



FOGARTY INTERNATIONAL CENTER • NATIONAL INSTITUTES OF HEALTH • DEPARTMENT OF HEALTH AND HUMAN SERVICES

# Ebola, Zika modelers aim to inform policy decisions

By Karin Zeitvogel

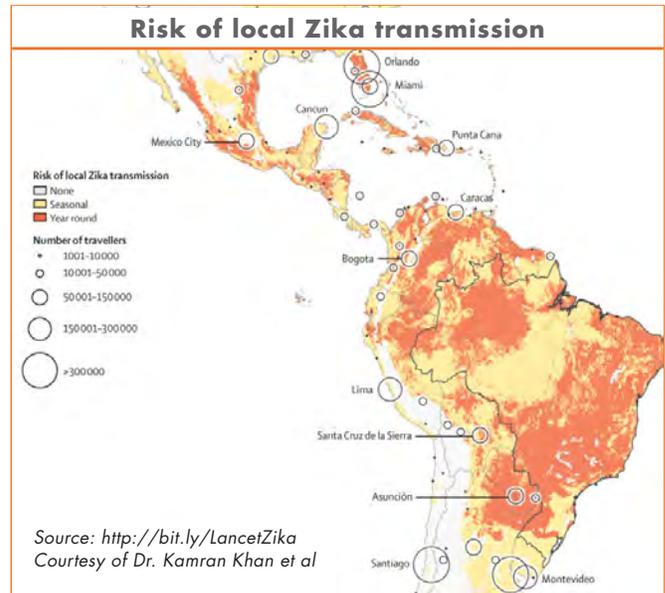
Mathematical modelers face numerous challenges as they try to predict the course of epidemics, such as Ebola and Zika. Their forecasts can inform policymakers' decisions on how to most effectively deploy resources to contain and manage the outbreaks.

To discuss these complex issues, Fogarty recently convened a meeting of disease modelers and U.S. government officials. They considered how to improve models to provide actionable information early on in outbreaks, when the right interventions can be critical, and foster closer collaboration between government and academia. In addition, they reviewed the results of an Ebola modeling exercise.

The difficulty of predicting the course of the current Zika outbreak was examined, but just as at the start of the Ebola pandemic, the paucity of data on the mosquito-borne viral illness that has swept Brazil and traveled to at least 13 other countries makes modeling difficult.

"We don't have many good previous Zika outbreaks to work with," noted Dr. Lone Simonsen, a research professor at George Washington University's Department of Global Health. "We don't know the link between Zika and microcephaly. We don't know the rates of how many pregnant women have this problem. We don't know the duration of immunity. If you get infected in childhood does that mean that it protects you when you are a pregnant woman one day?" she asked, calling for more case control studies to try to assess if there is a link between Zika and microcephaly.

But the lack of data should not prevent modelers from trying to understand the virus, she suggested. "Modeling is a thinking tool. We can say the link between Zika and microcephaly is real, can say one in 10 pregnant women are going to be affected by this if they are infected, and can use different incidence intervals and come up with different predictions."



By working through the process, scientists will better understand which pieces of information are needed to answer the important questions. And that can be useful now, Simonsen said. . . . continued p. 2

## Zika virus resources

The NIH is working to better understand the Zika virus, how it causes disease, and how it can be rapidly diagnosed, in addition to developing treatments and vaccines.

To spur research, the NIH has issued several targeted funding opportunities to support investigations of the disease itself, as well as how it affects pregnancy and the developing fetus.

### INFORMATION

Website: <http://bit.ly/ZikaInfo>

## FOCUS



National Institute of Environmental Health Sciences: 50 years of research

- Breakthroughs improve understanding of foodborne poisons called aflatoxins
- Researchers develop strategies to help prevent heat-related deaths in India
- School education points Bangladeshi families to safer drinking water

Read more on pages 6 – 9

## Ebola, Zika modelers aim to inform policy decisions . . . *continued from p. 1*

The scientists also reviewed what they learned from an Ebola modeling exercise, which Fogarty helped to organize, under the Research and Policy for Infectious Disease Dynamics (RAPIDD) program. Eight teams from U.S., U.K. and Canadian universities and several U.S. government agencies were tasked last year with predicting when Ebola would peak in Liberia and how it would progress between September and December 2015. Each team had been given four different Ebola scenarios to model, each with different levels of containment. The results were presented and compared at the two-day forum.

Teams were free to choose the type of model to use and the parameters they would add to their model to “interrogate the reality” of the Ebola outbreak in Liberia, as one modeler noted. For instance, the opening of Ebola Treatment Units and the deployment of healthcare workers around Liberia—both of which played a key role in bringing the epidemic under control—were implicitly modeled by lowering the transmission rate parameter, said Fogarty’s Dr. Cecile Viboud, one of the challenge’s organizers.

As more data became available, all of the models became more accurate. Most accurately predicted when the epidemic would peak in Liberia. Even the weakest model held useful information, showing that transmission is not exponential at the beginning of an outbreak.

But the lead of the CDC’s Health Economics and Modeling Unit (HEMU), Dr. Martin Meltzer, said being able to forecast accurately with ample data is not enough. “By the time you’re getting more accurate as measured by these

metrics, [policymakers] have already spent money, made decisions and deployed resources,” Meltzer told the gathering.

“It’s nice to know it gets more accurate when you have more data, but is it good enough at the beginning so that policymakers can rely sufficiently on it to say this is where it’s generally pointing if you don’t do anything, and this is where it will go if you do X, Y and Z?” he said.

It was Meltzer’s warning in September 2014 that up to 1.4 million people in West Africa could be infected by Ebola within months if nothing was done to stop the disease that spurred the global health community to take action. He noted that many of the policy decisions that have been made in the Ebola or current Zika outbreak have been made early on.

As modelers work with the little data available and try to cut through the fog of war that comes with epidemics, they need to keep in mind that policymakers need “actionable” information from models, a White House official told the meeting.

But Meltzer said models need to show more than just what can be done. “I think for a model to be useful to policymakers, it has to show the impact of different interventions, both individually and as a sum,” he suggested. “Very often, in fact, we’ve found through one of our analyses that the combined effect of the interventions is greater than the sum.”

### RESOURCE

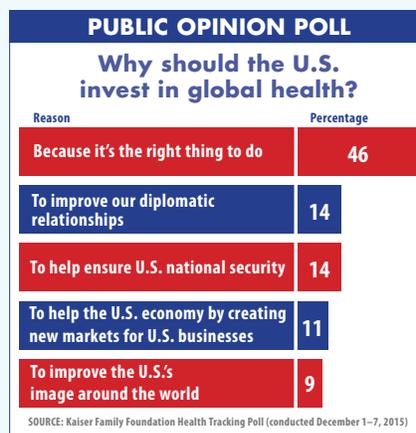
Website: <http://bit.ly/NIHRAPIDD>

## Poll says supporting global health is the right thing to do

Nearly half of Americans say the U.S. should continue to fund global health initiatives “because it’s the right thing to do,” a survey by the Kaiser Family Foundation has found.

About 46 percent of respondents say the U.S. has a moral responsibility to fund health initiatives in developing countries. Significantly smaller percentages say enhanced security, economic opportunities, or the country’s image around the world are key reasons for U.S. involvement in global health efforts.

Additionally, a majority of Americans—63 percent—say spending on global health protects Americans by preventing spread of disease; 53 percent say it helps make people and communities in developing countries more



self-sufficient; and just over half believe it improves the U.S. image around the world.

U.S. funding for global health has hovered at around \$10 billion since Fiscal Year 2010. An additional \$3.7 billion was allocated in FY 2015 for the Ebola response.

The Kaiser poll found that Americans think, on average, that nearly a third of the federal budget goes to foreign aid. Only three percent correctly stated that the actual budget allocation for foreign

aid is 1 percent or less.

The full survey is available at <http://bit.ly/KaiserPoll>.

# Commission considers how to improve global disease outbreak response

Zika, Ebola, HIV and other infectious disease outbreaks threaten more than just the world's health and urgent action is needed to strengthen the global response, according to an international group of experts. They propose \$4.5 billion be spent worldwide each year to upgrade national health systems, accelerate research and development, and establish preparedness funds at the WHO and World Bank.

The Commission on a Global Health Risk Framework for the Future—comprised of independent, international authorities on finance, governance, R&D, health systems and social sciences—recently released its study of global security and infectious disease response. The National Academy of Medicine served as the Commission's secretariat.

Pandemics cause an annual loss of \$60 billion from the global economy, the report estimates, making a \$4.5 billion investment in prevention a good buy that protects both health and global security.

"It is not only the health of our people that's at stake, all indications suggest that we are just one major global pandemic away from significant economic and humanitarian catastrophe," noted Dr. Judith Rodin, Rockefeller Foundation president and vice chair of the Commission's international oversight group.

The Commission recommends a three-pronged framework to counter infectious disease crises. First, national governments should strengthen their health systems as part of their basic duty to protect their citizens. The WHO and member states should set benchmarks for core capabilities of effective national systems and provide technical support so goals could be met by 2020. Second, global and regional coordination and capabilities should be improved by bolstering the WHO so it can effectively lead outbreak response, with oversight from an independent technical advisory board. Third, the WHO should establish an independent committee to galvanize acceleration of relevant research and development, define priorities and mobilize resources to counter the threat of infectious diseases.

"The consequences and risks here are immense. And frankly this has not been on the 'A' list of global problems in the way that nuclear proliferation or terrorism or global climate change has been," said Harvard economist Dr. Larry Summers, during a panel discussion at the report's launch.

Photo by David Rockkind for Fogarty



*An urgent investment is needed to improve the global response to pandemics, according to the Commission on a Global Health Risk Framework for the Future.*

Regular and transparent assessment of progress is needed, the commission urged. Governments must be held accountable and all must participate, since the global health protection chain is only as strong as its weakest link.

"One lesson we have repeatedly learned is that delays in raising infectious disease alerts have huge costs in terms of both lives and money, given the exponential nature of the threat," said Dr. Peter Sands, Commission chair, and senior fellow at Harvard. "Yet countries are often reluctant to raise alerts since they fear the consequences."

If the WHO publicly distributed a high-priority "watch list" of potential health emergencies on a weekly basis, it would increase transparency and lessen the stigma, the commissioners suggested.

Research and development are also critical to the response effort. "We need innovation," said Dr. Maria Freire, Commissioner and president of the Foundation for the NIH. "We need to innovate the way we develop medicines, we need to innovate the way we regulate how these medicines can come to the patient, and we need to have new ways of doing clinical trials. This has to be a concerted effort."

To develop and improve diagnostics, drugs and vaccines, Freire called for a \$1 billion per year investment to fill the gaps. A committee of the best scientists, regulators and manufacturers should be convened to pinpoint existing capabilities and needs, and determine how to most effectively proceed. Researchers and implementers must also consider the important role local communities play, she continued. "Without the anthropological understanding, and the research that needs to be done by the people in the field, we will have developed the best technology but it may not be adopted and it may not be accepted," Freire said.

The Commission's recommendations were informed by 11 days of public workshops across four continents, as well as input from 250 experts and stakeholders.

## RESOURCE

Free report: <http://bit.ly/NAMglobalsecurity>

# PROFILE

## Fogarty engineering fellow tests water purity in India

By Cathy Kristiansen

Dr. Arti Kundu spends her days looking closely at dirty water. Trained in civil and environmental engineering—as well as public health—she applies problem-solving techniques to improve water quality and prevent disease around the world.

“Today’s challenges in global health include providing clean water and enough food for people, and protecting vital ecosystems,” Kundu said. “I believe the mammoth task of improving health in developing countries can only be achieved through multidisciplinary research.”

Kundu is contributing to that varied approach with her engineering training and specialization in water. She has learned techniques for state-of-the-art molecular diagnoses and computer modeling of the physical, chemical and biological processes in the environment. Scientists use models to compare different alternatives and strategies for environmental resources management. Kundu’s doctoral thesis at the University of California, Davis focused on testing water for *E. coli*, which poses a major bacterial threat in developing countries. “My engineering background helped when looking at a different way of solving a problem, such as contaminated water,” she said. “I always tended to work on challenging issues, trying to find practical solutions.” So far, she has participated in water studies in India, Thailand, Argentina, Israel and Alaska.

To develop as an independent researcher, Kundu applied for a fellowship from Fogarty’s Global Health Program for Fellows and Scholars. This initiative provides a yearlong mentored clinical research experience overseas for postdoctoral fellows and pre-doctoral scholars. She was accepted and for her research project, she investigated whether hands and drinking water in an Indian urban community were contaminated with *E. coli* and had any association with household diarrhea. Each year, diarrheal diseases kill about 10 percent of Indian children under the age of five, according to the WHO.

Kundu partnered with a local nonprofit organization to select 152 households—each containing at least one young



**Arti Kundu, M.P.H., Ph.D.**

Fogarty Fellow: 2013 - 2014

Fellowship at: All India Institute of Medical Sciences

U.S. partner: University of California, Davis

Research topic: Role of unclean hands in water contamination

child—located on the outskirts of New Delhi. Her study included a questionnaire on the source of household water, handwashing habits and recent diarrheal symptoms. She also analyzed samples of drinking water—both at the source and in home storage vessels—and of hand surfaces. To obtain the latter, Kundu massaged each hand for 15 seconds in a separate bag of sterile water.

She discovered that source water from community pumps, municipal taps and commercial tankers was generally clean, but more than 65 percent of water in household storage vessels had fecal contamination. Additionally, she found a high correlation between gastrointestinal symptoms and the presence of *E. coli* on family members’ hands—especially the mothers’. Kundu shared her study results with affected households and visited local schools to teach the importance of handwashing and encourage each child with a gift of soap.

Kundu said she gained many new skills during her fellowship, by performing all the data and sample collection herself and operating in a challenging environment. She learned to manage her time and improvise. “Before working in India, I didn’t do a lot of juggling different things at once, didn’t know I was strong on that, to finish on time and write the paper,” she said. “But in the fellowship, I was completely independent. That gave me the opportunity to see how much I can do on my own.”

Kundu intends to apply for an NIH career development award to advance her multidisciplinary research. “I want to continue to make changes in society, reducing diarrheal diseases,” she said. “You feel very good when you can see you’re making an impact on peoples’ lives. I would like to keep doing that.”

## MARCOS ESPINAL, M.D., PH.D., M.P.H.

*Dr. Marcos Espinal is chief of the Department of Communicable Diseases and Health Analysis at the WHO's Pan American Health Organization (PAHO) in Washington, D.C. He was previously executive secretary of the WHO's Stop TB program and earlier held positions in the Dominican Republic's Ministry of Health. Espinal trained as a pediatrician in the Dominican Republic and, starting in 1989, pursued his master's and doctoral degrees at the University of California, Berkeley with support from Fogarty's flagship AIDS research and training program. He has published more than 100 papers about communicable diseases.*



### What is your role in outbreaks such as Zika?

PAHO is an agency that catalyzes, bringing together scientists from different countries in the Americas. We also have some of the best expertise to assemble technical guidance for countries on how to address TB, HIV, Chagas and many other diseases. When we don't have the necessary expertise, we convene technical advisory groups of experts from outside PAHO. That is what we are doing with the Zika outbreak. PAHO has arranged meetings with representatives from many global partners, including the CDC, with FIOCRUZ in Brazil, our mother organization the WHO, and with the NIH, academia, people from the South and from the North, to discuss research questions that we urgently need to answer.

To address these problems means we must be strong in advocacy and communication, to convince governments to spend more money for health matters. Scandinavian countries devote 15-20 percent of their budgets for health, but in Latin America, many countries still allocate below 5 percent. We need to ensure that health is at the top of the development and political agenda of our region's leaders. After all, they need money to implement public health programs, to vaccinate their population and to pay their health workers.

### How critical are partnerships to global health?

Partnerships are the number one issue in my view, because we live in a globalized world, in a time when communication is powerful, data are information and power. With social media/email/Internet availability, you cannot hide anything! So you need to be ahead of the curve, in terms of knowledge and information, because the situation can change hourly. Importantly, not one agency knows everything. Partnerships bring a value-add with knowledge coming from different institutions and they also help us to avoid duplication, wasting money—which is not unlimited—and make sure we maximize the available resources. We provide leadership by convening, bringing everyone together around the table to ensure we get the best answers.

### How has Fogarty training prepared you for this?

It has been for me a defining experience in my career. Being at Berkeley and being a Fogarty Fellow is indescribable, because I learned so much, I created

so many networks. I was honored to be able to work not only for the WHO, PAHO and the New York City Health Department, but also for my own country. More importantly, I became very knowledgeable about public health internationally, not only technically but also politically, strategically and so on. I would define my career as 'Before' and 'After' Fogarty! There was not much opportunity before. As I finished my residency training in pediatrics in the Dominican Republic, I didn't have the financial resources to pay for advanced training at Berkeley or any other U.S. college of that level. Fogarty gave me the opportunity of my life, professionally. It opened up my world completely, gave me another view and I fell in love with public health and research.

### What are the most pressing research needs?

Among the biggest global research needs are concerns about the mosquito that is transmitting Zika, dengue, chikungunya, and other diseases. It is a genius to be able to carry all these viruses. We need to do a lot of research on vaccines, diagnostic tests and new antivirals. Sometimes we tend to forget diseases that are limited to small population groups or are not prone to spread like HIV, until the viruses become very aggressive, which happened with Ebola. I think the international community needs to face that emerging and reemerging infectious diseases are here to stay and will continue coming. We also need to find better tools for mosquito control and to eliminate malaria. But we also must keep focus on TB and HIV. We have gone a long way with antiretrovirals, but TB remains one of our highest disease burdens. The treatment time for TB is six months and who wants it to take so long? And we need an efficient vaccine—there are about 10 in clinical trials now.

### How does capacity building make the world safer?

To me, Fogarty has been one of the success stories in terms of capacity building for people from resource-limited countries. Diseases don't respect borders and if we don't collaborate, we will not be able to battle these diseases, some of them very new, some of them very old but still not solved. So for me, Fogarty needs to continue doing what it does for decades to come, because there is so much need in resource-limited countries and Fogarty is making a massive contribution to training there.

## The National Institute of Environmental Health Sciences: 50 years of research & training to improve global health

**A**ir pollution, pesticides, lead and other toxic metals, are among the hazardous environmental exposures that are major contributors to noncommunicable diseases, which are increasing worldwide. Climate change is expected to alter weather and ecosystems in ways that will worsen current health threats and pose new ones, particularly for vulnerable populations. Investigating and increasing awareness of such environmental health challenges is the work of the NIH's National Institute of Environmental Health Sciences (NIEHS), which marks its 50th anniversary this year. The Institute's primary research focus is on disease prevention. With its \$770 million budget, NIEHS supports scientific discovery, training and dissemination of knowledge throughout the world.

"Environmental health is inherently global," says NIEHS Director Dr. Linda S. Birnbaum. "For a research institute devoted to environmental health, we must be active where the rates and burden of environmentally-related diseases and disability are highest."

Environmental risk factors cause nearly a quarter of all global deaths, according to the WHO, with the greatest disease burden in developing countries. There are

*In Dhaka, Bangladesh, workers wash plastic for recycling in river water polluted by chemical factories' wastes.*

longstanding problems such as smoke from cookstoves and polluted water, plus new concerns brought by globalization, industrialization and urbanization. Air, water and land pollution; changes in diet; living circumstances that reduce physical activity—all of these contribute to heart, respiratory and other diseases. The health problems, in turn, cause lost wages and lower productivity that take an economic toll.

NIEHS-supported research in developing countries tackles health problems from farm to factory, village to city, and through all stages of life. For instance, scientists have made major breakthroughs in the understanding of aflatoxins, fungal poisons that contaminate crops and, when combined with a virus, pose a cancer risk. Research on heavy metals including arsenic, lead, manganese and mercury has demonstrated their toxic effects on health including neurodevelopment and psychosocial disorders. NIEHS also encourages the study of the developmental origins of health and disease, which looks at the connection between exposures early in life—even while in the womb—and cancer, diabetes, heart disease and other conditions later in life.

The Institute provides global leadership as a WHO Collaborating Centre for Environmental Health Sciences. The Centre works in tandem with the WHO to promote cooperation among research institutions around the world; support education and training; and raise awareness of emerging issues such as climate change and electronic waste. The Centre designation in 2013 followed decades of work with the WHO including the development of its International Programme on Chemical Safety. NIEHS also is home to the National Toxicology Program (NTP), which tests and evaluates the safety of substances and exposures. NIEHS and NTP scientists conduct and support toxicology studies worldwide and share expertise with organizations such as the International Agency for Research on Cancer.



Fogarty and NIEHS are frequent partners on research and capacity building projects in low- and middle-income countries (LMICs). Indoor air pollution caused by inefficient cookstoves is one area of longtime collaboration. Both Fogarty and NIEHS support NIH's involvement in the Global Alliance for Clean Cookstoves and its efforts to reduce the more than 4 million deaths a year attributed to cooking with solid fuels. The Institute is also a co-funder with Fogarty of a recently announced program to test the impact of improved cookstoves and fuel interventions.

NIEHS is a key partner and co-funder with Fogarty in the new Global Environmental and Occupational Health (GEOHealth) program that supports research on pesticide use, air pollution, mining hazards, and other occupational and environmental risk factors in LMICs. This new effort builds on a previous partnership that supported more than 460 trainees in over 40 countries. The NIEHS also funds about 100 international scientists who come to the NIH each year as visiting fellows.

In addition, the Institute plays a vital role in the global dissemination of research findings. It produces the monthly, peer-reviewed journal, *Environmental Health Perspectives*, and makes all content freely available online. Selected articles are translated into Chinese,

Spanish and French and distributed via partnerships with journals in other countries. NIEHS regularly sponsors scientific writing and publishing workshops to help researchers in LMICs increase their ability to publish their work in top international journals.

These efforts are critical to improving global health, says Birnbaum. "Advancing environmental health research offers us the best opportunity for preventing disease—because you can't change your genes, but you can change your environment."

*On a cold day in Nepal, a mother keeps her baby warm in front of the stove.*



© 2006 Rakesh Vegal Shrestha, Courtesy of PhotoShare

## Scientists study foodborne carcinogens called aflatoxins

More than 5 billion people in the developing world are at risk of eating food contaminated with fungal poisons known as aflatoxins, according to a report issued jointly by the WHO and CDC. Aflatoxins are a by-product of mold that can grow in corn, nuts, cereals and other crops. They've been implicated in hundreds of poisoning deaths and are linked to liver cancer.

Contamination can happen anywhere and occur any time during the production process, from pre-harvest to storage. Wealthy countries have agricultural technology and regulatory policy to reduce the chance of dangerous products reaching consumers. That's not the case in most developing countries, especially where subsistence farming is prominent.

The National Institute of Environmental Health Sciences (NIEHS) has funded research that's helped scientists better understand how the poisons work, how they affect the body, and how the body might protect itself.

Many of the studies have taken place in China and Africa, where the problem is most prevalent. Seventy percent of the people who become ill from aflatoxins live in the Western

Pacific region, which includes China, according to the WHO's recently published report on foodborne diseases. More than 10,000 people in the region develop aflatoxin-

induced liver cancer each year and nine out of 10 of them die from it. Meanwhile in Africa, chemical hazards including aflatoxins cause a quarter of deaths from foodborne disease, the WHO reports. Kenya in particular has suffered widespread aflatoxin exposure and multiple poisoning outbreaks since 2004, resulting in nearly 500 acute illnesses and 200 deaths, according to CDC data.

NIEHS-funded scientists have established the link between

hepatitis B, longtime exposure to aflatoxins, and increased risk for liver cancer. The drug Oltipraz can counteract the poison and reduce the amount of aflatoxins circulating in the body, research shows. Investigators have also been examining chlorophyllin, a derivative of chlorophyll, the green pigment in plants, as a treatment for aflatoxin-induced liver cancer. Aflatoxins may also play a harmful role in child development, another research topic.



*Aflatoxin-infected crops, mostly found in developing countries, can cause liver cancer.*

Photo courtesy/ Mark Weaver, USDA

# Researchers help prevent heat-related deaths in India

An unprecedented and deadly heat wave struck the Indian city of Ahmedabad in 2010, killing hundreds of its most vulnerable citizens. Scorching temperatures reached a record 116 degrees Fahrenheit. The local government saw it as a wakeup call.

With global climate change predicted to fuel more frequent and intense heat waves, Ahmedabad's leaders made it a priority to develop South Asia's first action plan to protect people from extreme heat. The science-based approach aims to raise public awareness; build capacity of health professionals; provide early warning for dangerous heat; initiate measures to reduce exposure; and collect data to show the impact of heat on health and mortality. Since the plan was enacted in 2013, fewer deaths have been reported during Ahmedabad's hottest days, according to a preliminary analysis. Now, other cities are following Ahmedabad's lead.

The research guiding the adaptation effort was partially funded by the National Institute of Environmental Health Sciences, with additional support from Fogarty.

An international team of investigators and local officials examined the burden of heat-related illnesses and considered how to better manage future heat waves. "We need to prepare now," says Dr. Dileep Mavalankar, a co-investigator and director of the Indian Institute of Public Health in nearby Gandhinagar. "You cannot build the well once the fire starts."

Ahmedabad—located in the hot, dry northwest region of India—has a population of 7 million, many of whom live in slums. Extreme heat wasn't seen as a major health hazard and long-range forecasts for it didn't exist. That's changed. "One really important shift by virtue of this project was from 'it's always been hot here in India,' to 'we can do something about this,'" says Dr. Kim Knowlton, a co-investigator and senior scientist at the Natural Resources Defense Council.

During the lethal 2010 heat wave, there were 43 percent more deaths compared to the same time frame in other years, the researchers discovered. That amounts to

an excess of 1,344 deaths from all causes. Scientists analyzed mortality and weather data to characterize the impact of the heat spike and identify temperatures at which mortality rises. The findings were used to set the temperature thresholds for the warning system that triggers alerts. The seven-day forecasts that initially gave the city time to prepare were from a partnering institution, Georgia Tech. The team now consults with India's national weather service, which has expanded its forecasts to help Ahmedabad and other jurisdictions plan for extreme heat.

Through a combination of surveys, focus groups, site visits and data analyses, investigators identified factors affecting vulnerability to heat and studied the health system's ability to handle heat emergencies. Special attention was given to patients of emergency medical services and to people highly exposed to the elements—slum dwellers with limited access to electricity and water, and construction workers and traffic police who work outside. Assessments led to interventions such as health care provider training, the establishment of drinking water stations, billboard postings of heat stress prevention tips, educational pamphlets, media alerts and text messages.

Health effects of heat exposure range from rash, dizziness and fatigue to life-threatening heat stroke, which may cause delirium, seizures and even

death. Extreme heat can contribute to heart attacks or kidney failure and leave survivors with an increased risk of mortality for years to come. Investigators learned that heat-related illnesses didn't necessarily occur to health workers making diagnoses, prior to receiving training on heat illness. High fever and altered mental state, for example, are signs not only of heat stroke but also malaria, which is common in the area. Training sessions were held to sensitize health professionals to the signs of heat-related illnesses and best practices for treatment.

Ahmedabad is serving as a model for other Indian cities that are developing their own heat response plans. "Increasingly, people are looking to the work we've done as an example of how to build resilience for climate variability and change," says principal investigator Dr. Jeremy Hess of the University of Washington. He emphasizes the importance of evaluation "to make sure the investments you're making are the right ones and that you're actually getting a more resilient population as a result."



© Ahmedabad Municipal Corporation  
 Researchers are studying interventions, such as water stations, to see if they reduce deaths during heat waves.

# School program reduces arsenic exposure, study shows

A mother in rural Bangladesh goes about her task of collecting household water from a well outside her home. She may not know the water contains high levels of arsenic, or that using a different well could be lifesaving. An NIH-supported study found that an arsenic education program based in elementary schools was successful in convincing families to switch to safe water sources.

Arsenic is naturally occurring and can leach into groundwater from rocks and soil. Contaminated water is a problem in many countries, but is particularly severe in Bangladesh. Wells, drilled decades ago to avoid surface water that was spreading diarrheal disease, tapped into groundwater that naturally contains arsenic. The WHO estimates as many as 45 million people in Bangladesh may be at risk of exposure.

Installing new, safe wells in a community doesn't necessarily mean people will use them, researchers say. Arsenic contamination isn't readily apparent because the metal is colorless, tasteless and odorless. Toxic effects such as cardiovascular disease, skin lesions, and cancer in adults, and intellectual impairment and behavioral problems in children, take time to show up. And, there's the inconvenience of switching from a nearby contaminated well, to a safe one that requires carrying heavy water a longer distance.

Investigator Dr. Khalid Khan proposed training teachers to communicate the dangers of arsenic and the need to switch to safe wells. Khan, a native of Bangladesh, says educators in developing countries are pillars of the community—if a teacher asks students to convey a message to their parents, it's taken very seriously.

“The idea was the children would get information in the earliest stages of their life,” Khan explains. “It could basically save them for their entire life, and their families also could benefit.”

Fourteen schools and roughly 800 children, ages 8 to 11, participated in the study. An NGO partner installed safe wells. Half the teachers were trained and given arsenic education posters and books with rhymes and stories to use in classrooms. At baseline and in follow up, well water was tested, students were quizzed on their knowledge of arsenic and their urine was analyzed for signs of the metalloid.

Students who received arsenic education were five times more likely to switch to a safer well, compared to control groups. The children receiving the intervention also had a significantly greater decline in urinary arsenic, a biomarker of exposure, than the controls. And, there was a substantial increase in knowledge about arsenic after the intervention.



By teaching students to drink from safe wells, the whole family benefits, an NIH-funded study shows.

Teachers and students who didn't receive the education as part of the study were provided the information as soon as the project ended.

Dr. Joseph Graziano, Khan's mentor, leads the NIEHS Superfund research program at Columbia University that is studying the health effects, geochemistry and remediation of arsenic and manganese. Graziano says Khan's approach is a useful model and could be used for other health topics.

“Education paid off,” Graziano says of Khan's project. “This message that was provided to elementary school children worked its way up in the family household so that mom became educated. School-based programs are affordable and can have a powerful impact.”

Khan's own education in the process included environmental health, epidemiology, biostatistics, geoscience, spatial mapping and the opportunity to learn from a multidisciplinary group of researchers. He and another Bangladeshi scientist received their doctoral degrees with support from Fogarty's International Training and Research in Environmental and Occupational Health program. Khan is now an assistant professor of environmental health at Indiana University Bloomington and is the principal investigator on other research efforts in Bangladesh.

The school project had a ripple effect beyond the participants, reaching thousands of families, Khan and Graziano say. They were both moved by the community's gratitude and Khan was pleased to make a contribution to his country. “I was able to develop expertise at Columbia University and take that back to Bangladesh and implement it on the ground,” he says. “It was kind of amazing.”

# OPINION

By Dr. Roger I. Glass, Director, Fogarty International Center

## We have much to learn from research in Haiti



Although Haiti is a small country, it's home to cutting edge research that benefits us all. A number of diseases that currently threaten small numbers of Americans are quite prevalent in Haiti, which provides scientists working there with a unique opportunity to accelerate progress on diseases important to Haitians and Americans alike.

I had the pleasure recently of visiting grantees Jean (Bill) Pape, Warren Johnson, and Dan Fitzgerald from GHESKIO, the Haitian Group for the Study of Kaposi's Sarcoma and Opportunistic Infections and Cornell. I met their Fogarty trainees, young Haitians and Americans, who presented their research—each addressing a major public health challenge of our time. Some of their projects, reported here, demonstrate the immense value of both their training and their research, and the fertile research environment that GHESKIO supports.

GHESKIO was originally formed in 1982 to combat HIV/AIDS, as it emerged in Haiti. In the decades since, its scientists have been at the forefront of research studying how to most effectively prevent and treat the disease. More recently, GHESKIO and partner Cornell University became engaged in research on other Haitian priorities, such as tuberculosis, cholera, and infections with chikungunya, dengue and Zika viruses. The country has the highest rate of TB in the Western Hemisphere, with 22,000 new cases per year. TB will soon pass HIV as a leading cause of death worldwide killing 1.5 million annually.

Why should Americans care about research in Haiti and what could Fogarty trainees do to address these global problems? For TB, we have been using many of the same drugs for decades and are now confronting growing numbers of people with multidrug-resistant (MDR) strains—estimated at nearly 500,000 cases around the world. In the U.S., the cost of treating a patient with MDR-TB is about \$150,000.

Developing more affordable drugs for MDR-TB could take decades and cost hundreds of millions of dollars. In Haiti, one American Fogarty fellow, Dr. Kathy Walsh,

is conducting a randomized trial of a drug called Nitazoxanide (NTZ). This broad-spectrum anti-parasitic agent was developed in 1975 and is safe and inexpensive. Scientists have discovered that NTZ is active against the pathogen that causes TB, so this repurposed drug could provide a totally new treatment at minimal cost, in a short time. What a powerful breakthrough and what an introduction to research!

Since the 2010 earthquake, the concentration of Haitians living in slums has allowed TB to spread more easily, especially to children. Regimens to treat TB in adults were established decades ago but neither dosage, effectiveness, nor toxicity has independently been established for children. Dr. Vanessa Rouzier, another Fogarty trainee is developing the scientific basis for a pediatric regimen for TB, particularly important in a setting where malnutrition and adverse events complicate treatment.

In 2010, another deadly disease, cholera, occurred for the first time in Haiti in the aftermath of the earthquake. Now, six years later with more than 800,000 cases and 9,000 deaths, the epidemic remains out of control, despite attempts to improve water and sanitation. New vaccines show hope for prevention and recent studies involving Dr. Karine Severe, another Fogarty trainee, have established the effectiveness of vaccines to clear cholera from a large field site in Port-au-Prince, results that could unleash the future use of cholera vaccines worldwide.

Finally, chikungunya—which causes fever and joint pain—is coming to the U.S. from the Caribbean and abroad. There is no cure for this debilitating illness but Dr. Jean Rony Jeremie, a Fogarty trainee, is helping to test a candidate vaccine, supported by the NIH's National Institute of Allergy and Infectious Diseases. By studying this vaccine in populations where it is common—such as Haiti, where 70 percent have tested positive already—they will establish the safety and efficacy of this new product. Haiti is rich in opportunities for early-career scientists to make discoveries that will change the practice of treating and preventing diseases and, in GHESKIO, has an institution capable of supporting excellence in research and training. People everywhere, including in the U.S., will benefit from these advances.

### RESOURCE

Website: [www.gheskio.org](http://www.gheskio.org)



## New FDA Commissioner assumes post

Dr. Robert M. Califf has been sworn in as the new FDA Commissioner. A cardiologist and internist, he most recently served as FDA's Deputy Commissioner. Previously, he spent many years at Duke University Medical Center as a professor, researcher and vice-chancellor.



## White House honors former Fogarty grantee

The White House has honored former Fogarty grantee, Dr. Mary-Claire King, of the University of Washington, with a National Medal of Science for demonstrating a genetic predisposition for breast cancer and identifying the *BRCA1* gene.



## Former NIH chief Varmus to receive Legacy Award

Nobel Laureate and former director of both the NIH and the National Cancer Institute, Dr. Harold E. Varmus has been selected by Research!America to receive its Legacy Award. He is currently a professor at Weill Cornell University's Meyer Cancer Center.



## Frenk inaugurated as University of Miami president

The University of Miami recently inaugurated Dr. Julio Frenk as its sixth president. A renowned global health expert and former Mexican health minister, he was most recently dean and professor at Harvard University School of Public Health.



## Fogarty names Carlo to advisory board

Fogarty has appointed Dr. Waldemar Carlo to serve on its advisory board. Carlo is director of neonatology and professor of pediatrics at the University of Alabama at Birmingham. A native of Puerto Rico, he has served as principal investigator on numerous NIH grants, including a Fogarty brain disorders project.



## Previous Fogarty grantee recognized for Ebola work

For his leadership in development of the first rapid Ebola diagnostic test, previous Fogarty grantee Dr. Robert Garry was selected by *Foreign Policy* magazine for its list of 100 Global Thinkers of 2015. Garry is a professor of microbiology and immunology at Tulane University.



## Former Fogarty scientist Nugent moves to RTI Int'l

Former Fogarty scientist, Dr. Rachel Nugent, has joined the nonprofit RTI International as vice president of noncommunicable diseases. An economist by training, she directed a number of Fogarty grant programs and most recently was an associate professor at the University of Washington.

## Vaginal ring provides HIV protection

A device that constantly releases an experimental antiretroviral drug into the vagina safely provided a modest level of protection against HIV infection, a large NIH-funded study conducted in Africa found. The ring reduced risk of HIV infection among all participants, most significantly in women 25 and older.

News release: <http://bit.ly/HIVring>

## Global burden of dengue investigated

There are nearly 10,000 global deaths due to dengue each year, according to a recently published analysis by the *Global Burden of Disease Study 2013*. The incidence of dengue has rapidly increased since 1990, more than doubling each decade.

Full report: <http://bit.ly/GBDdengue>

## Health Affairs considers vaccine benefits

Global investments in vaccines yield an average sixteenfold return on investment—in terms of reduced health care costs and benefits—in addition to broader economic gains. These and other issues related to vaccines were examined in a recent special issue of the journal *Health Affairs*.

Full publication: <http://bit.ly/HAvaccines>

## Lancet examines preventable stillbirths

The majority of the world's 2.6 million annual stillbirths occur in developing countries, according to a recent series published by *The Lancet*. Most stillbirths result from preventable conditions such as infections, noncommunicable diseases or obstetric complications.

Full report: <http://bit.ly/LancetSB>

## WHO studies global childhood obesity

The prevalence of childhood obesity is rising around the world—including in developing countries—and can affect health, educational attainment and quality of life, according to a new WHO report. The Commission on Ending Childhood Obesity produced a series of comprehensive, integrated recommendations to address the problem.

Full report: <http://bit.ly/WHOChildObesity>

## Research videos available online

More than 3,500 hours of research videos providing insights into human learning and development have been made available in a virtual resource called Databrary. The repository is funded by NIH's National Institute of Child Health and Human Development and the National Science Foundation.

Website: <https://databrary.org>

Funding Opportunity Announcement	Details	Deadline
International Bioethics Research Training Program (D43)	<a href="http://bit.ly/bioeth-D43">http://bit.ly/bioeth-D43</a>	May 18, 2016
International Research Ethics Education and Curriculum Development Award (R25)	<a href="http://bit.ly/ethics-edu">http://bit.ly/ethics-edu</a>	May 18, 2016
Global Infectious Disease Research Training Program (GID) (D71) (D43)	<a href="http://bit.ly/GID-D71">http://bit.ly/GID-D71</a> <a href="http://bit.ly/GID-D43">http://bit.ly/GID-D43</a>	July 29, 2016 July 29, 2016
Emerging Global Leader Award—Career Development (K43)	<a href="http://bit.ly/K43-2016">http://bit.ly/K43-2016</a>	Dec 14, 2016
Global Brain and Nervous System Disorders Research R21 R01	<a href="http://bit.ly/Brain-R21">http://bit.ly/Brain-R21</a> <a href="http://bit.ly/Brain-R01">http://bit.ly/Brain-R01</a>	Jan 5, 2017 Jan 5, 2017
Global Noncommunicable Diseases and Injury Research (R21)	<a href="http://bit.ly/NCD-injury">http://bit.ly/NCD-injury</a>	Feb 22, 2017
International Research Scientist Development Award (IRSDA) (K01)	<a href="http://bit.ly/IRSDA2017">http://bit.ly/IRSDA2017</a>	May 2, 2017

For more information, visit [www.fic.nih.gov/funding](http://www.fic.nih.gov/funding)

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Fogarty International Center  
National Institutes of Health  
Department of Health and Human Services

Managing editor: Ann Puderbaugh  
[Ann.Puderbaugh@nih.gov](mailto:Ann.Puderbaugh@nih.gov)

Writer: Cathy Kristiansen

Writer/editor: Shana Potash  
[Shana.Potash@nih.gov](mailto:Shana.Potash@nih.gov)

Writer/editor: Karin Zeitvogel  
[Karin.Zeitvogel@nih.gov](mailto:Karin.Zeitvogel@nih.gov)

Web manager: Anna Pruet Ellis  
[Anna.Ellis@nih.gov](mailto:Anna.Ellis@nih.gov)

Designer: Carla Conway

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## HHS revises global health strategy

Recognizing that the health and safety of Americans are more closely linked than ever before with the rest of the world's, the U.S. Department of Health and Human Services (HHS) has revised its global strategy. Because health concerns of the 21st century don't stop at national borders, they require global solutions, the new plan notes.

Three broad goals reflect the HHS mission in global health:

- protect and promote the health and well-being of Americans through global action
- improve global health and well-being by providing international leadership and technical expertise in science, policy, programs and practice
- advance U.S. interests in international diplomacy, development and security through global action

The revised strategy acknowledges that in an increasingly interconnected world, decisions and policy implementation must take global factors into account. In addition to its overarching goals, the plan also includes objectives to strengthen the health workforce to ensure equitable access to quality health care; sustain current efforts to prevent and control infectious diseases; address the growing global burden of noncommunicable diseases; counter global health security threats; ensure the safe, quality supply of food, feed, and medical products; and meet the needs of vulnerable populations.

In 2012, HHS issued a strategic plan to guide global collaboration.

The revised global health strategy is available at <http://bit.ly/HHSglobal>

