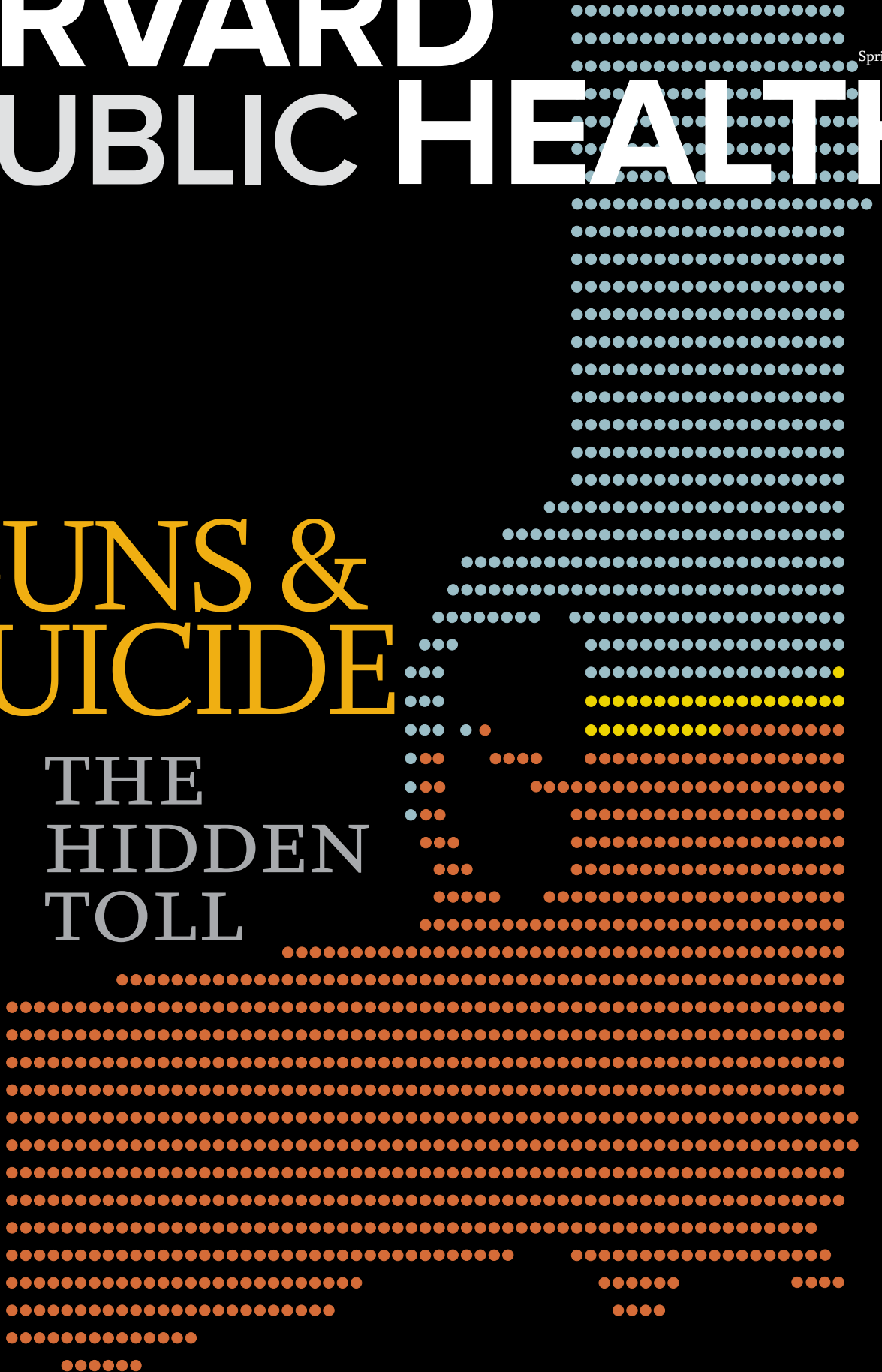


HARVARD PUBLIC HEALTH

Spring 2013

GUNS & SUICIDE

THE HIDDEN TOLL





Health and Headlines

As this issue of *Harvard Public Health* confirms, public health rings loud and clear in the daily news. And virtually every story that is printed, podcast, browsed, blogged, streamed, tweeted—and even just talked about—circles around ideas that inform our purpose and mission at the School.

Against the backdrop of a broad national discussion on gun violence, our cover article delves into the hidden toll of gun suicide—a problem on which the School's Matthew Miller, Catherine Barber and Deborah Azrael have conducted groundbreaking studies that have shaped the debate. Indeed, the Harvard Injury

Valley to Capitol Hill brings a sharp public health focus to federal lawmaking. And a lively conversation with Ichiro Kawachi reveals how the burgeoning science of behavioral economics can be applied in public health.

The public health mission is timely, because so much human suffering—from infectious diseases to unhealthy lifestyles to the afflictions of poverty and unequal access to care—can be prevented with evidence-based policies. But public health is also timeless, because it depends on vigilance and a long-term vision that transcends the accelerating news cycle.

As the School prepares to celebrate its centennial, the vital role of public health will continue to find its way into the headlines. And many of those headlines will reflect the work of the School, which accounts for more media mentions than any other school of public health. As this issue of *Harvard Public Health* shows, HSPH researchers will be there with the high-impact data and perspective needed to make sense of our rapidly changing world.

Virtually every story that is printed, podcast, browsed, blogged, streamed, tweeted—and even just talked about—circles around ideas that inform our purpose and mission at Harvard School of Public Health.

Control Research Center, directed by David Hemenway, has been at the forefront of separating facts from fiction in the contentious discussion around the U.S. gun violence crisis.

Also in this issue, the profile of Siddharth Kara reminds us that the quest for health and well-being is inextricable from the quest for universal human rights. Curtis Huttenhower's creative work on the human microbiome is setting the stage for what may be the next revolution in public health and medicine. Raul Ruiz's inspiring journey from California's Coachella



Julio Frenk
Dean of the Faculty and
T & G Angelopoulos Professor of Public Health
and International Development,
Harvard School of Public Health

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Zachary Demers died of gun suicide in 2008 at the age of 23.

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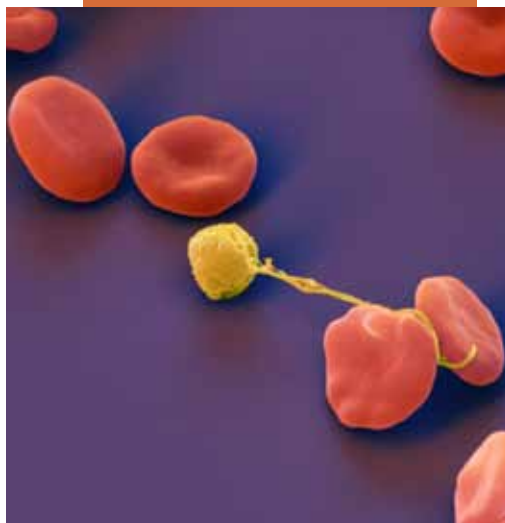
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HSPH on edX

On the Cover: Our illustration represents the relative numbers of different types of gun deaths in the United States. Red dots represent gun suicides; blue dots represent gun homicides; yellow dots represent accidental gun deaths.

HSPH CRACKS SECRETS OF THE MALARIA PARASITE



HSPH researchers, led by Manoj Duraisingh, HSPH associate professor of immunology and infectious diseases, have discovered the mechanism by which the malaria parasite, *Plasmodium falciparum*, evades detection by the human immune system. The parasite changes a critical protein on its surface, which it uses as one of several molecular “keys” to enter a new red blood cell. With 1.2 million malaria deaths each year worldwide—mainly children in sub-Saharan Africa—these findings could help in developing drug therapies.



Workplace Wellness: HSPH Leads by Example

The CEO Roundtable on Cancer recently accredited HSPH with the CEO Cancer Gold Standard™, recognizing the School’s efforts to reduce cancer risk for employees and family members by promoting healthy lifestyle choices, cancer screenings and access to quality treatment.

SNAP DIETS FALL SHORT ON NUTRITION



The federal Supplemental Nutrition Assistance Program (SNAP) is “a vital program with the potential to influence the diets of millions of vulnerable Americans,” said Cindy Leung, SD ’12. But Leung and other School researchers have found that SNAP participants’ diets are actually worse than those of low-income adults not participating in the program, with significantly lower intakes of whole grains and higher intakes of fruit juice, white potatoes and red meat, and too many sugary beverages, particularly among women. Researchers speculate that SNAP beneficiaries may be spending their allotments on cheaper, nutrient-poor foods. Leung and her colleagues conclude that “further consideration needs to be given to creating incentives for SNAP participants to access healthier foods, and to limit the purchase of unhealthy food with SNAP benefits.”

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Dean Frenk Strengthens Collaborations During China Trip

On a week long trip to China in January 2013, HSPH Dean Julio Frenk brought an important message about public health: It's essential to continued human progress.

Frenk's trip, which took him to Shanghai, Beijing and Hong Kong, was aimed at strengthening the School's existing ties in China, connecting with health sector leaders and meeting with some 150 alumni and other supporters of the School.

At a speech to the Asia Society in Hong Kong, Frenk spoke of the "profoundly important connection" between public health and economic growth, and of ways that HSPH can work with the government, organizations, businesses, and individuals to help promote both health and prosperity in China.

Frenk also signed a renewed memorandum of understanding with the University of Hong Kong School of Public Health, which is led by HSPH alumnus Gabriel Leung, MPH '99, PDS '05. The two schools have collaborated since the 1990s on public health research relevant to China and the Asia-Pacific region.

Is It ADHD, or Is He Just Young for His Grade?

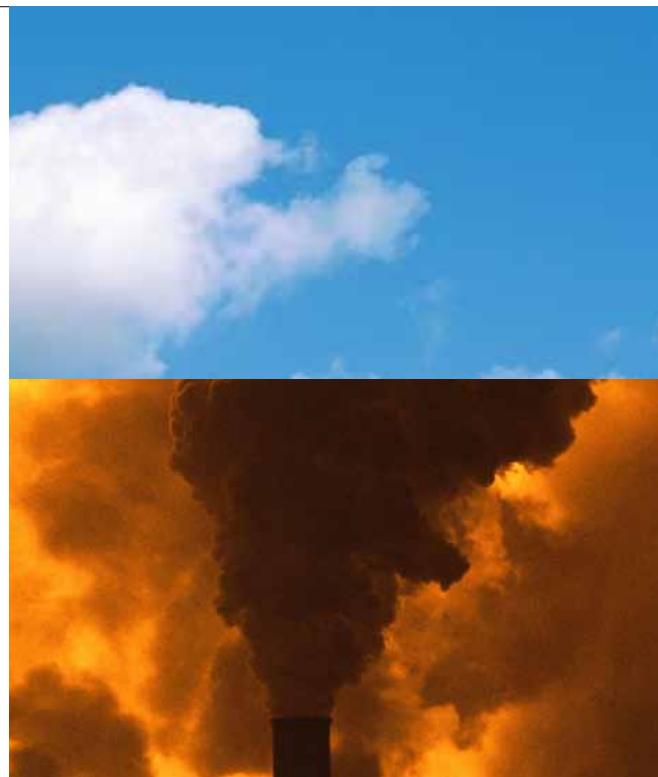
Being younger than one's classmates may lower a child's academic performance throughout childhood and increase the likelihood of being prescribed medication for attention-deficit/hyperactivity disorder (ADHD), according to a study from HSPH and the University of Iceland. Of nearly 12,000 Icelandic students ages 9 to 12, students in the youngest one-third of their class were 50 percent more likely



than older peers to be prescribed ADHD medications. "Kids may just be acting their age if they're nearly a year younger than some of their peers and are struggling a bit emotionally and academically," said senior author Sonia Hernández-Díaz, HSPH associate professor of epidemiology.

Air Pollution Down, Life Expectancy Up

A new HSPH study—the largest of its kind to date—has documented continued reductions in air pollution and improved life expectancy in 545 U.S. counties between 2000 and 2007. Air pollution has been declining steadily in the U.S. since 1980, but at a slower rate since 2000. HSPH researchers set out to ascertain whether even these relatively smaller decreases in particulate levels are still improving life expectancy. Lead study author Andrew Correia, HSPH PhD candidate in the Department of Biostatistics, concluded, "Despite the fact that the U.S. population is exposed to much lower levels of air pollution than 30 years ago, it appears that further reductions in air pollution levels would continue to benefit public health."





Lowering Women's Heart Attack Risk: Berry Good News

Women who eat three or more half-cup servings of blueberries and strawberries each week may lower their risk of heart attack, the leading cause of death for women. A recent study led by researchers from HSPH and the University of East Anglia found that the dietary flavonoid anthocyanin in these berries may improve blood flow and counteract plaque buildup. "Blueberries and strawberries can easily be incorporated into what women eat," said HSPH senior author Eric Rimm, associate professor of nutrition and epidemiology. "This simple dietary change could have a significant impact on prevention efforts."

Documenting Public Health Concerns at World's Largest Gathering



Every 12 years, a massive temporary city is created in Allahabad, India, to accommodate the tens of millions of Hindu worshippers gathered to bathe in the sacred waters of the Ganga, Yamuna and Saraswati rivers during the Kumbh Mela festival. It is the largest human gathering on earth.

This year, a team of HSPH faculty members and students, coordinated and funded by the School's FXB Center for Health and Human Rights, implemented a real-time disease surveillance system at the Mela—the first of its kind in a transient mass gathering. The project was part of a larger qualitative study that focused on health care delivery, water distribution, sanitation systems, and stampede mitigation strategies at this year's festival, which was held from January 12 to March 10 and drew an estimated 80 million pilgrims.

The team's innovative surveillance tool, the goal of which was to bolster understanding of public health concerns during mass gatherings and migrations, was noted in the February 8, 2013 *New York Times*.

CIGARETTE WARNINGS: THE POWER OF PICTURES

N

ew research from HSPH and Legacy®, a national public health foundation devoted to reducing tobacco use in the U.S., suggests that graphic cigarette warning labels may help smokers quit—including those who are poor and belong to racial/ethnic minorities, who often struggle harder to quit than others. The new study—among the first to compare pictorial labels with text-only labels across diverse racial/ethnic and socioeconomic groups—shows that powerful pictorial warning labels (mandated by the 2009 Family Smoking Prevention and Tobacco Control Act) play a lifesaving role in motivating smokers to quit. Despite this evidence, a U.S. appeals court in August 2012 ruled that cigarette companies do not need to comply with federal rules requiring their products to show graphic warning images. In March 2013, while defending the constitutionality of graphic warnings, the government dropped its push for such images on cigarette labels and said it would craft new anti-smoking ads. Senior author Vish Viswanath, HSPH associate professor of society, human development and health, said, "Given the disproportionate burden of tobacco-related disease faced by the poor and minorities, mandating strong pictorial warnings is an effective way to communicate the risk of tobacco use."





PHYLLIS KANKI

PROFESSOR OF IMMUNOLOGY AND
INFECTIOUS DISEASES
DEPARTMENT OF IMMUNOLOGY AND
INFECTIOUS DISEASES

launched, drugs were relatively expensive, but over time the costs went down. This meant that long-term treatment in even the poorest nations could enter the realm of the possible.

The School's program, like PEPFAR overall, surpassed all goals. Through our work in Botswana, Tanzania and Nigeria, we enabled 160,000 patients to receive lifesaving drugs. We trained thousands of health care workers, set up systems to deliver treatments and refurbished and equipped clinics and labs. And we learned lessons through research that can guide prevention and treatment for other common and deadly diseases, such as tuberculosis or malaria. PEPFAR proved that even the most resource-deprived clinics and hospitals in Africa can deliver and sustain the highest quality of care. ”

The Turning Point in the AIDS Epidemic

Ten years ago, President George W. Bush launched a \$15 billion international program to fight AIDS—the largest public health initiative in history dedicated to a single disease. The School's Phyllis Kanki spearheaded HSPH's application to the President's Emergency Plan for AIDS Relief (PEPFAR) and served as principal investigator on the grant. Kanki talks about how history will look back on this effort.

“PEPFAR was a turning point in public health. If you roll back the clock to the 1990s, the developed world was benefiting from new drugs to combat AIDS—the disease no longer had to be a death sentence. But in Africa and Asia, where the burden of AIDS was—and still is—greatest, treatment was not widely available or affordable. How could we consider we were making progress in combating the AIDS epidemic if we weren't helping the most resource-limited nations?

The PEPFAR program's goals were huge: treat 2 million people, prevent 7 million new infections, provide supportive care for 10 million people. And with AIDS patients, you can't just deliver therapies and walk away—it's lifelong. When PEPFAR was

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The Science of Irrationality

Why we act against
our own best interests

Q&A



This long-established observation, corroborated now by the burgeoning field of behavioral economics—which studies the influence of social, cognitive and emotional forces on our choices and decisions—holds great potential to transform both personal habits and public health. Ichiro Kawachi, chair of the Department of Social and Behavioral Sciences, talks with Harvard Public Health writer Amy Gutman about why all of us (himself included) so often fail to act in our own best interests and how we can change.

“We’re not coldly calculating machines.

We are motivated by the part of the human brain that is heavily present-focused.”

— Ichiro Kawachi

Q: Public health often starts out with good intentions but fails to change people’s behavior. Why?

A: Because many public health theories assume that humans are rational, and we’re not. Our thought processes are automatic. And our behaviors are ruled by emotions, including the emotional states that advertisements create.

Q: Can you give me some examples of wrongheaded public health interventions?

A: Take smoking. Public health tries to dissuade people from smoking by using surgeon generals’ messages that smoking will cause lung cancer 20 years down the line—as if, at the moment of lighting up, someone is thinking about what will happen 20 years from now. It’s what behavioral economists call “the problem of intertemporal choice”: The costs and benefits of many behaviors fall in different time periods.

Nearly all of the lifestyle choices that we in public health lecture people about fall into this category. For example, there are “investment behaviors,” such as going to the gym today to prevent heart attack 10 years from now, or flossing your teeth so that you can avoid dental bills six months later. There are also “sinful goods,” where the pleasure comes now and the cost comes later: Krispy Kremes, risky sex, smoking.

If we were perfectly rational beings, we would be able to factor all this in and make the right decision. But we’re not coldly calculating machines. We are motivated by the part of the human brain that is heavily present-focused.

Q: So what can public health do to overcome this irrationality?

A: We can be the architects of people’s decisions, so that the natural choice tends to be the healthier one. One trick from behavioral economics is default options. At McDonald’s, make the default option for kids’ meals an apple instead of a bag of french fries. Or instead of asking people if they want to super-size their meal, ask if they want to downsize it. A third default option is to make serving containers smaller; one reason why Europe has less obesity than the U.S. is that their cups and saucers and plates are much smaller than ours.

Even public transportation is a default option. In Japan, in spite of the fact that virtually nobody works out in their

leisure time, they have managed to remain lean and slim. It’s because of the investments their society has made in public transportation and the resulting exercise involved in walking between their homes and train stations, and walking up and down stairs and platforms at those stations.

Q: Any other lessons from behavioral economics?

A: It’s taught us that if you give people a good feeling about a product, your assessment of the benefits goes up and your assessment of the risks goes down. Cigarette ads play up positive emotions—“alive with pleasure,” how much fun you’re going to have by smoking this product. Often, these ads don’t even show people smoking.

Until recently, the public health message about smoking was totally unemotional: You’ll get cancer in 20 years. With the proposed Food and Drug Administration warnings, we are finally combatting fire with fire by showing images that are equally vivid and emotion-laden. But fear also tends to put people in a state of denial. I happen to think there’s a vast palette of subtler emotions, such as pride or anger or sadness, which we could use to instill healthier choices.

Q: What’s at stake if we don’t take these ideas into account?

A: Ralph Keeney, who is *emeritus* professor at Duke, has said we should stop thinking about the major health problems in America as being cancer and cardiovascular disease. But smoking, a sedentary lifestyle and overeating represent the lion’s share of preventable causes of illness. It’s personal decisions that are the major cause of our health problems.

The food and tobacco industries are well aware of the insights from behavioral economics. They liberally use these techniques in their advertising and persuasion. So why don’t we?

Q: Do you ever find yourself making the sort of irrational health choices that you’ve just described?

A: When I go to Logan Airport, specifically Terminal C, there’s a Burger King. Even though I tell myself that I’m falling prey to this pattern—even though I tell myself the night before that I’m not going to do it this time—the moment I’m there, I smell the french fries and find myself making a beeline.

Global Burden of Disease: Good News and Bad News

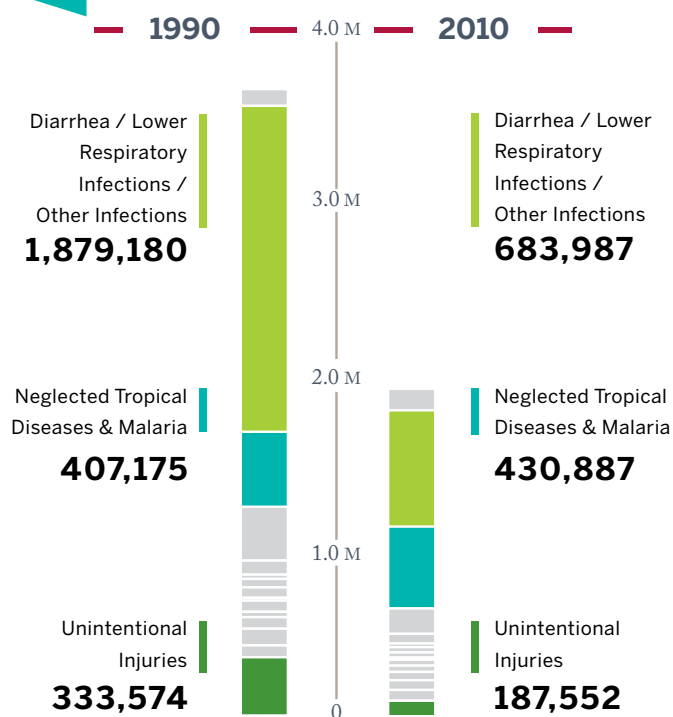
OUR WORK IS WORKING...

The past two decades have seen major progress in global health, according to the latest Global Burden of Disease study—an ambitious worldwide project involving Harvard School of Public Health faculty and many others. But as life expectancy has risen, the burden of disease has shifted—people are living both longer and sicker.

THE GOOD NEWS ABOUT GLOBAL HEALTH



MORTALITY OF CHILDREN
age 1-4 has **declined significantly**.



This is largely due to improvements in our ability to **control infectious disease** with **sanitation and vaccines**.

...AND ITS UNEXPECTED CONSEQUENCES.



GLOBALLY, PEOPLE ARE LIVING LONGER. **Life expectancy** has increased in 19 of 21 regions around the world. But people are spending their later years in poor health, particularly as a result of **chronic diseases**.

In 2010:



8 MILLION
people died of cancer.



1.3 MILLION
people died of diabetes.



POOR DIET
is the leading risk factor for death and burden of disease across the planet, followed by blood pressure, tobacco and household air pollution.



DEATHS FROM ROAD INJURIES
have increased by almost half.

The Global Burden of Disease study is a landmark event for health. It represents a collaboration of:

486
Scientists, including many from HSPH

302
Institutions

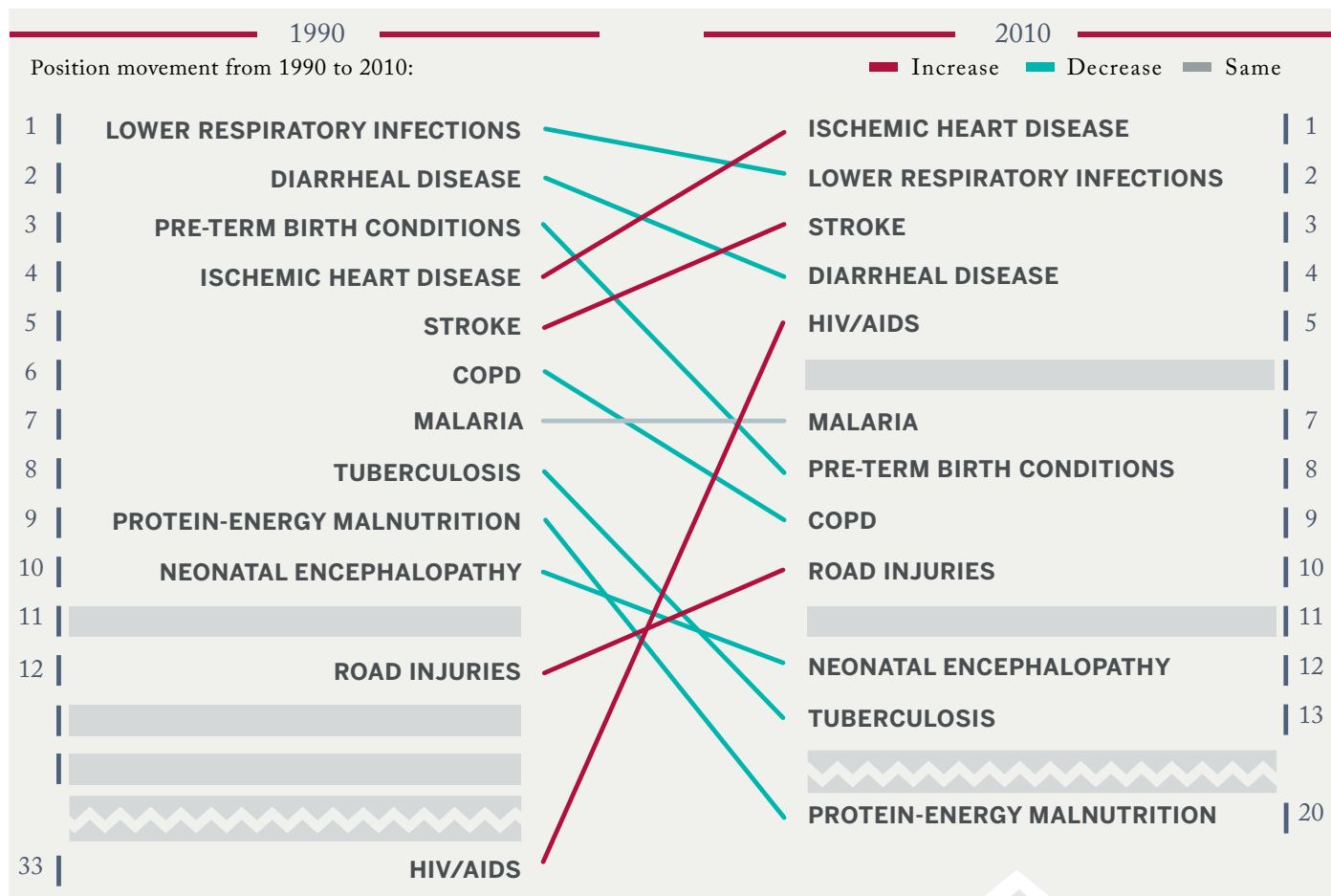
50
Countries

It is the largest study of its kind and the first such study since 1990.

...BUT THERE IS MORE TO BE DONE.

MAJOR CAUSES OF DEATH AND DISEASE—THEN AND NOW

The leading causes of health problems and health risks have shifted.



AFRICA STILL BEARS THE GREATEST BURDEN.

AIDS and other preventable conditions are still huge problems here, alongside maternal, child and newborn mortality.

AIDS REMAINS THE 3RD LEADING CAUSE OF DEATH IN EASTERN EUROPE.



IN 1990, AIDS WAS THE 33RD leading cause of disease burden and death around the world.

33rd

5th

BY 2010, AIDS MOVED TO 5TH.

1.5 MILLION PEOPLE DIED FROM AIDS IN 2010 ALONE.



HARVARD
SCHOOL OF PUBLIC HEALTH

Created by

COLUMN FIVE



With insights into the changing causes of disease and death globally, the public health community can better address critical threats to health over the coming two decades and beyond.



PHILANTHROPY & INNOVATION

Prevention and early diagnosis are among the best ways to reduce costs and ease human suffering. A great example of how philanthropy enables this is a grant from Goldman Sachs to support our involvement in their efforts to combat the rapid increase of breast cancer among Chinese women. Breast cancer diagnoses have soared in China over the past decade; 2011 saw a nearly 60 percent increase from nine years earlier. Knowing HSPH will be joining in efforts to reverse this trend is exactly the sort of thing that makes our work so meaningful.

Another strategy for reducing costs is to be sure the health systems we're paying for actually work. Thanks to support from the Bill & Melinda Gates Foundation, the School's Peter Berman will be leading an initiative in Ethiopia to help the health care delivery system adapt to changing economic and demographic conditions, especially in rural areas.

Of course, a first step to ensure that we're getting the biggest bang for the buck is to understand the true costs of options so we can compare them. A great example is the study of alternative energy sources, to be conducted by our Center for Health and the Global Environment and funded by Wells Fargo over the next five years. The study will look not only at the most obvious financial costs but also at hidden expenses, such as environmental damage and harm to health.

Finally, as every student of public health knows, we need to consider the impact of vaccines, drugs and other interventions across entire populations before we can determine whether they are cost effective and beneficial. To this end, Millennium: The Takeda Oncology Company will be funding an HSPH fellowship in pharmacoepidemiology, a fast-growing field that takes clinical drug evaluation to the population level.

While these four projects may seem very different, I hope you appreciate, as I do, the common thread running through them. Each identifies cost-effective public health solutions provided by philanthropy. And each moves us closer to a world where quality health care is available to all.

Warm regards and many thanks,

Ellie Starr,

Vice Dean for External Relations

Kent Dayton / HSPH

Millennium Gift Will Redefine Ranks of Pharmacoepidemiologists

Phar • ma • co • epi • demi • ologist:

1: A public health specialist who determines the effectiveness and safety of drugs, vaccines or medical devices by studying their effects in populations.

2: A practitioner in this fast-growing public health field for which demand has outstripped expertise.

Fortunately, a new \$375,000, five-year gift from Millennium: The Takeda Oncology Company will rewrite that definition, launching a fellowship to support pharmacoepidemiology students at Harvard School of Public Health. Over the long term, this support—which will help HSPH train a new generation of professionals who will be able to contribute to crucial public health decisions—could translate into improved health outcomes for millions of people, according to Sonia Hernández-Díaz, HSPH associate professor of epidemiology and director of the pharmacoepidemiology program.

Tallying the True Costs of Controversial Energy Sources



What are the real costs of recent and controversial energy technologies such as extracting oil from tar sands or using hydraulic fracturing to release natural gas from shale? What are the far-reaching expenses, in terms of money, damage to the environment and harm to health? In this comprehensive accounting, are wind energy or solar energy any less costly?

Researchers from HSPH's Center for Health and Global Environment (CHGE) plan to explore these questions, thanks

to new funding from the Wells Fargo Foundation. Over the next five years, Wells Fargo—which has provided support to CHGE since 2007—will give \$1 million to support the center as it conducts comprehensive “life cycle” analyses of both the extraction of oil from tar sands and of natural gas from shale. The Wells Fargo funds will also enable CHGE to examine life cycle costs of wind and solar energy, which have been marketed as “green” solutions to U.S. energy needs, although their effects on the environment and on human health are often poorly understood. As part of the grant, CHGE will widely disseminate its findings.

“Wells Fargo’s support enables us to think deeply and broadly at the intersection of energy and health, and to make sure that we communicate what we learn as effectively as possible,” says CHGE associate director Aaron Bernstein, who is also a physician at Children’s Hospital Boston and an instructor in pediatrics at Harvard Medical School. He adds, “The grant has the potential to help inform a wide audience—from policymakers in D.C. to K through 12 teachers to the lay public—about how the energy choices we make today will affect our health in the years to come.”

Aided by previous support from Wells Fargo, CHGE has published several influential reports on climate, energy and health, including a 2011 assessment of the true economic, health and environmental costs of coal.

“The tools of pharmacoepidemiology are a vital complement to the extensive testing that drugs receive before they reach the broader public, because they identify effects that become more apparent in large populations than in clinical trials,” Hernández-Díaz explains. “With the generous unrestricted support of private donors like Millennium, the program can equip future leaders with the knowledge and skills they need to examine across populations the safety, effectiveness and utilization of drugs, vaccines, medical devices, and procedures.”

She adds, “Funding is crucial for students these days. Our department has lost top candidates in the past because other universities were offering more attractive financial packages. This gift will increase the number of top candidates we can attract and retain in the program.”

“Pharmacoepidemiology is critical for drug development,” notes Jane Porter, senior director of epidemiology at Millennium. “Regulatory agencies are increasingly requiring pharmaceutical companies to provide epidemiologic information and conduct epidemiologic postmarketing studies. It is important to Millennium and other drug companies to have access to current research and thinking in evaluating the safety of our products—and HSPH has a reputation for leadership and excellence in pharmacoepidemiology.”

The Millennium gift will also fund annual meetings between HSPH pharmacoepidemiology students and Millennium scientists. Says Porter, “We hope to have a two-way exchange of ideas, so that there is a mutual understanding of issues and challenges.”

Goldman Sachs Supports Efforts to Reduce and Prevent Breast Cancer in China

Breast cancer is the most common type of malignancy among Chinese women, and it's on the rise. There were 215,600 new breast cancer diagnoses in China in 2011, a nearly 60 percent increase from just nine years earlier. The median age of Chinese women with breast cancer is 48—roughly 10 years younger than their Western counterparts. And China's breast cancer mortality has doubled over the past 30 years. Often, breast cancer diagnoses aren't made until women are already suffering late-stage cancer.

A new \$1.7 million grant from Goldman Sachs Gives to Harvard School of Public Health is aimed at reversing these grim trends. As part of Goldman Sachs Gives' Breast Cancer Education and Awareness Initiative in China, launched in 2011, a faculty team at the School, led by Yuanli Liu, senior lecturer in the Department of Global Health and Population, is developing scientifically sound and culturally sensitive breast cancer awareness and training materials and curricula for the Chinese provinces of Hunan and Sichuan and the Tianjin metropolitan area—that can be replicated and scaled up nationwide. The project will support the All-China Women's Federation and the Chinese Ministry of Health in their efforts to promote breast cancer awareness and prevention.

"This project provides an incredible opportunity for Harvard faculty from diverse disciplines—health systems, epidemiology, oncology, health communication, and social and behavioral sciences—to come together to design and evaluate an evidence-based model for breast cancer awareness and education in China," says Vish Viswanath, associate professor of social and behavioral sciences and a co-investigator on the China breast cancer project. "If we develop a successful model, this has the potential to save millions of lives."

"We're funding the Harvard School of Public Health because we believe this world-class institution is uniquely positioned to advance the goals of our work already under way in China," says J. Michael Evans, vice chairman and



global head of growth markets at Goldman Sachs. "As one of the most highly regarded institutions in public health with extensive experience in China—and thus attuned to the cultural, social, economic, and political dynamics in the country—we think HSPH can make an immense contribution to our efforts of building evidence-based models for breast cancer awareness and developing the first standardized series of disease education curriculum in China that can be scaled nationwide."

The new breast cancer initiative builds on the School's 30-plus years of collaborations with colleagues in China. For example, Liu also leads HSPH efforts in conducting applied research, convening global leaders for high-level policy dialogues and providing leadership education for China's health-policy makers and senior health executives. HSPH faculty have also helped China tighten air-quality standards and piloted a low-cost health insurance system that now covers more than 90 percent of the country's rural population, an estimated 600 million people.

Others on the breast cancer project team include Wendy Chen, MPH '99, assistant professor of medicine and a breast cancer oncologist at Dana-Farber Cancer Institute (DFCI); Shoba Ramanadhan, SD '08, a research scientist at the DFCI Communication Laboratory; and HSPH associate dean Karen Emmons, who leads the advisory committee for the project.

A Man with a PLAN



“Do I look like a man with a plan?”

The slender young man with the radiant smile is mimicking a line from the villainous Joker in the second Batman movie.

At first glance, the answer to his mischievous question is, “Yes.” The youngest of six children in a hardworking Indonesian family, Panji Hadisoemarto, now 33, earned a medical degree before embarking on a public health research and teaching career that has taken him from his hometown of Bandung to Boston, where he is currently a doctoral student at Harvard School of Public Health.

But appearances can be deceiving. In fact, this seamless list of accomplishments began as a Plan B. Medical school was a distant second choice for Hadisoemarto when he failed to get into a top informatics program to prepare for a career creating computer games, the passion of his teen years. Two older siblings already owned the pricey medical textbooks, and he didn’t really see another option. “My dad always told us, ‘You don’t have any choice but to pass the college entrance exam. If you don’t, I will just buy you a pair of goats.’ I didn’t want to be a goatherd—not that there’s anything bad about it.”

continued on page 44



the story of public health has largely been a story of conquering infections, from smallpox to syphilis to scarlet fever. Since the late 19th century, the War on Germs has boosted life expectancy and eased incalculable suffering.

But today, scientists are realizing that the unseen bacteria, viruses and other microorganisms that pervade our world are not necessarily our foes. While our bodies contain some 10 trillion human cells, there are more than 100 trillion microbial cells in and on every exposed surface of our bodies—a resident menagerie collectively known as the human microbiome. (Because of their small size, microorganisms make up only 1 to 3 percent of the body's mass.) And while we sport about 23,000 human genes, our microbiome contains some 8 million, making them a far more capable force than we had ever reckoned.

Put simply, our bugs are us. And according to Curtis Huttenhower, assistant professor of computational biology and bioinformatics in the Department of Biostatistics, that insight may transform our understanding of how healthy bodies become

OUR BUGS, OURSELVES

Microbes in and on our bodies outnumber human cells 10 to 1—and may determine how we get sick and stay well.

diseased, how aging leads to infirmity and especially how we might tinker with our internal ecosystems to prevent and treat a vast range of conditions, from diabetes to asthma to obesity.

“Our relationship with our microbes is not a war; it’s a well-defined truce, a balance. It’s a system that natural selection has worked on for millions and millions of years,” he says. “We get one genome and that’s what we’re stuck with for our life. But our bugs can change and adapt much faster than we can. And our immune system, our metabolism and many other systems in our bodies evolved specifically to engage in this rapid conversation with our bugs, and vice versa.”

Now, for the first time, scientists are listening in.

continued



“We get one genome and that’s what we’re stuck with for our life. But our bugs can change and adapt much faster than we can.”

—Curtis Huttenhower, assistant professor of computational biology and bioinformatics

POWER IN NUMBERS

In the long genealogy of life on Earth, single-celled microbes preceded multicellular creatures by a billion years. According to Huttenhower, “You could say that humans and other multicellular organisms evolved as robots to carry around microbes.”

And microbes can boast power in numbers. “If you go to Africa and count the large mammalian species, it’s in the double digits, but their interactions and ecology are

CONDITIONS THAT MAY SOMEDAY BE TREATED BY ALTERING THE MICROBIOME

- IRRITABLE BOWEL SYNDROME
- *CLOSTRIDIUM DIFFICILE* INFECTION
- DIABETES
- RHEUMATOID ARTHRITIS
- OBESITY
- TOOTH DECAY
- ASTHMA

still complex,” he explains. “If you examine a particular skin location or a microbial biofilm in the mouth, you’ve got ten or a hundred times that many different kinds of bacteria, all interacting, and each with its own niche and genome and priorities.” The human gastrointestinal tract is the most microbially diverse part of our bodies, exposed to an onslaught of foods, drugs and other disturbances that exert strong and constant selection pressures.

In 2007, the National Institutes of Health launched a massive five-year consortium to map our microbial complexity. The agency’s Human Microbiome Project (HMP) created a base line portrait of a healthy human microbiome. By sequencing more than 5,000 samples from 242 healthy volunteers in two U.S. cities, it revealed the contours of microbial diversity in disease-free individuals. Researchers sampled and analyzed the genomes of microbes from five areas on the human body: nasal passages, oral cavities, skin, the gastrointestinal tract, and the urogenital tract.

The project found that more than 1,000 microbial species occupy our internal ecosystems. And while our human genomes are more than 99 percent identical genetically, our microbial communities are typically only about 50 percent the same. That suggests that different species of bugs are doing the same jobs in our bodies—in a sense, pinch-hitting for one another.

The HMP also found that while the worst bad guys—microbial pathogens—aren’t present in healthy individuals, all of us carry organisms that can cause disease

under the wrong circumstances. Most of the time, these “opportunistic” pathogens live in harmony with their human hosts, providing the vital functions necessary for their and our survival. How and why these microbes become renegades rather than team players is an important scientific question.

NEW TOOLS AND TECHNOLOGIES

These insights were made possible by new tools, both in the lab and on the computer. Traditionally, microbiology has focused on single species, often isolating each by itself in a petri dish for examination. But the vast majority of microbes that thrive in and on us have never been cultured in this way, in part because their growth depends on a particular microenvironment that had not been, or could not be, replicated at the bench.

ON AND IN EACH PERSON:

- HUMAN CELLS
10 TRILLION
- MICROBIAL CELLS
100 TRILLION

Modern advances in DNA sequencing technology changed all that. Today, scientists can parse not just the genome of a single bacterial strain, but the genetic material from whole microbial communities. They first purify the human and microbial DNA in a sample straight from the environment, sequence it and then use computers to sort through the resulting genomic fragments and identify the genetic signals found only in bacteria and other

continued

“What happens when I shake somebody’s hand? Do their skin microbes get beaten out, in some sense, by my skin microbes, because my microbes have evolved to be with me? Or do our microbial communities combine?”

—Curtis Huttenhower



microbes. This cheap, high-volume technology can create an instant catalog of organisms, genes and genomes from a microbial community sample. “From literally billions and billions of microbial DNA sequences,” says Huttenhower, “we’re beginning to interpret these complex mixtures of nucleic acids—the A’s, C’s, G’s, and T’s—in terms of how they affect our ecosystems and our health.”

A lead author for one of the HMP papers published in *Nature*, Huttenhower likens the possibilities to those that suddenly opened when astronomers began using radio telescopes. “The data that you obtain from a radio telescope aren’t something you can see with the eye, but abstract values read out of an instrument and converted into a pattern by a computer. Likewise, in biology, we’ve gone from optical microscopes—our equivalent of telescopes—to instruments that rely on DNA sequencing and use a computer to tease out signals from the data.” Using these high-throughput sequencing technologies, researchers have uncovered an infinitesimal universe.

UNIQUE MICROBIAL PROFILES

Each of us has a unique microbial profile—in some ways, our bugs are as much a biological signature as our genomes. Our unique sets of microbial passengers are forged by genetics, early life events, diet, and a lifetime of exposures to infections, pharmaceuticals and other aspects of our physical environment.

Even within each of us, individual body sites harbor unique microbial ecologies. “To the microbes living on our bodies,” says Huttenhower, “our skin and our mouth and our gut are as different as a desert and a prairie and a rainforest.”

Where do these organisms come from? Until birth, humans are virtually sterile, consisting of only our own somatic cells. But during the first few years of life, we are bathed in microbes we pick up from our mothers, the hospitals where we’re born, our homes, our families, food, clothing, trees, dirt, pets, playgrounds, the air we breathe. Some of these organisms stick with us all our lives, while others are transient.



Curtis Huttenhower and his team are studying how our normal microbial communities are transferred in daily life. Below: A student swabs a touch screen in Boston’s crowded MBTA subway system.



WHAT MICROBES DO FOR US

- TRAIN OUR DEVELOPING IMMUNE SYSTEMS
- BREAK DOWN FOOD INTO ABSORBABLE NUTRIENTS
- MANUFACTURE VITAMIN K AND OTHER ESSENTIAL COMPOUNDS
- CROWD OUT DANGEROUS ORGANISMS SUCH AS *STAPHYLOCOCCUS AUREUS*

Just as these microbes need us to survive, we rely on them as well. Among other things, they train our immune systems from an early age to discern healthy flora from disease-causing invaders, break down our food into nutrients that we can absorb, manufacture essential compounds such as vitamins and anti-inflammatory

help answer that question, he is drawing on data from the Health Professionals Follow-Up Study, which for a quarter-century has collected detailed information on volunteers' diets and lifestyles. Using oral and fecal samples from the study's volunteers, Huttenhower hopes to learn how IBD, a disease with both genetic and environmental components, interacts with microbial influences in the environment.

Other autoimmune conditions, such as type 1 diabetes, rheumatoid arthritis and asthma, may also arise from changes in the microbiome. Long before researchers began investigating the microbiome, they knew that allergies and asthma were tied to early-life environments. Children who are more exposed to dirt and animals are less likely to develop allergies and asthma. The so-called hygiene hypothesis suggests that childhood exposure to germs and certain infections trains the immune system to be robust later in life, and that, conversely, relatively clean environments in early life prod the immune system to overreact to harmless substances such as pollen.

"The microbiome is one part of the environment that might help explain the rapid increase in the last 50 or so years of chronic, nongenetic disease," Huttenhower says.

signals, and crowd out dangerous pathogens, such as disease-causing strains of *Clostridium difficile* in our intestines or *Staphylococcus* on our skin.

FROM HEALTH TO DISEASE

And when this ecosystem, finely tuned by evolution, slips out of balance, we get sick.

Inflammatory bowel disease (IBD), for example—a group of conditions that includes Crohn's disease and ulcerative colitis, both painful and relapsing conditions—seems to be triggered when normal gut bacteria become less diverse and shift in their proportions of various species. Huttenhower is working on a study that may illuminate whether the typical high-fat, low-fiber Western diet correlates with the microbiome profile found in IBD patients. To

Microbiome studies may uncover the mechanisms behind the hygiene hypothesis. Today, researchers are comparing the microbiomes of children raised on farms and exposed to livestock with those of kids who grow up in cities. According to Huttenhower, "If you're a child in an urban area that's all steel and concrete, with no trees and no parks, that increases your risk of allergy or asthma later on, relative to growing up in open areas with more natural microbial communities."

MICROBES AND MASS TRANSIT


In 2012, Huttenhower received a grant from the Alfred P. Sloan Foundation to study how our normal microbial communities are transmitted during our everyday lives,

continued

such as in Boston's crowded MBTA subway system. Swabbing samples from subway cars and touch screens on three different lines, his team will try to find out how or if bugs are transferred between people, becoming permanent denizens of other riders' microbiomes.

"What happens when I shake somebody's hand?" he ponders. "Do their skin microbes get beaten out, in some sense, by my skin microbes, because my microbes have evolved to be with me? Or do our microbial communities combine? Or do they stably transfer some of their community to me? And do those same patterns of transmission hold true for surfaces and airways? That's why

Take the painful and seemingly random flare-ups of Crohn's disease. "If we could determine from changes in bugs—say, from a stool sample or, in an optimistic world, a saliva sample—that there's a microbial or immunological change before the flare begins, then we could treat the problem before it starts," says Huttenhower. That treatment could consist of standard medications, or perhaps even of tailored doses of bacteria that would restore the gut microbiome to a healthy state. (Think of it as a research-based version of consuming large quantities of live-culture yogurt to keep the digestive system functioning smoothly.)



Each of us has a unique microbial profile—in some ways, our bugs are as much a biological signature as our genomes.

I'm interested in looking at the MBTA: How do our bugs get to our environment and back, if at all?"

Given the intimate connection between our microbiome and our own cells, other conditions, from obesity to mental illness to the frailty of old age, are also ripe for exploration. Huttenhower cites several recent studies indicating that the microbiome in older people, for example, is less diverse than in the young. As in several other conditions, this raises the question of whether changing microbial communities are a cause or a result of declining health during aging and disease.

INTO THE CLINIC?

Microbiome studies may someday pay off in methods to alter the course of disease. According to Huttenhower, "An important difference between our microbial genes and our own genes is that our microbes are plastic and modifiable. Every time we eat something or take antibiotics, we change our microbial communities. This means that they have the potential to be an effective point of prevention and disease treatment."

Deploying bacteria as drugs isn't new. Earlier this year, studies showed that transplanting fecal specimens from healthy individuals cured *Clostridium difficile* infections—an agonizing and sometimes deadly infection in the intestine, usually in the elderly, that typically follows a regimen of broad-spectrum antibiotics. Indeed, antibiotics—the lifesaving medications behind many of public health's 20th-century triumphs—may turn out to have unintended consequences beyond the well-documented problem of drug-resistant pathogens.

If our bodies are composed of delicately balanced microbial environments, then antibiotics are like a "wildfire," says Huttenhower. "They burn down everything." Even interventions like fecal transplants "are a big hammer," he conceded. "A question many of us are interested in is: What's the smallest, most targeted, most nuanced intervention to treat not only *C. diff* infections or IBD, but also other inflammatory conditions such as diabetes or rheumatoid arthritis? Could we introduce a single species of bacteria, or just a few species, to restore a healthy, diverse ecology? Could we target specific molecules or a specific chain of events in microbial communities, the way we've begun to do in cancer?"



Catherine Baranowski, PhD '18, swabs surfaces on Boston's MBTA subway system, in a project that explores whether human microbial communities are transferred in well traveled public places.

The microbiome even offers possibilities for early diagnosis. “We should be able to learn to read our bugs to tell us about our future health, just like we’ve done with the human genome in the past 10 or 15 years,” says Huttenhower. Microbial profiles are potential clues to whether patients will respond to drug treatment, need surgery or stand the risk of ever developing certain diseases.

But it’s important to temper the enthusiasm of the moment against the daunting challenge such research presents. “Think about how long it’s taken us to find molecular treatments for cancer or genetic treatments based on the human genome, both of which have been more studied by more people for a lot more time,” he warns. “All translational science underestimates two things. One is the difficulty of reliably picking a signal out of big data. The second is the difficulty of going from that signal to the clinic.” Both steps are possible in the human microbiome, but neither will be easy.

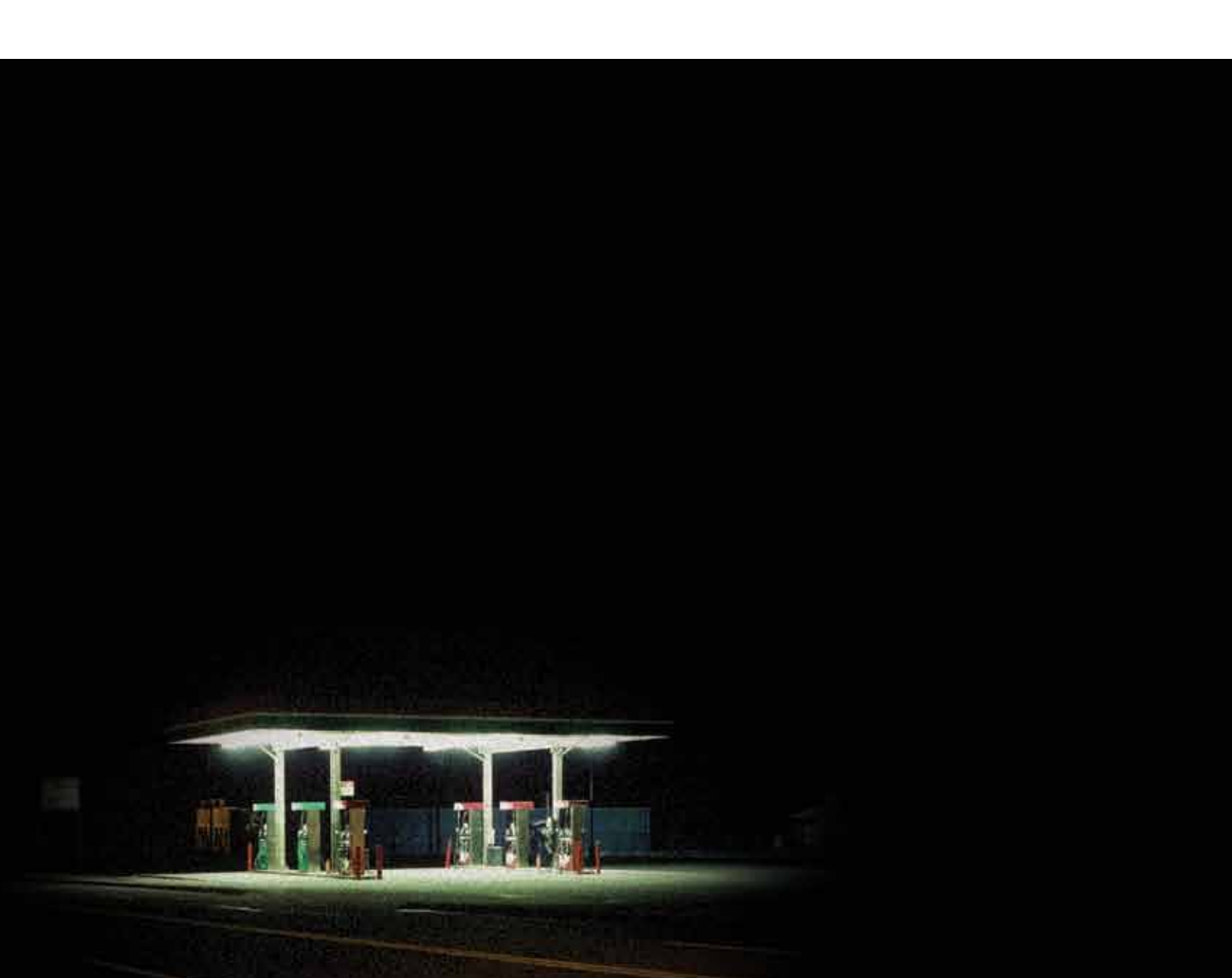
HIGH STAKES

But the stakes for such research are high, and the potential payoff dramatic. “The microbiome is one part of the envi-

ronment that might help explain the rapid increase in the last 50 or so years of chronic, nongenetic disease. Obesity, types 1 and 2 diabetes, inflammatory diseases like inflammatory bowel disease, and autoimmune diseases like rheumatoid arthritis have all have gone up at a rate that cannot be explained by human genetics, and therefore must be caused by changes in our environment,” Huttenhower says. “Changes in that time have included diet, our stress levels, our indoor and outdoor environments, and our use of antibiotics and other pharmaceuticals. All of those factors also affect our microbiomes, which have evolved over hundreds of millions of years to train our immune systems and keep us healthy. The last few decades have seen changes at a rate faster than anything else during those millennia, and our microbes might be having trouble adapting—putting our health at risk in the meantime.”

If those connections prove true, he adds, “That’s a huge motivation to do this work. We need to focus on this now, as quickly as possible.”

Madeline Drexler is editor of Harvard Public Health.



Guns & Suicide: The Hidden Toll

Special Report

by Madeline Drexler, Editor, Harvard Public Health

There's a gas station maybe a five-minute drive away from us, and the gas station sells guns. I didn't realize places like that existed. Ryan just walked in and bought a handgun. We had gotten into an argument—which we hardly ever did—and he left. The next morning, the police knocked on my door. A construction crew had found him dead in his car at an abandoned railroad station.

—Emily Frazier, 27, widow of
Ryan Frazier, who shot himself
with a semiautomatic in 2008

continued

In the national debate over gun violence—a debate stoked by mass murders such as last December’s tragedy in a Newtown, Connecticut, elementary school—a glaring fact gets obscured: Far more people kill themselves with a firearm each year than are murdered with one. In 2010 in the U.S., 19,392 people committed suicide with guns, compared with 11,078 who were killed by others. According to

kill themselves with guns than with all other intentional means combined, including hanging, poisoning or overdose, jumping, or cutting.

Though guns are not the most common method by which people attempt suicide, they are the most lethal. About 85 percent of suicide attempts with a firearm end in death. (Drug overdose, the most widely used method in suicide attempts, is fatal in

Institute of Mental Health, complex and deep-rooted problems—such as depression and other mental disorders, drug and alcohol abuse, family violence, and a family history of suicide—often shadow victims. Suicide among males is four times higher than among females. In adults, separation or divorce raises the risk of suicide attempts. In young people, physical or sexual abuse and disruptive behavior

“Cut it however you want: In places where exposure to guns is higher, more people die of suicide.”

—Deborah Azrael, associate director of the Harvard Youth Violence Prevention Center

Matthew Miller, associate director of the Harvard Injury Control Research Center (HICRC) at Harvard School of Public Health, “If every life is important, and if you’re trying to save people from dying by gunfire, then you can’t ignore nearly two-thirds of the people who are dying.”

Suicide is the 10th-leading cause of death in the U.S.; in 2010, 38,364 people killed themselves. In more than half of these cases, they used firearms. Indeed, more people in this country

less than 3 percent of cases.) Moreover, guns are an irreversible solution to what is often a passing crisis. Suicidal individuals who take pills or inhale car exhaust or use razors have time to reconsider their actions or summon help. With a firearm, once the trigger is pulled, there’s no turning back.

NOT “WHY?” BUT “HOW?”

When we think of suicide, we usually think of a desperate act capping years of torment. According to the National

increase vulnerability.

The harrowing fact of suicide demands a story: “Why?” But from a public health perspective, an equally illuminating question is “How?”

Intent matters, but so does method, because the method by which one attempts suicide has a great deal to do with whether one lives or dies. What makes guns the most common mode of suicide in this country? The answer: They are both lethal and accessible. About one in three American households contains a gun.

The price of this easy access is high. Gun owners and their families are much more likely to kill themselves than are non-gun-owners. A 2008 study by Miller and David Hemenway, HICRC director and author of the book *Private Guns, Public Health*, found that rates of firearm suicides in states with the highest rates of gun ownership are 3.7 times higher for men and 7.9 times higher for women, compared with states with the lowest gun ownership—though the rates of non-firearm suicides

ACCESS TO GUNS RAISES THE RISK OF SUICIDE		
VARIABLE	States with the Highest Rates of Gun Ownership	States with the Lowest Rates of Gun Ownership
Average population 2001–2005	49 million	50 million
Percent of households with guns	47	15
Total firearm suicides	16,577	4,257
Total nonfirearm suicides	9,172	9,259

Source: Miller M and Hemenway D. *Guns and suicide in the United States*. New England Journal of Medicine 2008; 359:672-3.

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“He was struggling with nightmares.”

Emily Frazier’s 21-year-old husband, Ryan Frazier, shot himself with a semiautomatic in November 2008, soon after bringing a lawsuit against a priest who had molested him during his teenage years. Emily, pregnant at the time with their second child, is now the single mother of a 5-year-old son and a 3-year-old daughter. She works in human resources. The priest was convicted in 2007 and sentenced to 30 days in jail.

Ryan and I met in high school and married right out of high school. He was friendly, genuinely cared about everybody. He was one of the top five salespeople in the country for Verizon. He had a business card collection that I still have, it’s five or six inches thick. People would write down their number and they would want to meet up with him again, because he was so kind.

He was very young, handling a lot of responsibilities, working really hard, with the sleep deprivation of having an infant. And he had struggled with nightmares since the incident with the priest.

Ryan had never used a gun before. The police report said he had fired test shots out the window of the car. After he died, I walked into the gas station where he had bought the gun, and the owner was there. I asked him about the process for selling a gun and if they ever screened people for mental illness. Then I said, “My husband bought a gun here and shot himself.” The owner said just a couple of words. I couldn’t read his emotion. I don’t know if he was uninterested or shocked. He didn’t say he was sorry.



are about the same. A gun in the home raises the suicide risk for everyone: gun owner, spouse and children alike.

This stark connection holds true even when other factors are taken into account. “It was a reasonable hypothesis to think that the type of person who chooses to own a gun is different from the type of person who chooses not to. Maybe there’s a ‘go-it-alone’ attitude that leads to less help seeking. Or maybe gun owners are more likely to live in rural areas, and rural locales are associated with greater suicidality,” explains Catherine Barber, director of HICRC’s Means Matter campaign, a suicide prevention effort that focuses on the ways people attempt to take their own lives.

“But when we compared people in gun-owning households to people

epidemic of those years,” says HSPH’s Deborah Azrael, associate director of the Harvard Youth Violence Prevention Center. “Young black male suicide rates approached those of young white males—though black suicide rates had always been much lower than white suicide rates. It was entirely attributable to an increase in suicide by firearms.”

Put simply, the fatal link applies across the board. “It’s true of men, it’s true of women, it’s true of kids. It’s true of blacks, it’s true of whites,” says Azrael. “Cut it however you want: In places where exposure to guns is higher, more people die of suicide.”

IMPULSIVE ACTS

The scientific study of suicide has partly been an effort to erase myths. Perhaps the biggest fallacy is that

that the middle-aged guy had gotten word that the divorce papers had come through. That reactivity surprised me, because I’d always pictured suicide as being a painful, deliberative process, something that was getting worse and worse, escalating until finally you’ve got it all planned out and you do it. It hadn’t occurred to me that it could be a cop arguing with his wife, and in the midst of the argument, pulling out his gun and killing himself.”

This impulsivity was underscored in a 2001 study in Houston of people ages 13 to 34 who had survived a near-lethal suicide attempt. Asked how much time had passed between when they decided to take their lives and when they actually made the attempt, a startling 24 percent said less than 5 minutes; 48 percent said less than 20

“The public health message is neither anti-gun nor pro-gun. It’s pro-data.”

—Matthew Miller, associate director of the Harvard Injury Control Research Center

not in gun-owning households, there was no difference in terms of rates of mental illness or in terms of the proportion saying that they had seriously considered suicide,” Barber says. “Actually, among gun owners, a smaller proportion say that they had attempted suicide. So it’s not that gun owners are more suicidal. It’s that they’re more likely to die in the event that they become suicidal, because they are using a gun.”

While gun-suicide rates are higher in rural states, which have proportionally more gun owners, the gun-suicide link plays out in urban areas, too. “In the early 1990s, the dramatic rise in young black male suicides was in lock step with the homicide

suicides are typically long-planned deeds. While this can be true—people who attempt suicide often face a cascade of problems—empirical evidence suggests that they act in a moment of brief but heightened vulnerability.

“One of the things that got me interested in launching the Means Matter campaign was that I had been reading through thousands of thumbnail sketches of suicide deaths, to see if a reporting system we were testing was catching the feel for the case,” says Barber. “I started noticing that, jeez, this death happened the same day that the kid was arguing with his parents, or that the young man had just broken up with his girlfriend, or

minutes; 70 percent said less than one hour; and 86 percent said less than eight hours.

The episodic nature of suicidal feelings is also borne out in the aftermath: 9 out of 10 people who attempt suicide and survive do not go on to die by suicide later. As Miller puts it, “If you save a life in the short run, you likely save a life in the long run.”

LETHAL ENVIRONMENTS

A central tenet of public health is that environment shapes individual behavior. In the realm of suicide, this truth has played out dramatically in recent history. When widely used lethal means are made less available or less deadly, suicide rates by that method

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“I couldn’t tell people that my father had died of suicide.”



Kristyn Bernier is a detective in Portsmouth, New Hampshire. Her father, Bruce Rogers, a dentist in Connecticut, shot himself in August 2003, at the age of 63. He had suffered for years from undiagnosed depression. Rogers used an antique hunting rifle that had been in the family. Late one evening, after several rounds of drinks, he surreptitiously took cartridges from an open box of ammunition on a neighbor’s refrigerator.

My father had a great sense of humor. He had a thriving dental practice. Volunteered all over the place, he was on every board. In his spare time, he refinished furniture. He made baskets, caned chairs. Those beautiful chairs—I have a couple of them. But he was lonely. Things changed around him, we all changed, and he didn’t.

I am a master at dealing with crisis. I’m a hostage negotiator. I was an EMT for 25 years. I handle child sexual assault cases. I handle felony domestics. I interview predators day in and day out. I have seen the most horrible things people do to each other. But I missed this crisis in my own family.

I couldn’t tell people that my father had died of suicide. I came up with creative ways to answer the question of how he had died. “He died suddenly”—that was my answer. Even in my line of work, suicide is a stigma. And if people aren’t willing to talk about suicide after it happens, how do you expect them to talk about the risks beforehand?



Harvard School of Public Health researchers have conducted many of the key national studies linking gun access and suicide. Left to right: Matthew Miller, associate director of the Harvard Injury Control Research Center (HICRC); Deborah Azrael, associate director of the Harvard Youth Violence Prevention Center; and Catherine Barber, director of HICRC's Means Matter campaign.

decline, as do suicide rates overall. In Sri Lanka, for example, where pesticides are the leading suicide method, the suicide rate fell by half between 1995 and 2005, after the most highly human-toxic pesticides were restricted.

Similarly, in the United Kingdom before the 1950s, domestic gas derived from coal contained 10 to 20 percent carbon monoxide, and poisoning by gas inhalation was the leading means of suicide. A source of natural gas virtually free of carbon monoxide was introduced in 1958; over time, as carbon monoxide in gas decreased, so did the number of suicides overall—driven by a drop in carbon monoxide suicides, even as other methods increased somewhat.

Changing the means by which people try to kill themselves doesn't necessarily ease the suicidal impulse or even the rate of attempts. But it does save lives by reducing the deadliness of those attempts.

DEARTH OF DATA

Though these basic facts are known, there is a striking dearth of research on guns and suicide. In the U.S., govern-

ment officials don't even have current data on where household gun ownership rates are higher or lower. The only survey large enough to produce state-level estimates of gun ownership was conducted by the federal Behavioral Risk Factor Surveillance System, the world's largest ongoing telephone health survey. The survey asked questions about gun ownership in 2001, 2002 and, for the last time, in 2004. It was HICRC investigators who analyzed this state-level data to show that suicide rates run in tandem with gun ownership rates.

Today, the U.S. Centers for Disease Control and Prevention's National Violent Death Reporting System, which collects data from police and coroners' reports and death certificates on every suicide and homicide, covers only 18 states. Compare this with the National Highway Traffic Safety Administration's Fatality Analysis Reporting System, which amasses extensive details within 30 days of every fatal car crash on public roads, from the time and location of the accident to weather conditions to the role of alcohol and drugs. Partly as a

result of this bureaucratic diligence, the fatality rate from car crashes has dropped by about a third over the last two decades. Could the same dedication bring down suicides?

Matthew Miller thinks it can. "Better data is a good place to start. That way, discussions are grounded in facts rather than distorted by ideology. It can only help foster social-norm-shifting conversations similar to those that took place around cigarette smoking, safety belt use and driving drunk," he says. "I'd like physicians to feel it's their responsibility to tell people about the risks. There's no reason that you should have a conversation about a bike helmet or a seat belt, but not firearms."

But change also takes time. "With public health, when you don't have the one-size-fits-all solution, you chip away at the problem," says Barber. Preventing suicides will likely require many approaches, from education and media campaigns to skilled treatment and community support. Ultimately, the goal is to transcend politics—which is why those who have lost loved ones to gun suicide should have the last word:

Ryan is my baby. I remember once telling him, "If anything happens to you, I would cease to exist." And that's what it feels like. It's a pain like no other. I would encourage open conversation—actually talking about it. Preventing just one person from going through what I went through and will go through for the rest of my life—that would be enough for me.

—Wendy Tapp, mother of 19-year-old Ryan Tapp, who shot himself with a handgun in 2011

“A club I never wanted to join.”



Janyce Demers is a school lunch worker in Hooksett, New Hampshire. Her 23-year-old son, Zachary Demers, killed himself with a firearm in 2008—hours after a first drunken driving arrest. Zachary may have been afraid of losing his commercial driver's license, a great source of pride and accomplishment.

Being a suicide survivor is a club I never wanted to join. But it wasn't my choice. Zach's death was a shock to all of us. He was happy-go-lucky, loved his family, loved his sisters, loved his nephews and nieces. But he thought he was in over his head financially. And he was still living at home—that was a bother to him. To have even considered suicide, he must have been so low, just beyond anything.

I went back and looked through all his school papers. What stood out in his teachers' comments was his impulsiveness. Being impulsive, you sometimes make rash decisions, spur-of-the-moment, and they don't always turn out for the best.

There were guns in our home. My husband has hunting rifles. My daughter and my son-in-law have guns for target

practice. Zach had purchased his own firearm for hunting and target practice. That being said, I am not a gun lover—I really don't care for them. But I'm also not anti-gun. I believe there are people who can be trusted with guns for the right purposes.

Today, if I notice anyone in trouble, I don't step back and assume it's none of my business. I approach them and say, "Hey, are you thinking of doing this?" I'll ask them directly, "Do you have a gun?" I've experienced it and I'm no longer afraid to ask. People need to know that help is available.

Starting a Conversation

To foster open discussion about the consequences of gun ownership, public health researchers want to know much more about the lure of guns. Why do people own guns in the first place? How do they perceive the risks and benefits? Is the gun mainly for self-protection? Hunting? Target practice? Picking off wild animals that eat crops? And are there other ways to answer those needs that don't involve guns?

They'd also like to know why people just got rid of their last gun or acquired their first. What drives decisions at these inflection points? Is it divorce from a gun-owning spouse? Moving to a city, where guns are less prevalent? The fact that young grandchildren are starting to visit?

And researchers are curious about the beliefs and experiences of non-gun-owners living in a home with a gun. Studies have shown that women aren't always aware that their partners or children are keeping guns, suggesting that these wives and mothers would disapprove if they did know.

The blunt question that community gatekeepers should ask clients or friends who seem troubled: “Is there a gun in your home?”

COMMUNITY “GATEKEEPERS”

Psychiatrists, psychologists and social workers have begun trainings on how to talk with suicidal patients and their families about reducing access to firearms at home. Unfortunately, people contemplating gun suicide are not always in treatment and often don't display clues in advance—not even to themselves. According to Catherine Barber, director of the Harvard Injury Control Research Center's Means Matter campaign, “They may think: ‘It's not my assessment of the world that's the problem, it's the world. I'm headed back to jail, my girlfriend's broken up with me, I've got no hope for the future.’” Even when deep despair prompts people to seek help, their clinicians often fail to ask about guns or feel uncomfortable broaching the topic, in part because they lack suicide prevention training.

All of which suggests that informal contacts, outside the familiar channels of mental health care, may serve as a stronger safety net. In public health lingo, these potentially lifesaving friends and colleagues are known as “gatekeepers.” They include teachers, school psychologists, truant officers, sports coaches, pediatricians, emergency department doctors, defense attorneys, court-mandated batterers' counselors, social workers, rehab clinicians, employee-assistance staff, divorce attorneys, marriage counselors, and clergy. According to Barber, “It's those people who need to get the message, because that's where suicidal people intersect with the system.” The blunt question these gatekeepers should ask clients or friends who seem troubled: “Is there a gun in your home?”

Barber believes that most efforts to keep a firearm away from a suicidal person should be based on conversation, not confiscation. Though some situations—such as with delusional individuals—may be too dangerous to allow guns to remain nearby, in most cases an engaged and respectful approach is more effective. “You want to bring about safety through conversation,” she says. “Very rarely do you want to take control away from a person at risk of suicide.”

The Gun Shop Project

In April 2009, over a five-day period, two young men and an older woman in New Hampshire each bought handguns from Riley's Sport Shop in Hooksett and within hours committed suicide. The victims did not know each other. Soon, as often happens in a small, rural state, word spread, as did the desire to prevent such a triple tragedy from happening again. Thus began the Gun Shop Project, a novel collaboration, guided by the New Hampshire Firearm Safety Coalition, of mental health and public health practitioners, firearms dealers and gun rights advocates. HSPH injury researchers Catherine Barber and Mary Vrinotis helped organize the project, interview gun shop owners and develop educational materials.

To some, the notion of suicide prevention groups finding common cause with gun sellers seems implausible. But to Barber, it makes perfect public health sense. "You're trying to reach gun owners," she says. "Gun control isn't the way to go for suicide prevention groups, because these groups are made up of both gun owners and non-gun-owners. Even internally, they might not agree." In many ways, the gun-friendly state of New Hampshire—where the Association of Chiefs of Police recently raised money for an annual cadet training program by selling raffle tickets for 31 guns, including an assault rifle—is the perfect proving ground for creative approaches to gun-suicide prevention. Each year, the state sees about 20 homicides, but 150–200 suicides; about half of those suicides are by gun.

Riley's sells thousands of guns each year. When he learned of the three suicides committed back-to-back with firearms from his store, owner Ralph Demicco was horrified. "The suicide issue deeply impacts me," Demicco says. "I've had friends who have taken their lives. I've had wives of friends who have taken their lives. And as a businessperson, having a customer do it—it's just an ugly, ugly thing. I decided I must become involved."

Demicco reviewed the store's surveillance tapes of the soon-fatal transactions, to see if the customers were giving away clues to their intent. They weren't. But Demicco recalled earlier instances when he had picked up such clues: a customer asking for a very small amount of ammunition, or looking uneasy, or starting to cry after being asked a few questions—and his tactful inquiries diverted them from their plans.

Over the past three years, the Gun Shop Project group produced instructional videos and tipsheets for gun retailers. "Trust your instincts; you are under no obligation to sell a gun to anyone," says a handout from the New Hampshire Firearm Safety Coalition. Demicco encourages all customers who are not familiar with firearms to get training before he will sell them a gun—valuable from a prevention point of view, because it buys time during which a crisis will often pass.

Posters and brochures for customers discuss how to make firearms inaccessible if a family member appears troubled. They also prominently display the phone number for the National Suicide Prevention Lifeline (1-800-273-TALK).

About half of New Hampshire's gun retailers are participating in the project, and the Maryland Firearms Dealers Association will be adopting the model this year. The initiative even earned plaudits in the magazine *Combat Handguns*. The next step, says Barber, is to encourage suicide prevention groups to team up with other natural allies such as hunting groups, shooting clubs and gun rights groups.

"It's important that gun owners and non-gun-owners talk to one another," she says. "The question can't be, 'What do you think of gun control?' because everybody's going to be for or against. But when the question is, 'How do we solve the problem of gun suicide?' we can work out good ideas that everyone can agree on."



Politics & Beyond

Gun violence is one of the most politically divisive issues in the United States—and this contentiousness has played out in government funding of research. In 1993, a study supported by the U.S. Centers for Disease Control and Prevention (CDC) found that, rather than conferring protection, keeping a gun in the house raises the risk nearly threefold of being shot by a family member or intimate acquaintance.

Enraged by what it has called an “almost vicious sentiment against personal firearms ownership,” the National Rifle Association in 1996 successfully lobbied Congress to insert this restriction into the CDC budget: “None of the funds made available ... may be used to advocate or promote gun control.” It was a pointed prohibition that went far beyond the rule that federal research money cannot be used for lobbying on any issue. The restriction, which was interpreted broadly by CDC, served as a virtual ban on firearms research. Since the mid-1990s, the agency’s gun safety research budget has dropped by 96 percent.

In 2011, the NRA’s official website offered a rationale for its efforts to stifle research: “These junk science studies ... are designed to provide ammunition for the gun control lobby by advancing the false notion that legal gun ownership is a danger to the public health instead of an inalienable right.”

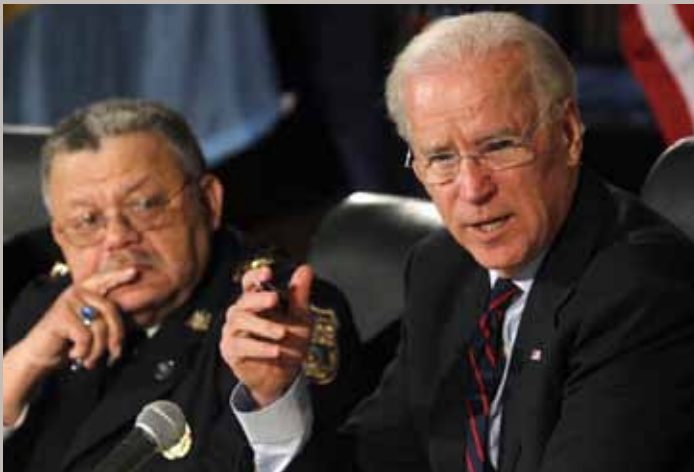
TRUSTING THE MESSENGER

But according to Matthew Miller, associate director of the Harvard Injury Control Research Center (HICRC), “The public health message is neither anti-gun nor pro-gun. It’s pro-data. A public health approach doesn’t look so much to blame as to understand and prevent.”

“Like older white men, people with mental health problems, people with family histories of suicide, etc., gun owners are ‘our’ people,” adds the HICRC’s Catherine Barber, referring to groups with increased suicide risk. “We can’t reach them with an anti-gun agenda. That’s like sending an anti-gay group to do

a suicide prevention campaign in the gay and lesbian community. If you don’t trust the messenger, you don’t trust the message.”

The Newtown, Connecticut, massacre, in which the young gunman, Adam Lanza, ended his own life after the elementary school rampage, opened another public health line of argument: that preventing suicides may also prevent homicides, including the relatively tiny number of mass murders. “Mass homicide is an outrageously hostile acting out,” says Miller, “and one can only imagine that it is deeply connected with a hostility directed at oneself as well.”



Kevin LaMarque / REUTERS

Yet for Barber, the public health conversation around guns is actually trickier since Newtown, because political positions have grown more entrenched. Toiling for years on the knotty problem of gun suicide has changed her perspective on gun control. “I’m more aware of the cultural divide between gun owners and non-gun-owners, especially when they become politicized and think ill of one another,” she says. “Some gun owners think guns make their family safer. A lot of the guys, they love the mechanism in guns—it’s the same as the love for fine woodworking tools. There can also be cultural connections, where they learned to shoot from their dad or their uncle. Gun owners and non-gun-owners are both caring, but they view the world differently.”

COULD NEW LAWS PREVENT GUN SUICIDE?

The current political debate swirls around universal background checks and assault weapons bans and magazine limits—policies unlikely to have a measurable impact on suicide. Deborah Azrael, associate director of the Harvard Youth Violence Prevention Center, is heartened by a less-trumpeted 1999 Connecticut law, which provides a mechanism for people to contact police when they fear a gun will be used for harm.

Police and prosecutors may obtain warrants to seize firearms from people who appear to be an imminent danger to themselves or others. The individual whose guns are taken has the right to a hearing within two weeks. “There have been hundreds and hundreds of people who have been motivated to call the police since the law was put into effect in the late 1990s,” says Azrael. “And they’re not saying, ‘I think my husband is going to kill me. They’re saying, ‘I think my husband is going to kill himself.’”

“THE COURAGE OF OUR CONVICTIONS”

Azrael worries that in the revived debate on gun violence, suicide will be eclipsed. She also laments that public health researchers are often reluctant to spin out the implications of the scientific evidence about firearms, for fear of being accused of an anti-gun bias. “It’s a constraint that most researchers don’t operate under. People who do research on lung cancer are allowed to draw conclusions about smoking. The same with people who do research on environmental exposure to PCBs, or on motor vehicle design issues, or on drug overdoses. There’s no national organization pillorying them or actively seeking to defund them.”

In other words, the frank and open conversation about guns that Americans need to have among themselves also applies to researchers who want to share their findings with the public. As Azrael sees it, “We need to have the courage of our convictions.”





GLOBALIZATION'S PERMANENT UNDERCLASS

Philippe Lissac/Godong / Panos



In a thatched hut in Bihar, India, amid agricultural fields and brick kilns where his children and grandchildren toiled away, an elderly man with shaking hands prepared tea. The “frayed skin scarcely covered the crumbling bones beneath,” later wrote his guest, Siddharth Kara, who recently became a fellow at the François-Xavier Bagnoud (FXB) Center for Health and Human Rights. The man’s name is Ajay, and he is a modern-day slave. He has spent more than five decades, his entire adult life, in so-called bonded labor, forced to work to pay off debts to a local landowner.

The original loan, incurred when Ajay was 17 years old, totaled 800 rupees—about \$18—to pay for his marriage. After decades of work, he still had not paid off the debt, which eventually consumed him and his family. When his wife became chronically ill, Ajay was too poor to afford medicine, and his wife died. Ajay suffers even more because he knows his two sons and grandchildren will inherit his financial obligation. “No one in this country cares about people like us,” he told Kara. “We live and die, and no one but ourselves knows we have drawn breath.”

The medieval system of bonded labor traps millions of workers worldwide for life.

Above: worker in a West Bengal brick factory.

FROZEN FISH TO FINE MARBLE

The story of Ajay, and hundreds more in similar situations, is recounted in Kara's new book, *Bonded Labor: Tackling the System of Slavery in South Asia*. The deeply researched exposé examines this cruel system of exploitation, sometimes called debt bondage. Kara, who is also a fellow at the Carr Center for Human Rights Policy at the Harvard Kennedy School, estimates that there are 18 to 20.5 million bonded laborers in the world, more than 84 percent of whom reside in just four nations: Bangladesh, Nepal, Pakistan, and most of all, India, Kara's native country.

Although the practice of debt bondage largely takes place in South Asia, the products of this institutionalized system of exploitation are consumed worldwide in everyday life. Kara found that bonded labor is used in a vast range of commodi-

ties and consumer goods, including frozen fish, tea, coffee, rice, wheat, diamonds, sporting goods, apparel, and marble. Nearly three-quarters of the frozen shrimp exported from Bangladesh, for example, is produced by bonded labor or child labor.

Stemming from a medieval system of labor, debt bondage is today an integral part of globalization, as transnational companies scour the world for cheaper labor and higher profits. As Kara writes, "[T]he persistence of bonded labor in South Asia is driven by the ability to generate substantial profits at almost no real risk, through the exploitation of an immense underclass of systemically impoverished and vulnerable people."

TREATED LIKE "DIRT AND CHATTEL"

Though a 1976 law banned the practice of bonded labor, it has gone largely unenforced. In a later Indian

SELECTION OF COMMODITIES PRODUCED BY BONDED LABORERS

- Frozen shrimp and fish
- Tea
- Coffee
- Rice
- Wheat
- Diamonds
- Gems
- Cubic zirconia
- Glassware
- Brassware
- Carpets
- Limestone
- Marble
- Slate
- Salt
- Matches
- Cigarettes
- Apparel
- Fireworks
- Knives
- Sporting goods

Sweat shops similar to this garment factory in Bangladesh frequently employ bonded laborers, including children.





“I wanted to make sure that I knew what their lives were like ... When anybody shares an intense pain, there’s a bond of trust.”

—Siddharth Kara, Fellow at the François-Xavier Bagnoud Center for Health and Human Rights

Supreme Court decision upholding the law, Chief Justice P. N. Bhagwati decried the hypocrisy of a society that “treats large masses of people belonging to the lower rungs of the social ladder or economically impoverished segments of society as dirt and chattel.” According to FXB Director Jennifer Leaning, the problem “is cyclical, it’s chronic and it’s deeply entrenched in the economic system of the state. It is fundamentally a problem of corruption and poor regulation.”

Kara’s unusual method of investigation, euphemistically known in academia as “active research,” is highly immersive. He spends countless hours with his subjects and their families, getting to know them and sharing in their work and lives. He makes it a practice to engage for up to a day in the grueling tasks he is writing about, so that he knows the experience firsthand. He has plowed fields, broken stones, tended a kiln, harvested shrimp, planted rice paddies, hand-rolled cigarettes, polished gems, and woven carpets.

“Simple scientific research is not adequate for this kind of project—it’s an intensive human engagement, trying to appreciate the predica-

ments of another human’s existence,” Kara says. “I wanted to make sure that I knew what their lives were like.” Forging a personal connection with his subjects is integral to telling their stories of hardship, he adds. “When anybody shares an intense pain, there’s a bond of trust.” A more traditional research approach—using a questionnaire, for example—can’t capture the real-life complexities.

“IS THIS HOW I WANT TO SPEND MY TIME ON THE PLANET?”

Although Kara had witnessed forced labor as a child in India, he didn’t fully understand the issue until he was an undergraduate at Duke University, in the early 1990s. Volunteering at a Bosnian refugee camp, he heard disturbing stories about sex trafficking and rape camps, where Serbs reportedly systematically raped Bosnian women. Continuing his studies back in the U.S., he never forgot the experience.

In 2000, after several years as an investment banker, Kara asked himself, “Is this how I want to spend my time on the planet?” Contemplating his next move, he

continued

HOW CAN CONSUMERS STOP BONDED LABOR?

- Pressure corporations to enforce fair labor practices among their suppliers.
- Urge lawmakers to ensure that companies monitor and take responsibility for their supply chains.
- Spread the word on social media.
- Support local and international organizations working in the field.

Siddharth Kara's investigations, which have taken him to 31 countries across six continents since 2000, have been almost totally self-funded.

Kara says his work would not have been possible under traditional academic constraints. "You would probably never get institutional review board approval for a lot of the research I did, especially for *Sex Trafficking*. It's too risky in most cases." When encountering horrific situations where someone was being

His investigations, which have taken him to 31 countries across six continents since 2000, have been almost totally self-funded, using his banking earnings and funds from further finance advisory assignments.

"A COMMON AND PERVERSIVE ASSAULT"

For many, the system of bonded labor unfolds in a hellish perpetuity, passed on generation to generation. A man named Gaurav, toiling at a brick kiln, recounts to Kara how he inherited his debt from his father. "No matter how hard I work, I am always in debt. I have taken so many loans through the years ... I take loans for food and water and cooking oil." Finally, he tried to escape with his family, but was captured by the landowner's men, who electrocuted him and then sold off his daughter to a trafficker. "I never saw my daughter again," Gaurav tells Kara.

Young children are frequent victims of this exploitative system. Pratima was 14 when her parents sent her to work for a wealthy family in Kolkata (Calcutta). In exchange, they were given an advance of 3,000 rupees, or about \$67. For three years, Pratima dusted, cleaned, washed, and cooked, without a day off, with only a mat to sleep on and leftovers for her meals, while being shouted at and demeaned by her employers. All the time, she was supposedly working off the advance that had been given to her family, but Pratima never saw a penny. While Pratima was never physically abused, other girls Kara encountered were not so lucky, regularly suffering rapes and beatings at the hands of their employers.

In the Indian state of West Bengal, a young man and a girl make clay for a brick kiln. Brickmaking is common employment for bonded laborers.



recalled his college experience in Bosnia and started to look into the issue of sex trafficking. Surprised to find a dearth of research on the problem, he decided to do the research himself. In the beginning, "I was just some investment banker who hopped on a plane," he says. But after nine years, that work became his first book, *Sex Trafficking: Inside the Business of Modern Slavery* (published in January 2009), which received Yale University's Frederick Douglass Book Prize in 2010. His new book fills out what he learned with a wider-ranging look at human servitude.

abused, for example, Kara resisted the reflex to rescue them. To do so could cause more harm than good, he explains, because the victims or their families could face violent retribution. Instead, he alerted trustworthy local NGOs or law enforcement officials, who could take effective action. Kara also protected the anonymity of his subjects by using pseudonyms and withholding identifying details.

These days, Kara sees his role as multifaceted: academic researcher, policy adviser and human rights activist, yet not fully any one of these.

DESTROYING THE FORCED LABOR SYSTEM

Siddharth Kara has developed policy recommendations by diagramming supply chains and delving into the motivations of the people and companies that exploit forced labor. Among his proposals:

- Enforce existing anti-forced-labor laws.
- Raise minimum wages.
- Enact reforms that enable low-caste peasants to own land.
- Expand financial credit to the poor.
- Open new markets to laborers.
- Stage public awareness campaigns.

Jennifer Leaning explains that human trafficking and debt bondage are classic public health issues, because they are “a common and pervasive assault on the life chances of children and adolescents.” Kara’s work, she says, is in keeping with the evolving mission of public health over the last 50 years, from a narrow focus on disease to a broader range of issues that includes psychological well-being and interventions that bolster an individual’s ability to live life to a full capacity.

STOPPING SERVITUDE

Kara envisions both demand-side and supply-side solutions to the complex problem of bonded labor. On the demand side, Kara argues for several legal reforms, including laws in every country in South Asia that mandate a national minimum wage of at least \$5 per eight-hour day for unskilled labor and higher for more skilled positions, and stricter laws so that commercial employers can be held liable if local subcontractors violate humane labor

practices, as well as greater economic penalties for the offense of bonded labor. He would create rapid-response teams to identify and rehabilitate bonded laborers. Kara has also called for land reform: “Landlessness is a key driver of vulnerability to debt bondage,” he writes in his book, “and fear of eviction for landless tenants ensnares countless millions in years of slavlike exploitation.”

Among his proposals on the supply side: a comprehensive program that reduces extreme poverty, expands access to formal credit markets to the poor, improves infrastructure, and opens new markets to laborers. Kara also calls for national awareness campaigns for the general public, as well as educational programs for law enforcement, judicial and government officials focused on promoting the equality of minority castes and ethnicities across South Asia and on raising awareness of bonded and child labor.

“I hope that the analysis in this book, the voices of the bonded laborers

that I share and the elevated awareness in media, policy and government circles will lead to more resources, more research and more efforts to tackle this issue,” he says. Kara’s book on debt bondage is the second in a planned series of three or four that will focus on forced labor. His next volume will cover such issues as organ trafficking and labor trafficking.

As Kara sees it, the biggest factor keeping people in bondage is lack of economic alternatives. “The duress is the force of grinding destitution. It is a colossal failure of society, of civilization, that millions of people have to face that devil’s bargain every day: Either I die or I accept servitude,” he says. “It is exceedingly painful to encounter hundreds of cases of extreme human barbarism and exploitation—particularly when you come from a world where people have so much. It is hard to comprehend that we all live on the same planet.”

Sam Loewenberg is a Boston-based journalist specializing in global health.



DR. RUIZ GOES TO WASHINGTON

FROM CALIFORNIA'S IMPOVERISHED COACHELLA VALLEY TO HSPH TO CAPITOL HILL



W

hen Raul Ruiz was growing up in California's Coachella Valley, his parents—both migrant farm workers—couldn't afford health insurance, so they relied on home remedies and nutritious meals to stay healthy. His mother served herbal teas and lentil soup fortified with vitamin-rich onions and bell peppers, a dish Ruiz would eat to gather his strength before college exams.

"She taught us to appreciate food as a vehicle for feeling better and promoting a happier life," says Ruiz, MPH '07. "More important than the science of the food was the motivation and the inspiration and the worldview of nutrition as remedy, food as medicine."

That experience of material deprivation and common-sense care helped shape Ruiz's thinking about public health and medicine in the years that followed. Now 40, he plans to put those insights to work as a newly elected U.S. congressman representing California's 36th District, the same area where he grew up. Ruiz, a Democrat, won the seat that Mary Bono Mack had held for 14 years.

9,000 RESIDENTS, 1 DOCTOR

Ringed by mountains and known for its grape, date and alfalfa crops, Coachella Valley has long faced a shortage of doctors in poorer areas. Even if more physicians practiced in the area, some residents would still be unable to afford a visit to the doctor. "That's one of the main reasons I decided to become a physician," explains Ruiz, who returned to the valley to work in emergency medicine after earning three degrees from Harvard, including medical and public policy degrees in 2001.

Coachella Valley faces "one of the worst health care crises in the state of California, possibly in the country," he says, "not only in the lack of health care access but also in disparities to access." Low-income areas have just one doctor

for every 9,000 residents, while more affluent areas have one per 300 people. The national standard is one doctor per 2,000 people. "We're way below that target."

his biological mother, he credits much of his success to his upbringing in the Coachella Valley. He raised funds for school by soliciting money from local businesses and pledging that he would return to the area as a doctor—a profession he had chosen at age 4.

After graduating magna cum laude from UCLA, Ruiz went on to Harvard, where he worked on public health projects in Mexico, El Salvador and Serbia. At HSPH, he focused on humanitarian and disaster aid, assisting in the aftermath of the 2010 earthquake in Haiti. "I always knew, even when I was in medical school, that in order to make a larger impact in a community I would have to leave the exam room."

Ron Walls, chair of the emergency medicine department at Brigham and Women's Hospital in Boston, knew Ruiz when he was an international emergency medicine fellow at the hospital in 2006 and 2007. "Raul saw the little things we do as part of bigger things and was always thinking of those bigger things. He'd try to figure out the context of the problem," Walls says, adding that Ruiz was an exceptionally compassionate doctor who was also "very charismatic" and "instantly likable."

"I always knew, even when I was in medical school, that in order to make a larger impact in a community I would have to leave the exam room."

— Raul Ruiz, MPH '07

In 2010, Ruiz founded the Coachella Valley Healthcare Initiative, an organization dedicated to expanding access to health care for disadvantaged residents. For Ruiz, widening access to health care also means offering education that will help people "make the right decisions to live a healthier life, not only for themselves but for the entire community." He cites childhood obesity as one of the valley's most urgent public health challenges.

A PLEDGE TO RETURN HOME

This concern for community has been a recurring theme in Ruiz's life. Born in Mexico and adopted as a baby by his aunt and uncle in California following the death of

CURING A SICK HEALTH SYSTEM

Now that he's embarked on a career in politics, Ruiz says he will miss being an emergency medicine doctor and shaping students into a new kind of physician focused on community wellness and advocacy. "But policy is a toolbox where I can fix and build the pillars of the American dream."

As part of his agenda, Ruiz wants to preserve the Medicare benefits and services that many of his constituents depend on. At the same time, he wants to streamline the system by "cutting off the fat." He supports allowing Medicare to negotiate drug prices with pharmaceutical companies, as the U.S. Department of Veterans Affairs does, and eliminating unnecessary lab procedures by improving the sharing of medical information.

continued on next page

DR. RUIZ *continued from previous page*

In the Coachella Valley, Ruiz plans to work with the public health and medical communities to boost the number of doctors serving the area. Already, he's collaborating with the University of California, Riverside, School of Medicine on residency programs that encourage students from disadvantaged parts of the valley to return and serve there as doctors. He has also launched a mentorship program for pre-med students who want to work in the valley.

CONGRESS RESEMBLES THE ER

Ruiz expects that working in Congress will resemble working in an emergency room, with its urgent and sometimes conflicting demands. In a sense, he plans to treat constituents as patients. "I will always put people before politics," he says. He likens policy development to a medical work-up, explaining that both require a diagnosis, an evidence-based treatment plan and—what lawmakers often overlook—a measurement of the outcome.

His path through the worlds of public health, medicine and now politics seems as clear to Ruiz as his mother's formative advice on good nutrition. "This is a dream come true for me: to incorporate the best public health school in our country into the farmworker trailer parks and in the poorest areas of our district, where I grew up," he says.

"I feel comfortable working in the barrios of the eastern Coachella Valley. I feel comfortable in the jungles of Chiapas or Port-au-Prince in Haiti. I feel comfortable in the halls of Congress. It's just a matter of being true to my values and understanding that we're all fundamentally humans, made up of the same fabric of life."

Daniel Lovering is a Cambridge-based journalist who has reported on public health issues and other subjects from nearly a dozen countries.

MAN WITH A PLAN *continued from page 15*

Soon, however, his ambivalence faded, and he found himself engrossed in his medical studies, especially classes in public health, where he quickly saw the potential for vastly expanding his impact. "With medicine, you're most likely doing good just one person at a time. With public health, you have the opportunity to do good for many people at a time."

BIRD FLU TO BREAKBONE FEVER

Shortly after completing his medical degree, Hadisoemarto landed a plum job with a U.S. Naval Medical Research Unit in Jakarta, embarking on an exhilarating if often unnerving stint on the front lines of Indonesian public health. He was on the ground in a disaster area the week after the 2004 tsunami that killed more than 200,000 people, helping with an epidemiologic assessment for his office. The following year, he found himself in the historic position of collecting the sample of what turned out to be Indonesia's first-ever human case of avian flu (H5N1). Alone in his office one day, he was called out on a two-hour road trip to take a nasal swab from a patient with a mysterious illness—an experience he describes as "very, very exciting and a little bit scary."

This was also when Hadisoemarto's interests coalesced around infectious-disease epidemiology, including dengue fever, now the focus of his dissertation. A mosquito-borne virus, dengue has been spreading rapidly since World War II and is now endemic in half the world's nations. "The mosquito is very smart," Hadisoemarto notes. "Controlling them is difficult, as if they were created to adapt to whatever we do. Perhaps, as one of my Indonesian professors says, 'The world was created for insects.'"

While some 80 percent of those infected with dengue show either no or very mild symptoms, in a small portion of cases, the disease can be life-threatening and extremely painful, earning it the moniker "breakbone fever"—as Hadisoemarto knows firsthand from his own two bouts with the disease, the first quite serious. "I was hospitalized for a week, and I felt very, very weak for a month after that," he recalls.

Two years into his research job, Hadisoemarto got an offer he couldn't

refuse: an invitation to teach at his Indonesian alma mater. He had grown increasingly uneasy with the aura of political intrigue that surrounded the Navy lab—to his mind, a reflection of larger tensions between Islamic countries and the U.S. And he had fallen in love with teaching classical guitar.

THRIVING IN THE LEAST DEVELOPED PLACE

Hadisoemarto quickly took to the academic environment. After a Fulbright Scholarship and an MPH at Georgia State, he applied to the HSPH doctoral program in Global Health and Population, drawn by the focus on world health issues. (In the meantime, he also married and had a child.)

Today, he is using mathematical modeling to explore how a dengue vaccine—now in Phase III clinical trials and widely predicted to be available in the next decade—could be deployed most economically and effectively in Indonesia. Looking ahead, he envisions using similar methods to fight other infections, including, perhaps, HIV/AIDS.

Hadisoemarto's vision for his own future is even more expansive. On returning to Indonesia, he plans to let his public health career take him where the need is greatest in a country that is moving forward (universal health insurance is slated to begin in 2014) but still suffers from "a double burden of disease": deadly infections such as dengue, malaria and TB, alongside the cardiovascular and other chronic afflictions now skyrocketing around the world.

"In my opinion, the best place to thrive is the place that is least developed," he says. "I want to involve the Indonesian communities in my research and improve whatever health condition needs to be improved there. I'm not going to limit myself to dengue, because, I think, there aren't enough people to do other things. I like research, but I don't want to do research for itself. I want to see change."

Hadisoemarto may not be a man with a plan, but he's clearly a man with a mission.

Amy Gutman is a senior writer at HSPH.

IN MEMORIAM



Robert Hamlin

Robert Hamlin, MPH '52, the School's first Roger Irving Lee Professor of Public Health, died on June 1, 2012, at age 89.

Hamlin, a physician, earned a JD at Harvard Law School at the same time as

his MPH at the School, and later taught as both an assistant professor of legal medicine at HLS and as a lecturer on public health law at HSPH. He served as assistant to the U.S. secretary of health, education and welfare and as the U.S. delegate to UNESCO before returning to HSPH in 1959 as an assistant professor of public health and, later, Roger Irving Lee Professor of Public Health.

Hamlin left HSPH in 1965 to work in public health consulting, first as vice president of Booz, Allen & Hamilton. In 1968, he started MACRO Systems Inc., a consulting company focused on international projects. He later established the University of South Florida School of Public Health, where he was acting director and professor of public health until 1983 and special adviser to the university's president until 2009.

Donald Hornig

Donald Hornig, professor of chemistry *emeritus* at HSPH, passed away on January 21, 2013. He was 92.

Hornig, SB '40, PhD '43, who received HSPH's Professor Emeritus Award of Merit in 2012, was trained as a physical chemist. He worked for two years on the Manhattan Project at Los Alamos Laboratory, where he helped design the firing unit for the atomic bomb. He was a science adviser under Presidents Eisenhower, Kennedy and Johnson.



In 1970, Hornig became president of Brown University, where he had previously taught chemistry. Over the next six years he helped establish medical sciences graduate programs that became the foundation for Brown's medical school.

After leaving Brown, Hornig came to HSPH, where he taught chemistry and served as founding director of the Interdisciplinary Programs in Health, which focused on health, the environment and public policy. He chaired the School's Department of Environmental Science and Physiology from 1988 through 1990.

Vilma Hunt



Vilma Hunt, a pioneering researcher who studied radioactivity in cigarette smoke and workplace environmental hazards for women, died on December 29, 2012, at age 86. She was a former research associate and visiting scientist at HSPH.

While studying radioactive elements at HSPH in the mid-1960s, Hunt decided on a whim to test a colleague's cigarette butts—and found polonium-210, a volatile radioactive element. Hunt and a colleague went on to discover that, over a lifetime, smokers are exposed to considerably more polonium-210 than nonsmokers. These findings helped establish the links between smoking and lung cancer.

Hunt went on to teach environmental health at the Yale School of Medicine and at Pennsylvania State University. From 1979 to 1981, she served as an administrator at the U.S. Environmental Protection Agency, dealing with the health effects of contaminated sites such as the Love Canal toxic waste dump in New York and Three Mile Island in Pennsylvania, where an accident in a power plant led to a partial nuclear meltdown.

ALUMNI NEWS

1963

E. James Lieberman, MPH, edited *The Letters of Sigmund Freud and Otto Rank: Inside Psychoanalysis* (Johns Hopkins University Press, 2012).

1975

Dr. Charles Hennekens, DrPH, the first Sir Richard Doll Research Professor and senior academic advisor to the dean in the Charles E. Schmidt College of Medicine at Florida Atlantic University, was ranked by ScienceHeroes.com as #81 in the history of the world for having saved over 1.1 million lives by demonstrating aspirin's use in preventing heart attack.

1976

Dr. Timothy Johnson, MPH, retired from his role as medical editor at WCVB-TV Boston, in December 2012. During his 40 years with the station, Johnson's reporting won many awards, including Emmy Awards from the Boston/New England Chapter of the National Academy of Television Arts and Sciences. Johnson's early work at WCVB-TV captured the attention of ABC News, where he served as the network's longtime medical editor, providing on-air analysis and reporting. Johnson held joint positions in medicine at Harvard University and Massachusetts General Hospital in Boston.

1977

Dan Costa, ScD, has been named national program director for Air, Climate and Energy Research at the U.S. Environmental Protection Agency (EPA). Costa oversees planning and coordination of research to address emerging environmental challenges in air quality, climate change and energy. He has worked at EPA for more than 26 years, starting as the chief scientist in the Pulmonary Toxicology Branch. His achievements include launching EPA's research on particulate matter, an air pollutant found to cause respiratory and cardiovascular problems. He also advanced toxicology to improve understanding of the health impacts of ozone.



1978

Dr. Paul Holinger, MPH, is dean of the Chicago Institute for Psychoanalysis. His book *What Babies Say Before They Can Talk: The Nine Signals Infants Use to Express Their Feelings* (Simon and Schuster, 2003) has been translated into several languages, including, most recently, Korean.

1980

Dr. Ted Mala, MPH, was inducted into the Royal Order of Kamehameha in Hawaii on January 19, 2013. Mala, director of traditional healing and tribal relations for Southcentral Foundation at the Alaska Native Medical Center in Anchorage, is the order's first Alaska Native honorary member. His wife, Marjorie Mau, MS '00, a Native Hawaiian, is founder of the Department of Native Hawaiian Health at the John A. Burns School of Medicine in Honolulu.

1981

Dr. W. Patrick Naylor, MS, associate dean for advanced dental education at the Loma Linda University School of Dentistry, made his second visit to Pyongyang, North Korea, in November 2011 to teach in the clinics of the Pyongyang Dental Treatment Center and the Dental Department of the Kim Il Sung Medical University Hospital. In April 2012, he taught in Saudi Arabia at the University of Dammam College of Dentistry in Dammam, and the King Abdulaziz University College of Dentistry in Jeddah. While in Saudi Arabia, he represented Loma Linda University at the third annual International Exhibition and Conference for Higher Education and signed the official contract between Loma Linda University and the University of Dammam, with the President of the University of Dammam and the Saudi

Arabian Minister of Higher Education presiding. In February 2013, Naylor returned to the University of Dammam College of Dentistry, where he lectured to students and faculty and presented to the Eastern Province Saudi Dental Society.

1983

George Thurston, SD, was awarded the Haagen-Smit Prize by the journal *Atmospheric Environment* in October 2012 for a paper he co-authored with John Spengler, Akira Yamaguchi Professor of Environmental Health and Human Habitation at HSPH: "Quantitative Assessment of Source Contributions to Inhalable Particulate Matter Pollution in Metropolitan Boston," which appeared in *Atmospheric Environment*, volume 19, pages 9–25 (1985). This was one of the publications resulting from his HSPH doctoral thesis. The prize recognizes outstanding papers published in the journal.

1984

Dr. Elizabeth Woods, MPH, director of Boston Children's Community Asthma Initiative (CAI), was honored by the *Boston Business Journal* for her team's community outreach efforts. CAI provides case management and home visits, offers education to caregivers, teachers, coaches, community agencies, and providers, distributes asthma control supplies, connects families to resources, and increases access through advocacy. She is also the associate chief of Adolescent/Young Adult Medicine at Boston Children's Hospital, and professor of pediatrics at Harvard Medical School.

1987

Dr. JoAnn E. Manson, MPH, DrPH, chief of the Division of Preventive Medicine at Brigham and Women's Hospital, the Michael and Lee Bell

Professor of Women's Health at Harvard Medical School and professor of epidemiology at HSPH, received the Bernadine Healy Award for Visionary Leadership in Women's Health. She received the award at the Annual Congress of Women's Health in Washington, DC, in March 2013 in honor of her exceptional contributions and leadership in the field of women's health and prevention of cardiovascular disease in women.

1989

Dr. Pradit Sintavanarong, MPH, was appointed minister of public health in Thailand in December 2012. An expert in Thai traditional medicine and a member of the National Health Insurance Board, Sintavanarong previously served as managing director of J&W Development.

1990

Dr. Philip Huang, MPH, a family physician from Austin, Texas, was awarded the 2012 Public Health Award by the American Academy of Family Physicians at its annual meeting in Philadelphia. The award recognizes individuals who have made or are making extraordinary contributions to the health of the American public. Huang serves as medical director and health authority for the Austin/Travis County Health Department.

1992

Dr. Joan Reede, SM, dean for diversity and community partnership at Harvard Medical School, has been selected for the Beckman Award after being nominated by former student Nawal Nour, MPH '99. Reede is a founder and director of the Morgan Commonwealth Fund Fellowship Program in Minority Health Policy, which offers physicians with an interest in minority and disadvantaged populations a year of professional train-

ing for leadership positions in health care policy and practice.

1995

Christine Molnar, SM, passed away suddenly on January 11 at age 47. Molnar was president and chief executive officer of Safe Space, a child welfare agency in Queens, New York. A leader in the human services community in New York City and New York State, Molnar served as a member of the board of the Human Services Council and the Council of Family and Child Caring Agencies. Prior to joining Safe Space, she served as vice president for strategy, policy and advocacy at the Community Service Society.

1997

Michael Waldrum, SM, became president and chief executive officer of The University of Arizona Health Network on January 27. Waldrum, a board-certified specialist in internal medicine, critical care medicine and pulmonology, previously served as CEO of the University of Alabama Hospital at Birmingham and as vice president of the UAB Health System.

1999

Karen Anderson, MPH, and her colleagues at Fundación Educación Popular en Salud (EPES), the organization she founded in Chile, have received the Clarence H. Moore Award for Excellence for Voluntary Service, an international award presented by the Pan American Health and Education Foundation and the Pan American Health Organization. This award recognizes the work done by voluntary and nongovernmental sectors to improve lives in the Americas. Read more about Anderson and EPES: <http://www.hsph.harvard.edu/news/magazine/chile-earthquake-health>.

Sarah Iselin, SM, became senior vice president for strategy, policy and community partnerships and chief strategy officer of Blue Cross Blue Shield of

Massachusetts in December. She previously served as president of the insurer's foundation. Before joining Blue Cross in 2009, Iselin was commissioner of the state Division of Health Care Finance and Policy, where she played a major role in implementing the 2006 health care law that expanded health insurance coverage in Massachusetts.

2000

Nicklas Akers, MPH, was appointed supervising deputy attorney general for the Consumer Law Section of the California Department of Justice in San Francisco in April 2012.

2001

Humayun Chaudhry, SM, published *Medical Licensing and Discipline in America* (Lexington Books, 2012). The book traces the evolution of the U.S. medical licensing system.

2005

Dr. Jadvar Hossein is now president-elect of the American College of Nuclear Medicine and president-elect of the PET Center of Excellence of the Society of Nuclear Medicine and Molecular Imaging. He also recently was selected for inclusion in the Best Doctors in America database, compiled by Best Doctors Inc., and the *Pasadena Magazine* "Top Doctors" list.

2007

Sophia Chan, MPH, was appointed the undersecretary for food and health in Hong Kong in October. She is the former head of the University of Hong Kong nursing school.

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AWARDS AND HONORS



A study co-led by **Katherine Baicker**, professor of health economics at HSPH, received the annual Health Services Research (HSR) Impact Award from AcademyHealth. She and her colleagues looked at a 2008 Medicaid expansion in Oregon that used a lottery to choose recipients from a waiting list. The study was the first to use a randomized, controlled study design to answer questions about how access to Medicaid affects health, health care use and other outcomes. The award was presented at AcademyHealth's 2013 National Health Policy Conference in Washington, D.C., in February.

David Christiani, Elkan Blout Professor of Environmental Genetics, is a member of the National Cancer Advisory Board. President Barack Obama announced the appointment on December 6, 2012. The board advises and assists the director of the National Cancer Institute.



Nathan Eagle, adjunct assistant professor of epidemiology, received the 2012 Global Economy Prize from Germany's Kiel Institute for the World Economy on

June 17, 2012. Eagle was honored for his work with the World Bank on quantifying the price of food commodities globally via mobile crowdsourcing.

Mahnaz "Mahy" El-Kouedi has joined HSPH as assistant dean for faculty affairs. She succeeds Bernita Anderson, who will retire from the University on June 30. El-Kouedi previously served as senior program director and interim assistant dean for the Office of Faculty Affairs at Harvard Medical School. She holds a PhD in chemistry from Georgetown University and, before entering higher education administration, served as an assistant professor at the University of North Carolina Charlotte, where she helped initiate a new interdisciplinary nanoscience PhD program.

Dean Julio Frenk was awarded the Andrija Stampar Medal by the Association of Schools of Public Health in the European Region at its annual meeting in November 2012. The award honors key international figures in public health.

Curtis Huttenhower, assistant professor of computational biology and bioinformatics, was named a recipient of a Presidential Early Career Award for Scientists and Engineers in a July 23, 2012, announcement by President Barack Obama. The award is the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers. Huttenhower was honored for his work helping identify and analyze the human microbiome, the trillions of microbial organisms that exist in and on the human body (see page 16).



Ashish Jha, professor of health policy and management, was named a policy research fellow at the West Health Policy Center in October 2012. Jha's fellowship work focuses on improving care for high-cost patients.

Bernardo Lemos, assistant professor of environmental epigenetics, and **William Mair**, assistant professor of genetics and complex diseases, received 2012 New Scholar in Aging Awards from The Ellison Medical Foundation. **Brendan Manning**, associate professor of genetics and complex diseases, received a 2012 Senior Scholar in Aging Award from the foundation.

Adetokunbo Lucas, adjunct professor of international health, received the 2013 Jimmy and Rosalynn Carter Humanitarian Award in March for his clinical and research work on neglected tropical diseases. Lucas, who earned an SM degree from HSPH in 1964, received the School's Alumni Award of Merit in 1999.



Jack Spengler, Akira Yamaguchi Professor of Environmental Health and Human Habitation at HSPH,

received a 2012 Haagen-Smit Prize in October. This annual prize is given to two outstanding papers published in the journal *Atmospheric Environment*. Spengler was honored for “Quantitative Assessment of Source Contributions to Inhalable Particulate Matter Pollution in Metropolitan Boston,” a 1985 paper that he co-authored with George Thurston, SD ’83.

Elsie Sunderland, Mark and Catherine Winkler Assistant Professor of Aquatic Science, received a new investigator award last fall from the Smith Family Awards Program for Excellence in Biomedical Research. Her research project focuses on the potential effects of environmental contaminants on children’s immune response to vaccines.

APPOINTMENTS & PROMOTIONS

Peter Berman
professor of the practice of global health systems and economics

Jacqueline Bhabha
professor of the practice of health and human rights

Philip Demokritou
associate professor of aerosol physics

Majken Jensen
assistant professor of nutrition

Ashish Jha
professor of health policy and management

Peter Kraft
associate professor of epidemiology



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June 3–7

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June 10–13

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JULY–AUGUST 2013

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August 5–16

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August 19–21

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August 19–23

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SEPTEMBER 2013

September 9–13

Forces of Change: New Strategies for the Evolving Health Care Marketplace

OCTOBER 2013

October 7–11

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October 13–25

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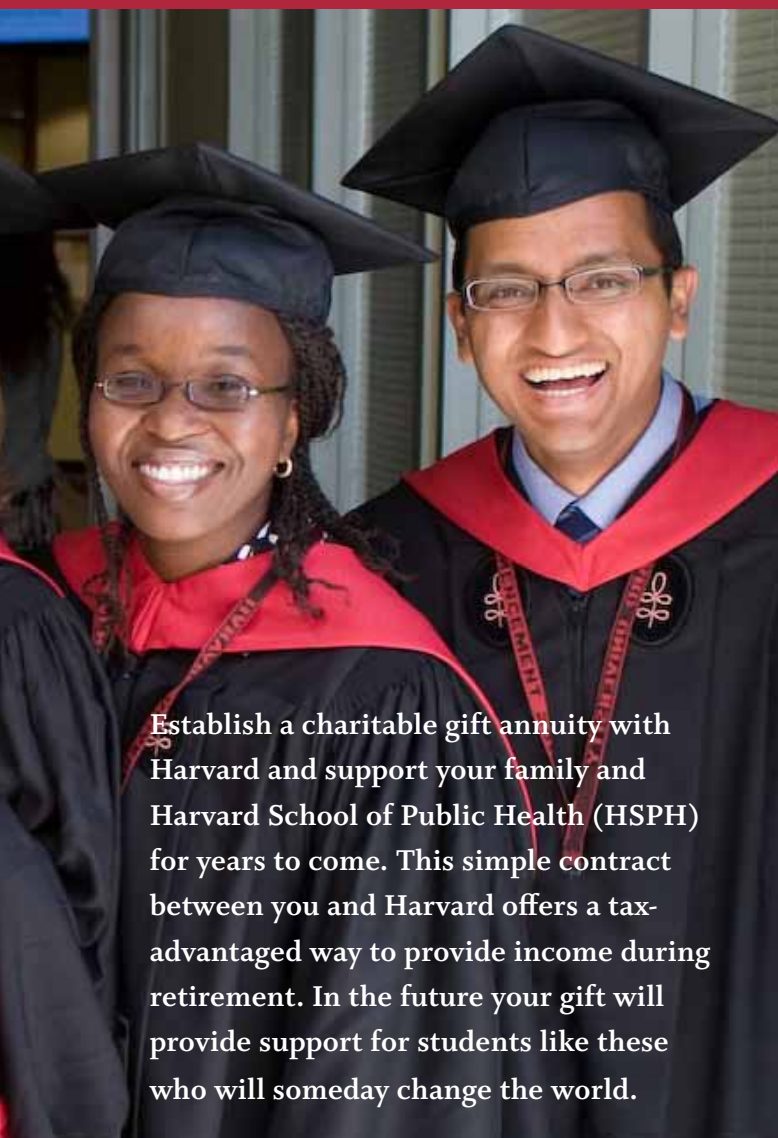
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Last fall, more than 55,000 students enrolled in HSPH's first online course, *Health in Numbers: Quantitative Methods in Clinical and Public Health Research*, with 28,000 actively participating and 5,000 earning a certificate for the class. Two-thirds of the initial enrollees resided outside the U.S., including 8,000 in India. The three-month course, which began in October 2012, was one of the first two classes offered by Harvard through the online education platform edX.

This spring, HSPH will launch a second edX course, *Human Health and Global Environmental Change*, co-taught by Aaron Bernstein, associate director of the Center for Health and the Global Environment, and John Spengler, director of the Center and Akira Yamaguchi Professor of Environmental Health and Human Habitation in the Department of Environmental Health.

The class starts May 15, 2013. Register and learn more about the course at <https://www.edx.org>.