matter"* **Michael J. Caterina MD, PhD**, Associate Professor of Biological Chemistry and Neuroscience in the School of Medicine *"PM exposure exacerbates the expression of susceptibility genes conferring COPD phenotypes"* **Clarke G. Tankersley, PhD**, Associate Professor of Environmental Health Sciences in the Bloomberg School of Public Health.

## PREPAREDNESS AND EMERGENCY RESPONSE NEWS

In the fall of 2009, The Johns Hopkins Public Health and Emergency Response Research Center (JH-PERRC) entered the second year of a five-year CDC research award. The Center is one of nine CDC-sponsored research centers aimed at strengthening public health preparedness infrastructure and systems to protect vulnerable populations in emergencies, and to create, strengthen and maintain sustainable public health preparedness and response systems.

The JH-PERRC research initiatives begun in the first year of the grant have already produced useful data that will help identify best practices in the public health sector for future preparedness and emergency response activities. Willingness- to-respond, mental health surge capacity through faith-based partnerships, understanding the media's impact on resistance and resilience, and the legal and ethical issues that impact mental and behavioral health issues are currently being studied with partners nationwide to provide the public mental health system with a variety of tools and practical frameworks to build capacity and improve preparedness and response efforts. One of the key products of the research team, developed early within this first year, is the construction of a new conceptual model for public health emergency preparedness. This model- "Ready, Willing, and Able"- is currently being used to unify the PERRC projects research efforts and will help inform and operationalize research findings, project outcomes and translational activities.

In addition to the four main JH-PERRC projects, each year the center funds up to four pilot projects and four new investigators in the field of preparedness. To date, projects have been funded in the following topic areas:

- Tracking International and National Media Coverage of H1N1 Influenza
- A Pilot Study of Practices, Attitudes, Beliefs and Perceptions of Pandemic Preparedness among Key Informants in Johns Hopkins ICUs
- Public Health Systems Preparedness and Emergency Response to Vulnerable Populations: EMS Assessment
- All-Hazards Community Coping Capacity Assessment
- First Responders' Beliefs and Attitudes toward Individuals with Mental Illness during a Disaster

Among the pilots and new investigator programs awarded in the first year of the PERRC grant is "*All Hazards Community Coping Capacity Assessment*," a project lead by Norma Kanarek, PhD, Associate Professor in the Department of EHS and Executive Director of the MD Cigarette Restitution Fund at JHMI.

The pilot project's goal is to define a framework for **community coping capacity** in disasters that will guide the development and use of a community-level rating of population vulnerability, social resiliency and collective resources. **Community coping capacity** can be defined as a combination of collective resources, social resiliency, and population risk for a community or county in a given disaster. This concept is particularly relevant when we consider the preparedness challenges, and failures, present during and after natural disasters such as Hurricane Katrina, or other catastrophic emergencies, like the World Trade Center's collapse.

Dr. Kanarek's pilot will apply epidemiologic and surveillance methods to the task of creating a measure of community coping capacity for disasters for every US county. This framework, and the project's findings, will allow identification of communities nationwide that are most vulnerable to natural disasters and catastrophic events and enable disaster readiness activities to be prospectively targeted to these neediest areas of the country.

Johns Hopkins PERRC Principal Investigator:  
Jon Links, PhD, Professor and Deputy Chair,  
Environmental Health Sciences

For more information on the JH-PERRC projects please go to: [www.jhsph.edu/preparedness](http://www.jhsph.edu/preparedness).





## CENTER FOR WATER AND HEALTH NEWS

### The Johns Hopkins University Global Water Program

Why water? Johns Hopkins knows that the world faces critical issues relating to water as the result of human pressures and climate trends. A major world challenge is to ensure the availability of water of sufficient quality for human consumption and ecosystem sustainability, and to provide better prediction and management of water quantity and quality for the sustained health of mankind and ecosystems, now and for future generations. There is a clear need to think and act both locally and globally. New integrated and evidence-based approaches are needed to find scalable and sustainable solutions for an array of complex global water problems.

To fill this need, The Global Water Program (GWP) was launched in 2009 following the award of a discovery grant funded by the Office of the Provost's Framework for the Future program. Meeting the global water challenge will require focused collaboration among researchers and students in The GWP fosters throughout all Johns Hopkins affiliated institutions around the six themes of i) Water and Health, ii) Water and Food, iii) Water and Ecology, iv) Water and Energy, v) Water Policy, and vi) Water Infrastructure.

With funding from the Office of Provost, the Bloomberg School of Public Health, and the Whiting School of Engineering, the Global Water Program released a competitive call for proposals in winter 2009 and has sponsored four seed grants on water and health:

*Impact of water characteristics on the epidemiology of antibiotic resistant E. coli in rural Tanzania.*

PI: Christian Coles (IH, JHSPH); Co-PI: Sheila West (OPT, JHMI); Co-PI: Jessica Seidman (IH, JHPSH)

*Utilizing Polyelectrolyte Multilayers to Immobilize Nanoparticles on Ultrafiltration Membranes for Enhanced Resistance to Biofouling.* PI: Kai Loon Chen (DoGEE, WSE); Co-PI: Howard Fairbrother (CHM, KSAS)

*Characterization of Microbial Communities Responsible for PPCP Biodegradation in Water Recycling.*

PI: Edward J. Bower (DoGEE, WSE); Co-PI: Jody Proescher (APL)

*Vibrio in the Chesapeake Bay.* PI: Darryn Waugh, (EPS, KSAS); co-PI: William Pan, (IH, BSPH)

The GWP continues to promote innovative research at Johns Hopkins. In Spring 2010, the GWP began collaborations with the Center for a Livable Future on "Water and Food Security," examining relationships between water availability, water quality, and food production at regional and global scales, which will be a launch pad for future externally funded research. Throughout 2010, the GWP has also actively pursued several NSF grants on themes of water sustainability. In summer of 2010, the GWP will unveil its brand new website and online *Global Water Magazine*, which will help provide opportunities for new collaborations.

## CENTER FOR A LIVABLE FUTURE FELLOWSHIP AWARDS

The **Johns Hopkins Center for a Livable Future (CLF)** has awarded predoctoral fellowships to 17 Johns Hopkins University students for the 2010-2011 academic year. The fellowship awards provide support for outstanding students who are committed to the discovery and/or application of knowledge related to CLF's two main program areas, *Farming for the Future* and *Eating for the Future*.

### DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES 2010-11 CLF AWARD WINNERS:

#### *Farming for the Future Recipients*



**Ann Carroll, MPH**, is a second-year, part-time DrPH student and employee of the United States Environmental Protection Agency Office of Brownfields and Land Revitalization. Her current interests include identifying ways urban agriculture can improve food security—particularly in urban ‘food deserts’—and support environmental protection and sustainable development. Ann’s advisor is Dr. Paul Locke.



**Meghan Davis, DVM, MPH**, is a third-year PhD student and is examining the transmission of MRSA (methicillin resistant *Staphylococcus aureus*) among people, animals, and the environments in which they live. She is interested in the pathogen exposures to communities who live near industrial agricultural facilities and the role of the household environment in dissemination of bacteria resistant to antibiotics. Meghan’s advisor is Dr. Ellen Silbergeld.



**Beth Feingold, MPH, MEdSc**, is a fourth-year PhD candidate. She is using satellite remote sensing and object-oriented classification to map animal feeding operations (AFOs) based on the spatial and spectral characteristics of the farm components. This will enable better characterization of the modern farm environment for exposure assessment studies over large geographic areas. Beth’s advisor is Dr. Ellen Silbergeld.



**Yessika Mashinski** is a third-year PhD student, and is interested in the impact that industrial food animal production has on the quality of the surrounding water bodies. She will focus her research on host-specific pathogens in water samples impacted by agricultural runoff of animal wastes. Yessika believes that providing persuasive data to policymakers will help to create more sustainable food systems. Yessika’s advisor is Dr. Kellogg Schwab.

#### *Eating for the Future Recipients*



**Jennifer Hartle, MHS**, is a third-year DrPH student, and is focusing her research on applying the Life Cycle Assessment framework to measure the environmental burden of the food system. By quantifying the true environmental costs of food production, processing, transportation, retailing, and waste, she aims to influence the development of policies that will correct food pricing inadequacies. Her advisor is Dr. Robert Lawrence.



**Rebecca Nachman, MPH**, is a fourth-year PhD student. She has proposed to investigate how infants’ developing metabolisms may influence their risk of adverse health effects from bisphenol-A (BPA) exposure in the diet. Through her research, she aims to increase our understanding of how the health of children is uniquely vulnerable to the effects of environmental exposures. Her advisor is Dr. Alison Geyh.

## CENTER FOR ALTERNATIVES TO ANIMAL TESTING

### CAAT Goes Transatlantic

The Johns Hopkins Center for Alternatives to Animal Testing (CAAT) now has a European presence. The European Center for Alternatives to Animal Testing (CAAT- EU) was founded as a joint venture between the University of Konstanz (Germany) and the Johns Hopkins Bloomberg School of Public Health. CAAT-EU will act as a communications platform for science, industry, and the regulatory authorities in Europe, serving as a hub for transatlantic exchange in the field of alternatives and toxicology.

CAAT has been an international leader in the “3Rs of alternatives” ever since the Center was founded in 1981. Now it is official: CAAT-US and CAAT-EU will work together to help bring about the most humane science possible and to bring toxicology into the 21st Century—on both sides of the Atlantic and around the world.

CAAT-EU was inaugurated on March 30, 2010 in a celebration at the Senatssaal of the University of Konstanz. The program for the celebration included Thomas Hartung, Director of CAAT-US and co-director of CAAT-EU, Michael Klag, Dean of the Bloomberg School of Public Health, Baltimore, and Alan Goldberg, Founder of CAAT-US, as well as many key researchers, regulators, and administrators from the European Union.

### CAAT Awards Seven Grants for 2010/11

CAAT awarded research grants relating to the areas of refinement, developmental toxicology, immunotoxicology, and translational toxicology. The CAAT research grants program, funded entirely through contributions from companies and foundations, makes available approximately \$250,000 per year. The CAAT grants program is aimed directly at bringing toxicology into the 21st century.

For more information, and to see previously funded projects and abstracts, please see:  
<http://caat.jhsph.edu/programs/grants/preproposal.htm>

### CAAT Reviewing Grant Proposals for 2011/12

CAAT is reviewing project submissions that focus on implementation of the NAS Report: *Toxicity Testing in the 21st Century: A Vision and a Strategy*.

Proposals relating to Toxicology are developed to provide understanding of mechanism/mode of action and to consider how one would be able to translate the mechanism to a method that can be used to evaluate/predict health consequences.

Proposals relating to developmental toxicology are in vitro, involve embryonic stem cells, or involve species such as *C. elegans* or zebrafish. Whole-animal, mammalian studies are not appropriate. The Center has ongoing research in the area of Developmental Neurotoxicology and is interested in grants focusing on Developmental Toxicology and Developmental Neurotoxicology.

## EHS FACULTY APPOINTMENTS & PROMOTIONS

**Daniel J. Barnett, Assistant Professor** Following the September 11, 2001 terrorist attacks on the U.S., public officials realized that massive changes needed to be made in the way health departments respond and operate in times of crisis. Dr. Barnett's research concentrates on helping the public health system be better prepared and equipped to deal with the intense challenges of responding to incidents.

Currently, he is working on gauging public health workers' perceptions regarding all-hazards response expectations, and developing trainings intended to enhance their willingness to respond in a variety of emergency scenarios. In this context, Barnett is also interested in the large-scale philosophical shifts and programmatic challenges that face health departments seeking to create a modern, well-prepared workforce. Following the 2001 attacks, "public health response expectations have necessitated an organizational culture change in health departments from a traditional '9-to-5' mode of operations to a 24/7 willingness and ability to respond to a broad spectrum of large-scale emergencies," writes Barnett.

His interests also include the adaptation and application of academic models for the public health readiness field. This includes work on translating injury prevention theory into public health preparedness protocols, for threats like pandemic influenza. Dr. Barnett has also investigated how risk perception theory and behavioral modeling "can better inform our understanding of barriers and facilitators to emergency response." Future studies for Dr. Barnett will examine behavioral and attitudinal influences on public health system emergency response capacity.

**Frank Curriero, Associate Professor** One of the most intriguing developments in public health is the ability to extract new and illuminating information from data. Dr. Curriero bridges the worlds of biostatistics and environmental health sciences with his research on using—and, in fact, linking—spatial statistics and geographic information systems (GIS) in the study of environmental epidemiology, disease mapping, and exposure assessment. He writes that his methods "are useful in evaluating spatial relationships and quantifying geographic determinants of health." From these studies and collaborative investigations into the numbers and raw data of public health, he hopes to be able to provide environmental health scientists with better understanding and predictive modeling tools (he holds a joint appointment in the Department of Biostatistics).

Dr. Curriero's research is all over the map, literally. With a broad definition of the environment, Dr. Curriero's research is getting real-world use today in a variety of public health areas. Specific examples include assessing the urban environmental impact on Baltimore City school children, linking social and behavioral impacts to breast and prostate cancer outcomes, real-time examination of psychosocial stress and illicit drug use, and identifying temporal climate triggers for mosquito populations. His work on non-Euclidian distance measures in geostatistics, which was used to assess and map water quality in the Chesapeake Bay, won a Bloomberg School of Public Health Faculty Innovation Award and the 2006 Best Paper Publication from the International Association of Mathematical Geology. Past projects have studied injury surveillance, sexually transmitted infection rates, and a variety of pollutant epidemiology studies.

**Alison Geyh, Associate Professor** Dr. Geyh's work centers on the potentially harmful airborne contaminants including particulate matter (PM) in the air we breathe. With a joint appointment in the Department of Epidemiology, her current research focuses on a wide variety of PM sources, from welding fumes to cookstoves to motor vehicles. She's a co-Principal Investigator on a five-year project that is one component of the Johns Hopkins Particulate Matter Research Center. This project is designed to characterize ambient air particulate matter at locations across the United States, which may help explain potential differences in toxicity of these particles. Dr. Geyh is especially interested in the metal component of these particles. Of particular interest are metals that result from catalytic converters, devices designed to render combustion engine exhaust less toxic.

Another major project is the Nepal Cookstove Replacement Trial, a five-year study that is attempting to improve home conditions for children from south Nepal, specifically conditions that can lead to low birth weight and acute respiratory illness. Indoor pollution from the traditional Nepalese cookstove is a likely culprit; the trial will provide new, better-vented and more efficient stoves to subject families and then study the effects on infant birth weight and overall health.

Dr. Geyh's work takes her all over the globe, but in 2001, it brought her to New York City, just three weeks after the terrorist attacks on the World Trade Center on September 11. She led a team from the Bloomberg School to monitor exposure to airborne contaminants and to study the respiratory effects of those exposures on crews cleaning up the disaster site. Five years later, she described the grueling nature of that work. "The first moments at the site I just couldn't process what I was seeing," she told the Bloomberg School of Public Health's news service in 2006. "It was like you went off the planet."

**Thomas Hartung, Professor** As scientific innovation and research has evolved, so has the role of animal testing to help translate those innovations into real-world products. In 2009, Thomas Hartung came to Johns Hopkins to continue that evolution as the second director of the Center for Alternatives to Animal Testing (CAAT), which was founded in 1981—a time when animal testing was seen as a mandatory and crucial stage in the development of pharmaceuticals and consumer products. Today, his role is to not only further the center's research, but to encourage continued re-examination of the place and need for animal research. According to Hartung, this can only happen if the science of testing catches up with the science of discovery. Hartung told *Johns Hopkins Public Health Magazine* last year that "it is my strong belief that we need to apply modern science to evaluate modern products."

A preeminent toxicologist and long-time advocate for reduced animal testing, Dr. Hartung also holds the Doerenkamp-Zbinden Chair for Evidence-based Toxicology at the Bloomberg School. Between appointments at University of Konstanz (Germany) and European research centers, for six years he headed the European Centre for Validation of Alternative Methods (ECVAM), where European chemical safety assessments are performed, and where he helped develop new testing procedures that drastically changed the way that region performs assessments. Among other professional boards and committees, Hartung is a member of the U.S. Scientific Advisory Committee for Alternative Test Methods to the National Toxicology Program.

**Sekhar P. Reddy, Professor** Dr. Reddy is pursuing and investigating the molecular mechanisms that environmental insults can use to create respiratory pathogenesis—including lung cancer. This includes the study of the AP-1 family of proteins, which are crucial for many cellular functions but are affected adversely by a variety of external environmental factors. Oxidants like tobacco smoke are a primary factor in this adverse reaction, as are diesel exhaust particles. Dr. Reddy—who has a joint faculty appointment at the Johns Hopkins Sidney Kimmel Comprehensive Cancer Center—writes that "these studies may lead to the development of novel treatment strategies against toxicant-induced respiratory pathogenesis."

In addition to that work, Dr. Reddy is taking some of the molecular lessons he has learned and attempting to use them to understand lung injury and repair, specifically that involving mechanical stress and oxidant (hyperoxia). A popular treatment for severely ill patients suffering from severe emphysema, acute respiratory distress syndrome (ARDS), and acute lung injury (ALI) is oxygen supplementation through mechanical ventilation. That supplementation can lead to hyperoxic exposure, which can cause extensive pulmonary damage and various types of cell death, leading to even worse situations like pulmonary edema and respiratory dysfunction. According to Reddy, "This endeavor may not only help us devise new strategies to minimize the potentially hazardous effects of hyperoxia, but may also lead to new therapeutic strategies aimed at minimizing the excessive morbidity and mortality associated with ALI/ARDS." He is currently involved in a variety of lung injury studies, which are looking at the mechanisms through which cellular function is affected by environmental change and pollutants.

## Student Award Winners

### FAMRI Young Clinical Scientist Award

Congratulations to **Thomas Sussan**, postdoctoral fellow in the Biswal lab, who received two years of funding for his proposal **Inflammasome as a Modulator of Emphysema in Mice**. This competitive award is to prepare and support new clinical investigators, particularly research fellows and junior faculty members, to provide the bridge between the clinic and the laboratory for the critical translation of basic research findings into diagnostic and therapeutic approaches. The program is limited to the development of young researchers in smoking-related disorders.

### Sommer Scholar Award

**Melissa Opryszko, EHE**

### NRSA

Congratulations to **Amit Reddi**, in the laboratory of Val Culotta, who recently received a Ruth L. Kirschstein National Research Service Award (NRSA) for Individual Postdoctoral Fellows. The purpose of this individual postdoctoral research training fellowship is to provide support to promising Fellowship Applicants with the potential to become productive, independent investigators in scientific health-related research fields relevant to the missions of participating NIH Institutes and Centers. The purpose of Amit's NRSA funded project is to **decipher the mechanism of cellular Mn-antioxidant activity, with a particular emphasis on the interplay between phosphate, Mn and Fe metabolism**.

## Researchers Develop New Methods for Imputing Data for Geographic Analysis

Typically, data are plotted spatially through a process known as geocoding, in which mailing address information is translated into map coordinates. However, not all addresses can be converted successfully (nongeocodable). Rural postal routes, post office boxes, and addresses with errors or missing information cannot be mapped using geocoding. Health records linked with these types of addresses have traditionally been discarded from analysis, leading to concerns of bias and underreporting. In a study published February 10 in the journal [PLoS ONE](#), the researchers develop and evaluate strategies for including nongeocoded data in spatial analysis.

"Our methods allow for the analyses of complete data, which is a notable improvement over the traditional practice of discarding information from addresses that did not geocode," said Frank C. Curriero, PhD, lead author of the study and associate professor in the Bloomberg School's Department of Environmental Health Sciences and Department of Biostatistics. "Although we evaluated our methods using health data, these strategies could be applied in other analysis settings."

For the study, the research team evaluated prostate cancer data from the Maryland Cancer Registry and considered total case counts at the Census county, tract, and block group level as the analysis objective. Three strategies were developed and evaluated. The third strategy tested used a weighted probability method to assign nongeocoded addresses to these Census units using available information on the age and race distribution within the assumed known zip code. According to the study, the weighted assignment strategy performed best overall.

Additional authors of "Using Imputation to Provide Location Information for Nongeocoded Addresses" are Martin Kulldorff, PhD, of Harvard University, Francis P. Boscoe, PhD, of the New York State Department of Health, and Ann C. Klassen, PhD, associate professor in the Bloomberg School's Department of Health, Behavior and Society. The research was supported by grants to Dr. Klassen from the CDC, NCI, Department of Defense and the Maryland Cigarette Restitution Fund. Cancer incidence data were provided by the Maryland Cancer Registry.



# New Findings on Environmental Factors in Childhood Obesity

Childhood obesity is a health crisis that affects millions of American kids. What isn't as clear is what specific environmental factors may lead children to become obese. It is interesting to note that during the past three decades, when obesity rates among children skyrocketed, this was also a time of dramatically increasing suburban "sprawl." To investigate these issues, two researchers from the Bloomberg School of Public Health—Dr. Brian S. Schwartz in the Department of Environmental Health Sciences, and Dr. Thomas A. Glass of the Department of Epidemiology—have recently completed the first phase of a study (in collaboration with Walter F. Stewart of the Geisinger Center for Health Research) of the body mass index (BMI) of almost 46,000 children cared for by the Geisinger Health System (GHS) of Danville, Pa. In February, the team presented a poster called "Using Electronic Health Record Data for Large-scale Studies of Pediatric Obesity and the Built and Social Environments in Urban and Rural Settings" to the seventh annual Active Living Research Conference in San Diego, CA. The project is funded by the Robert Wood Johnson Foundation's Active Living Research Program. "I am interested in the built environment because of its relevance to global environmental sustainability," says Dr. Schwartz. "Our pattern of land use in the U.S. is clearly contributing to climate change through greenhouse gas emissions associated with transportation needs in our sprawling communities, as well as water challenges and ecosystem degradation. In this project, we wanted to evaluate whether our built environments were also contributing to chronic diseases, specifically obesity, on a smaller scale."



## Using Electronic Health Record Data for Large-scale Studies of Pediatric Obesity and the Built and Social Environments in Urban and Rural Settings

Brian S. Schwartz, Thomas A. Glass, Craig Wood, Walter F. Stewart. Environmental Health Institute, Geisinger Center for Health Research, Danville, PA and Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA.



February 2010

### Abstract

- We completed a multi-level analysis of predictors of BMI percentile in 45,892 children and adolescents ages 5 to 18 years from 479 communities in central and northeastern Pennsylvania.
- The study subjects had a high prevalence of overweight and obesity.
- We used a mixed definition of place as the smallest of townships, boroughs, and census tracts.
- The 479 communities with 15+ children included 107 boroughs, 256 townships, and 116 census tracts.
- Aspects of the social, physical activity, and land use environments measured at the place level were predictors of individual BMI percentile adjusting for individual-level covariates.
- Age was observed to modify these associations, suggesting that the influence of place on childhood and adolescent obesity may differ by age.
- This suggests that policy interventions will have to address multiple environmental aspects.

### Background and Significance

- The Geisinger Health System (GHS) provides primary care services to patients in 31 counties in central and northeastern Pennsylvania (Figure 1).
- The GHS's patients have a risk of obesity higher than national averages; by age 10 years, almost 45% of children are overweight or obese.
- Land use growth has far outpaced population growth in these counties over the past three decades. Population densities have declined by over 40% in many areas.
- The large geography is ideal for studies of place and health.
  - Heterogeneous communities, urban and rural areas, great diversity in community socioeconomic status, land use, food, and physical activity environments.
- The GHS began implementing an electronic health record (EHR) in 1996 in its 41 community practice clinics and 4 hospitals. This was completed for all by 2001.

### Methods

#### Selection of study participants

- All children and adolescents ages 5 to 18 years with at least one BMI measurement between 2001 to present in which height and weight were measured within 30 days of each other
- Residential addresses were then geocoded; analysis was restricted to places with at least 15 children with BMI data.
- This left 45,892 children in the analysis.

#### Definition of place

- The Geisinger 31-county catchment area includes 653 townships, 319 boroughs, and 17 cities
- With our mixed definition of place (Figure 2), there were a total of 1,133 places with a total 2000 population of 2,384,958 persons.
- There were 479 places with at least 15 children (GHS patients).
- These places included 107 boroughs (area in square miles [mean, SD, range] 1.7, 2.1, 0.13-16.8), 256 townships (27.1, 18.0, 3.0-148.7), and 116 census tracts (1.1, 2.3, 0.14-22.9).

#### Data collection and data sources

- Individual-level data: Geisinger's EHR
- Place-level data: US census, TeleAtlas, Business Analyst, PA DCNR

#### Characterization of environments

- Land use environment:** population density, household density, intersection density, average block size, land use mix
- Physical activity environment:** physical activity establishment diversity, amusement and recreational facility density, fitness, recreational center, and sports and recreational facility density, miscellaneous facility density, percent of preserved land, trail length density, trail head and boat access point density, high school density, DCNR park project density, and total physical activity establishment density
- Social environment:** modified community socioeconomic deprivation index (6 census items)

#### Data analysis

- Multi-level analysis of BMI percentile (for age and sex), to identify place-level predictors while adjusting for key individual-level covariates

### Results

#### Data reduction

- Because of the large number of place-level variables, we first completed a data reduction step to get to a core set of primary variables of interest.

#### Multi-level predictors of BMI

- Age, sex, African-American race, and Hispanic ethnicity were all strong and consistent individual-level predictors of BMI.
- There was evidence that age modified relations of the social, physical activity, and land use environments with BMI (Table 1).
  - 5-9 y: only the social environment
  - 10-13 years: social and physical activity environments
  - 14-18 y: social and land use environments
- The strength of the community socioeconomic deprivation association increased with increasing age, suggesting a cumulative effect.

Table 1. Place-level predictors\* (one each for social, physical activity, and land use environments) of BMI percentile stratified by age.

PLACE-level Variable	All ages Beta (p-value)	5-9 y Beta (p-value)	10-13 y Beta (p-value)	14-18 y Beta (p-value)
Community socioeconomic deprivation	0.328 (<0.01)	0.238 (<0.01)	0.340 (<0.01)	0.448 (<0.01)
Diversity of physical activity establishments	-0.439 (0.03)	-0.386 (0.22)	-0.831 (<0.01)	-0.094 (0.76)
Population density				
2 <sup>nd</sup> quartile**	-1.195 (0.03)	-0.175 (0.83)	-1.965 (0.02)	-1.825 (0.03)
3 <sup>rd</sup> quartile	-1.501 (0.11)	-0.327 (0.82)	-1.985 (0.15)	-3.234 (0.02)
4 <sup>th</sup> quartile	-1.591 (0.15)	-0.315 (0.85)	-1.431 (0.39)	-4.043 (0.02)
Place indicator				
Census tract	0.350 (0.73)	-0.496 (0.75)	0.681 (0.66)	1.952 (0.21)
Borough	1.446 (0.11)	1.262 (0.37)	0.945 (0.48)	2.950 (0.02)

\* Adjusted for age, sex, and race/ethnicity. \*\* With 1<sup>st</sup> quartile reference group.

#### Future Plans – Phase II

- In Phase II, we have selected 32 communities with high (fifth quintile) and low (first quintile) average BMIs in children and "good" and "bad" environments (8 communities in each cell).
- We will randomly select 15 children from each community for more detailed individual-level data collection, including accelerometry.
- We will complete visits to each community for more detailed community assessment.

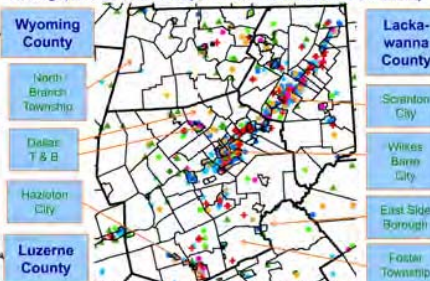
#### Conclusions

- To our knowledge, this is the first large-scale, population-based study in children that included urban and rural areas and that evaluated effect modification by age on associations of place-level predictors with BMI.
- The data suggest that place-level predictors of BMI in children and adolescents may differ by age.
- This suggests that community-level interventions will need to be multi-pronged and that the benefits of a single environmental change may only benefit narrow age ranges.

Figure 1. Geisinger's service area in Pennsylvania. Red outline= 31 primary care counties; purple shading = 42 specialty care counties.



Figure 2. A mixed definition of place: the smallest of township, borough, and census tract (with PA establishments indicated).



The researchers stated that “to our knowledge, this is the first large-scale, population-based study in children that included urban and rural areas and that evaluated effect modification by age on associations of place-level predictors with BMI,” and that “the data suggest that place-level predictors of BMI in children and adolescents may differ by age.”

The study had several interesting facets in addition to the large number of children studied. GHS completed an electronic health record (EHR) system in 2001 for its 41 clinics and 4 hospitals, which provide primary care services in 31 counties in most of the central and eastern regions of the state. This allowed easy acquisition of health information on tens of thousands of children. Also, GHS patients are more likely to be obese than national averages; almost 45 percent of GHS's child patients are overweight or obese by age 10. The study encompassed 479 communities, which covered both urban and rural areas, and offered a wide diversity of socioeconomic settings. Communities were characterized on their physical activity, land use, and social environments, using a variety of geospatial databases using geographic information systems (GIS). The study found that community socioeconomic deprivation, measured using a modified Townsend Index, was associated with higher BMIs for all ages, with increasingly larger influences with increasing age. A measure of the diversity of the physical activity environment was associated with lower BMIs only in children between 10 and 13 years of age. Finally, increasing population density, a surrogate measure for compact development and walkable communities, was associated with lower BMIs in children between 14 and 18 years of age.

“The different findings by age are what one might expect,” Dr. Schwartz says, “but the findings are important because they contradict the commonly held belief that compact development with higher population densities, generally in urban areas, are bad for health. The findings suggest that as children get older and increasingly interact independently with the built environment, that such utilitarian physical activity – walking for daily activities and errands – is good for health, as reflected in lower BMIs.”

The second phase of the project will focus on specific communities and children at each end of the BMI scale, and look more closely at how environmental factors influence physical activity measured with accelerometry.

## AMBIENT AIR POLLUTION INTER-DIVISIONAL COLLABORATION

### Air Pollution and Alterations in Mouse Cardiology Bring Together Physiology and Environmental Health Engineering

It's known that particulate matter (PM) and gaseous pollutants cause detrimental alterations to, and reduction of, heart rates—results observed in both epidemiological studies and in animal experiments. But what hasn't been as thoroughly researched is the relationship between the time of PM exposure and those heart rate alterations.

A new paper, "Ambient air pollution alters heart rate regulation in aged mice," was published in the January 2010 edition of *Inhalation Toxicology*, and it presented the results from an eight-week long experiment by five Bloomberg School of Public Health researchers. The study's authors—Dr. Juan P. Ramos-Bonilla, Dr. Patrick N. Breyse, Dr. Francesca Dominici, Dr. Alison Geyh, and Dr. Clarke G. Tankersley—evaluated the impact of ambient air pollution exposure on cardiac function in aged AKR/J mice. To do this, they employed a new method of exposing the mice to not only single pollutants, but to a more complex mixture of chemicals that better simulates the variety of pollutants found in air across the world. The results clearly showed not only how different PM and pollutants affected (or did not affect) heart rates, it showed how long those effects could take to manifest. The article's results "demonstrated for the first time cardiac alterations in mice associated with real world air pollution exposures at concentrations that mimic human exposure."

"The article is the result of several years of collaborative work between divisions and departments from the Bloomberg School of Public Health," explains Dr. Ramos-Bonilla, who along with Dr. Breyse and Dr. Geyh, are in the Department of Environmental Health Sciences, as is Dr. Tankersley, who is in the Division of Physiology; Dr. Dominici is from the Department of Biostatistics.

"Initially, the collaboration was framed between Dr. Breyse from EHS and Dr. Tankersley from Physiology," says Dr. Ramos-Bonilla. "They invited me to help them materialize the idea of measuring cardiovascular alterations in animals exposed to the complex mixture of air pollutants at real world concentrations, which departs from the traditional approach of exposing animals to single pollutants at high pollution concentrations. This project ultimately became my doctoral dissertation."

Dr. Geyh contributed to the design and setup of the exposure system, and also made major contributions in the exposure data interpretation, while Dr. Dominici handled statistical analysis of the data, specifically in the application of longitudinal data analysis.

The strength of this cross-disciplinary relationship continues to bear fruit for the research. "The result is a project that is still going on," says Dr. Ramos-Bonilla. "We are currently working on a second publication that will be the direct result of this collaborative effort, a collaboration we plan to maintain over time."

## RECRUITMENT WEEKEND RECAP

When an uninvited guest to Recruitment Weekend 2010--a record-setting blizzard--drastically changed the plans of everyone involved, the quick thinking, adaptability, and hospitality of students, staff, and faculty turned a recruiting visit into an unexpected vacation in a snow-drenched Baltimore City.

The annual Recruitment Weekend, held this year from February 5-7, brought the top applicants to the doctoral program in EHS to Baltimore to interview for positions. Typically, the weekend is packed with activities geared toward acquainting applicants with EHS and with the city of Baltimore. This includes interviews with faculty, meals with current students and faculty, campus and city tours, and dinner at the Chair's home. Fourteen applicants from all over the United States were invited to come to Baltimore for this year's Recruitment Weekend.

It was during lunch on Friday, February 5 when the first flakes started to fall; the National Weather Service warned that a massive snowstorm was just beginning its assault on the area. Some recruits chose to cut their visit short and headed home on Friday evening as airports began to close across the region; BWI airport was closed for most of the weekend. The remaining recruits braved the weather and stayed in Baltimore for what would prove to be an extended, impromptu vacation.



Friday's on-campus events were cut short (the university closed early) to get the recruits back to their hotel in Fells Point before the weather conditions made travel too perilous. The recruits were joined at dinner in Fells Point by several current students and Dr. Peter Lees. On Saturday morning, instead of leading the bus tour of the city, Christina DeStefano and Michael Coronado taught the recruits about another reuse for plastic shopping bags: makeshift waterproof shoe coverings. After making sure everyone's shoes would stay dry, Christina and Michael led the recruits on a walking tour of Fells Point and the Inner Harbor, all done through a driving snowstorm.

Thanks to lots of hard work by lots of people, by about 5:00 a.m. Monday morning, the last of the stranded recruits hopped on one of the few running shuttles and were off to BWI to catch their flights home. Despite the weather's uncooperative behavior, five of the weekend's recruits will be joining us in the fall--and we're confident they will remember their Recruitment Weekend (and the Baltimore blizzard of 2010) for years to come.

*Special thanks to Nina Kulacki, academic program manager, who arranged the visit and ensured the safety and positivity of the entire weekend!*

# Graduates for the 2009-10 Academic Year

## DRPH

Katherine Clark  
Maura Dwyer  
Jessica Hope Leibler  
Patricia Louise McLaine

## MHS

Lalita Abhyankar  
Lev David Bubis  
Ian Craig  
Halshka Graczyk  
Kerry Ann Hamilton  
Kevin L Huang  
Meghan E Marshall  
Paul Martone  
Suzanne Martos  
Kerri Anne McGovern  
Frederick Morgan  
Temitope Oluwadairo  
Titilope Oluwadairo  
Lisa Marie Polyak  
Laura Shumow  
Rina Solanki  
Megan Solomon  
Andrew Stewart  
Abigail Virginia Ward  
Christopher Whitehorne

## PhD

Kristen Gibson  
Jacqueline Heilman  
Shoba Saraswathy Iyer  
Amornrat Naranuntarat  
April Neal Julie Nijmeh  
Julie Diana Richman  
Shawn Soutiere  
Louis Stein  
Ellen Wells

### What are some of the EHS graduates doing?

**Julie Richman** *"just graduated, and following graduation I started a postdoctoral fellowship on a joint epi, exposure assessment, biostatistics training grant at the University of Washington School of Public Health. I intend to build on my current research by expanding into environmental epidemiology and exposure assessment."*

**Shoba Lyer** is currently job searching and planning to take some time off. *"I don't know how a recent PhD could NOT take some time off after school...we deserve it, if only to keep our sanity!"*

**Maura Dwyer** is *"currently doing some consulting work for the city health department while looking for a full-time job."*

**Andrew Stewart** will apply to medical school or work for a public health agency.

**Kerry Hamilton** is *"working at USEPA in the Office of Research and Development and planning on returning for a PhD."*

**Patricia McLaine** is an Assistant Professor at the University of Maryland School of Nursing.

### Has EHS Prepared them for their future plans?

**"It's given me grounding in the science of environmental health that I didn't have and needed to continue working in the field, and it has exposed me to a wide variety of environmental health issues, and connected me with many environmental health professionals."**

**"I have learned about topics relevant to medicine, which should help me in medical school and as a physician."**

**"The experiences that I really have been emphasizing in my resume and interviews are the Risk Sciences and Public Policy certificate I have earned, as well as my involvement in EHSSO and SOURCE, and just generally the skills I've developed in experimental design, data analysis, etc."**

## Business Office Update

The Business Office manages the administrative, financial and operational activities for the Department of Environmental Health Sciences. Specific areas of management include strategic planning, research administration, training grant management, general funds management, endowments management, human resources, facilities planning, professional practice planning, and academic financial planning.

On September 21, 2009 **Theresa Daniel**, officially began as the new department administrator. Theresa returned to the department with over 11 years of successful department administrator experience within W. Harry Feinstone Department of Molecular Microbiology and Immunology, in addition to over 25 years of previous fiscal administrative experience within Environmental Health Sciences. After several months of interviewing, other members were also recruited to the Environmental Health Sciences Business Office.

**Ada Tieman, Sr. Sponsored Projects Financial Analyst**, returned to the department after a seven year absence bringing her knowledge and experience in grant and contract management with her. Ada started her career at Johns Hopkins in 2002 working in areas in the University and earning an MBA. In her last position, she helped reorganize the department and establish new policies and procedures that fit with the new financial system established in 2007.

**Deb Lambert, Sr. Research Service Analyst**, joined the department on April 1, 2010. This is a much-deserved promotion for Deb who has been with the University for over 19 years. The last several years she has worked in the W. Harry Feinstone Department of Molecular Microbiology and Immunology as a Research Service Analyst. Deb brings strong knowledge of, and experience in, the areas of grant preparation and management.

**Karen Nelson, Sr. Research Service Analyst**, joined the department on August 10, 2010. Previously, she worked in Clinical Immunology at the Asthma and Allergy Center in the School of Medicine. Karen has more than 27 years of grants experience.

**Felicia Myers, Budget Specialist**, joined the department in early December 2009. She previously worked in the School of Medicine for eight years. Felicia is the guru for various SAP processes, such as on-line check requisition, shopping cart, P-card and independent contractors. If you have a question related to any of these areas, Felicia is the person who can help you.

**Brendan Tewey, Budget Specialist**, came to us from the University of Maryland in mid-January 2010. He is very precise when reviewing SAP documents for approval. So, if the account has no money or the receipts are not attached, the document will be returned.

Now, a little background on the members of the Business Office team who everyone already knows.

**Priti Ramesh, Sr. HR/Payroll Coordinator**, joined the department in September 2009 after spending two years in the Department of International Health as a Payroll Coordinator. Priti is responsible for all payroll related matters and HR issues. She is determined to make sure everyone receives a paycheck on time.

**Gladys Mbah, Sr. Research Service Analyst**, came to the School of Public Health from a clinical department in the School of Medicine. Gladys is responsible for the Toxicology Division with regards to grant submission and management.

## About our publication

Connection is a free e-publication of the Department of Environmental Health Sciences and the NIEHS Center in Urban Environmental Health at the Johns Hopkins Bloomberg School of Public Health. The name Connection reflects the Center's role in linking basic population and clinical research in environmental health to public health intervention strategies.