Nostalgic about calculating statistical probabilities on a slide rule. Eager to immerse an avatar surgeon in a virtual operating room. More than two dozen JHSPH alumni share their visions from the nexus of technology and public health in personal essays and photos.

magazine.jhsph.edu/techessays

How do you protect the boys of Touba, Senegal and the rest of the country's population from malaria? Defense may be the best offense against humanity's perennial enemy. The Johns Hopkins Center for Communication Programs and its Nets4Health project aim to cover every sleeping space in the country with a mosquito net.
We like to think that manufactured products have grown safer over the last century, that careful toxicological testing and stringent regulation now protect us from medicines that can poison and cosmetics that can blind us. The reality is not so rosy. Humans are potentially exposed to 80,000 chemicals for which no toxicological assessment has ever taken place. And the current methods of evaluation—high-dose animal tests extrapolated to human beings—are at best crude and at worst unscientific.

“The current toolbox simply doesn’t allow us to do the testing we want,” says Thomas Hartung, MD, PhD, who saw the limitations of these approaches in his previous work as director of the European Center for the Validation of Alternative Methods. Now the Doerenkamp-Zbinden Endowed Chair in Evidence-Based Toxicology and director of the Center for Alternatives to Animal Testing (CAAT), he says he was drawn to the Bloomberg School in 2009 by “the opportunity to become involved in something that could revolutionize the field.”

The opportunity he envisioned was to identify and catalog comprehensively what are known as “pathways of toxicity” (PoT): the molecular pathways that, when perturbed, produce adverse health effects. Whereas current toxicological tests typically expose animals to a substance in order to provide a crude characterization of its toxicity, Hartung wants to comprehensively document the substance’s interactions with human cells and compile the results in an open-source database.

“There are a couple of hundred ways to kill a cell,” he elaborates. “If we had a map of this, we could start to look into which cell has which of these pathways, and we might start to understand why a substance is toxic for mice and not for rats, or why it affects liver cells and not heart cells.”

With a $6 million NIH Director’s Grant, he has set out to do just that. “The first step,” he says, “is to develop a language to describe toxicity—describing these pathways in relation to the genes that are involved and metabolic pathways that are involved.” With this shared vocabulary, a global consortium can begin contributing to the database and building what he calls a “human toxome.”

The need to improve present-day toxicological testing is apparent. From food additives to medications to the ubiquitous materials of our built environments, we are both surrounded by and dependent on novel substances of unknown toxicological safety. “Products worth $10 trillion are rated with [the old] suite of toxicological tests, and people know they aren’t necessarily making the best business decisions,” says Hartung, a professor of Environmental Health Sciences (EHS). “But technologies that are young, from the last few decades, offer a new approach to solving this problem.”

A Map of the Human Toxome

The emblematic images of famine—emaciated children, skin taut across delicate bones—have habituated Americans to think of malnutrition primarily as brutal starvation. While famine relief is vitally important, too little recognized is the larger problem of “hidden hunger.” Though their external symptoms aren’t necessarily obvious nor is their prevalence in a population easy to gauge, micronutrient deficiencies affect one-third of the world’s people and are a leading cause of child disability and mortality. Keith P. West, Jr., DrPH ’87, MPH ’79, hopes research on protein biomarkers will bring the problem into the light.

Insufficient intake of a few dozen micronutrients essential to healthy development is implicated in a wide range of preventable illnesses. However, characterizing these deficiencies at the population level has been hampered by the cost and difficulty of measurement. Blood samples drawn in the field must be shipped to distant laboratories for analysis with expensive machinery, and it may take years to assemble the results. Performing the recurrent tests necessary to maintain consistent micronutrient surveillance is thus untenable; in Nepal, for example, the last time such data were collected was 1998, says West, the George G. Graham Professor of Infant and Child Nutrition.

“It dawned on us that we needed a change in paradigm,” he recalls. West and
his colleagues in the Bloomberg School and the Johns Hopkins School of Medicine aspire to identify a cheap and quick way to measure a spectrum of micronutrient deficiencies. They have focused on blood plasma, which contains a cross-section of the body’s proteins, and which the new field of proteomics has made more accessible. Since the proteins present in plasma at any moment may reflect what is going on in the tissues, the investigators hypothesized that changes in the concentration of certain proteins might indicate micronutrient deficiencies. For example, measures of the protein transthyretin may parallel the plasma content of retinol (vitamin A).

“The circulation becomes a window for viewing the way that nutrients and proteins interact in the body,” West explains.

What began as “a hobby that kept us up late at night” has grown into a full-scale pilot project funded by the Gates Foundation. West and his colleagues have already identified proteins that co-vary reliably with nutrient levels and, within the next 10 years, they are determined to develop an onsite, real-time test for multiple micronutrient deficiencies. This would allow investigators to quickly and accurately profile an entire population and take effective action.

“It would change the entire information landscape for making more rapid decisions about the nutritional conditions of populations affected today,” says West.

While some visionaries extend the boundaries of human investigation and problem solving, others bring the world that’s already visible into a remarkable, new perspective. Ellen Silbergeld, PhD ’72, does both. An authority on the toxicology of lead and mercury, she is now leading a push to give the blooming field of nanotechnology more critical examination, before it’s too late.

Nanomaterials—often defined as smaller than a tenth of a micrometer in at least one dimension—are being rapidly integrated into everyday life. The large surface area of nanoparticles relative to their volume confers special properties. Nanotechnologies make fabrics stain-resistant, inhibit bacterial growth in food packaging and increase the clarity of cosmetics. They also hold the promise to revolutionize medicine, by penetrating cells and delivering drugs with a precision that was previously impossible.

“I am as capable of being intrigued by nanomaterials as anybody and I think that the promise is potentially very great,” she says. But having witnessed the trajectory of other hyped technologies such as leaded gasoline—which was trumpeted as a ‘gift of God’ at the time of its introduction and then, once its toxicity became apparent, took decades to remove from the market—Silbergeld, an EHS professor, argues for a more cautious approach, writing articles on the subject and chairing workshops to engage the attention of government as well as fellow scientists. “We’ve just had too much of a history of doing things where the promise was very great,” she says.

Nanotechnologies raise a red flag because the deliberately engineered properties that make them so valuable could make them hazardous. A molecule designed to deliver a drug through a membrane, perhaps administered into the bloodstream, could pick up mercury from the circulation and deliver it instead to intracellular targets like DNA. (Silbergeld describes this as a “sorcerer’s apprentice” problem. The nanotechnology is like the story’s enchanted broom, which continues to draw water from a well even after the room is flooded.)

More careful scrutiny can only be good for nanotechnology in the long term, says Silbergeld, since the belated emergence of hazards would almost certainly undermine the public’s confidence in the technology.

But with an almost total lack of information on the effect of chronic exposure to nanomaterials, a change in course is overdue. “The most important step a responsible society can take is to come to an agreement about the knowledge that’s needed to make decisions about nanotechnology, be it in the private sector in terms of product development, in the public sector in terms of regulation and guidance, or in the public in terms of acceptability,” she says.

Stories: Ted Alcorn, MHS ’10
Photos: Chris Hartlove
“Let’s take a walk.”

Brian Murray, my physical therapist, had made a few last adjustments to the technology banded about my knee and then I took a step. And then another.

It was a February morning in 2010 when we embarked on our trek from the Department of Physical Medicine and Rehabilitation at Johns Hopkins Hospital, down the hallway and then left past the cafeteria. “This is going to take time to build up your strength and build up your muscles,” he counseled. We stopped a few times as Brian made some more adjustments. My legs were tense. My shoulders were tight. I hadn’t been upright like this in many years. I was winded, but I kept moving.

“You’ve got to make this work, Sheila, I told myself.

Those slow steps in the hospital were little miracles. In some ways, I began that walk almost 30 years ago on North Broadway, just west of the School. In 1981, I was a PhD student in Environmental Health Sciences. I had a husband, a seven-year-old daughter, a master’s in nursing, a dozen years of teaching and work experience and an enthralling challenge studying individuals with cardiovascular disease returning to work.

I started noticing that the late afternoon walk to my car parked on Broadway taxed me more than it should have. I had problems with balance. A heaviness in my right leg made me unsteady. The doctor confirmed something was wrong.

Multiple sclerosis. The autoimmune disease destroys the myelin sheath protecting nerve cells in selected parts of the neuromuscular system. I was 35 years old, in the first year of my PhD, and I thought the world was going to end.

It didn’t. My husband, Bill, was very supportive and told me there was no reason to stop studying. Life was pretty good for five years. I continued my studies, completed my degree and then joined the faculty. Eventually, my endurance decreased. A full-time job, a long commute and maintaining my family life became increasingly challenging. Walking for any distance became difficult. Trips to the grocery store required exquisite planning or else I would have to find a place to sit and rest. Recouping my energies became a big part of my day. Eventually, I purchased a scooter and a minivan with a mechanical lift. I could navigate the halls of the School and zip over to the nursing building to teach a class. (I had a reputation for driving full-tilt. I never got a ticket, but I once almost ran over former Dean Al Sommer.)

Over the next two decades, I wore out three or four scooters and as many minivans.

As my disease progressed, I found myself sitting more and walking less. It’s as though my middle age was stolen from me. The scooter was helpful but it’s not the same as walking on your own steam. Accessibility was always a challenge. I had to be very creative in opening doors on my own. At a conference in England, I had to swallow hard when we found that the building had only one elevator: a freight elevator. Riding up with cabbages and overripe tomatoes isn’t necessarily glamorous, but it got me to the presentation.

I was fortunate to draw on many resources as the disease slowly progressed. I relied on my family, my friends, my coworkers and my income. Resources come in a lot of different packages. After my husband died and my daughter was married, I moved to a condominium in Baltimore and began swimming to regain my strength. Then, my physical therapist suggested I try something called the NESS L300. He said it could help me walk again. I’m naturally optimistic and a bit of risk taker. When an opportunity presents itself, I give it a try.

The L300 consists of a heel sensor in my shoe, a control unit on a lanyard on my neck and a device on my knee that stimulates the nerves in my lower leg with a faint sting of electricity. Together they correct the footdrop on my right side caused by MS.

I can walk now. I can’t ski, I can’t run, but I can greet people by looking them in the eye. A colleague accustomed to seeing me scooter-bound said, “I didn’t realize you are as tall as you are!”

I’ve never been one to go out and get the latest gadget but have always appreciated technology. My experience with this device has made me ever more hopeful for people. I always hope no else will be diagnosed with MS. Until then, this piece of technology has expanded my life. Used by 600 hospitals and clinics in the U.S., the L300 is helping thousands of people with MS, brain and spinal cord injuries and strokes, to walk—though it doesn’t help everyone. With its steep cost of $7,900 (which is not covered by my insurance plan), it’s not yet a public health, population-level solution, but remember: Computers once filled rooms and cost millions of dollars. Now they’re in our phones. This is translational research. With future advances, this kind of technology will surely help more people and those with other neurological diseases. The price will come down as well.

For the moment, I can tell you how this technology has changed my life. I realize now that there is nothing so wonderful as to stand on your own two feet and negotiate the world.

Sheila Fitzgerald, PhD ’88, MSN, is an associate professor of Environmental Health Sciences.
Place matters—that’s epidemiology 101.

Until recently, gathering data and charting it on maps meant going door to door to survey families and then plotting the findings on paper. It was a tedious process at best and mostly two-dimensional. Data mapping might show, for instance, which households within a community had been affected by a certain disease or problem and where the condition was most prominent, but would most likely reveal nothing about relevant climate or social demographics in that particular area.

Today’s tools for epidemiological mapping offer much more, not only in detail but also in efficiency and ease. As a result, geographic information systems (GIS) are changing the way epidemiologists approach the entire concept of place as a component of public health. In some cases, GIS mapping requires little more than basic computer skills and a global positioning system (GPS)-enabled cell phone. More complicated applications require extensive training but also offer multidimensional analyses, including environmental factors like elevation and climate. Either way, for scientists looking to demonstrate the importance of place in public health, the options have far outstripped the tools of 20 years ago.

“Some of the biggest advances made have been in supporting technologies, like remote sensing of the environment using satellites and finding out, for instance, the soil moisture in Zambia today versus two days ago. Those are things you certainly couldn’t have gotten in the past,” says epidemiologist Greg Glass, PhD, a professor in the Department of Molecular Microbiology and Immunology.

Such environmental factors often correlate directly with epidemiological concerns. Take, for instance, the relationship between rainfall and the prevalence of malaria-carrying mosquitoes. Knowing which areas are more vulnerable to malaria outbreaks, says Glass, allows aid workers to predict where assistance—such as bed net distribution—is most needed.

In earlier work, Glass used geographic mapping to predict an increased risk of hantavirus in certain areas, based on increased precipitation and vegetation. More vegetation means a booming population of the rodents that carry hantavirus.

The resulting images vary depending on circumstances, sometimes appearing as heat maps—brightly colored maps resembling those used by meteorologists, with the highest risk areas showing a bright red. A map of a predicted malaria outbreak, on the other hand, might illustrate which areas of Bangladesh are both highly populated and highly vulnerable to malaria, encasing those areas in concentric circles.

Shannon Doocy, PhD, with the Center for Refugee and Disaster Response, often uses GIS to study natural disasters and affected communities.

She and her colleagues also use GIS information to analyze approaching storms,
in hopes of anticipating which areas are most vulnerable. “If you can have a good understanding of where a hurricane is likely to hit and flooding is likely to occur,” she says, “you can plan humanitarian assistance efforts with a better understanding of what to anticipate post-disaster.”

One example, she says, was Cyclone Nargis in Burma (Myanmar). “After that, we created a GIS model that estimated the affected population,” explains Doocy, an assistant professor in International Health. “There was an area where a lot of aid groups were being restricted, and there wasn’t a lot of access to information or good estimates of the affected population. The UN was able to use our maps and population estimates to inform their emergency response.”

But determining the significance of place has historically proved more complicated when studying less concrete issues, such as the role that one’s social environment might play in substance abuse. Here too, however, GIS is proving valuable, says Debra Furr-Holden, PhD, an associate professor in Mental Health.

Much of Furr-Holden’s research centers on the epidemiology of drug and alcohol abuse in Baltimore City. Using handheld GPS devices, she says, researchers can venture into the community to collect data about where they’re finding indications of violence, alcohol use, tobacco and drugs, as well as potentially influencing factors such as poverty or crime rates. Meanwhile, the GPS automatically records the location where researchers are collecting data.

One successful project occurred a few years ago, when Furr-Holden and her colleagues were studying whether the proximity of liquor stores and bars to schools influenced the rate of underage drinking. Not only did they find an increase in alcohol use in children, they linked it to poor academic and substance abuse outcomes.

Further still, researchers found that several establishments were violating a Baltimore law barring alcohol sales within 300 feet of a church or school. “Using that data, we were able to work with the city to identify which outlets were violating the law,” Furr-Holden says. “They were actually able to get some of those nonconforming outlets closed because we were able to make a strong case from the public health perspective that there would be health improvements if they took this on.”

That, she says, was made possible through GIS.

“One of the limitations we often cite in public health is that we’re unclear about the effects of the environment on individuals and communities,” she says. “I think GIS has brought to public health a population-based approach that looks at the relationship between people and place.”

—Debra Furr-Holden
Degrees of Distance

In 1997, the School offered its first online courses, enrolling 36 students in a Graduate Certificate Program in Public Health sponsored by the Centers for Disease Control and Prevention.

Since then, online learning has become central to the School’s mission, and many onsite courses have gotten better as professors work with experts in the Center for Teaching and Learning with Technology (CTLT), says James Yager, PhD, senior associate dean for Academic Affairs and the Edyth H. Schoenrich Professor in Preventive Medicine.

CTLT now has 28 staffers who work closely with faculty to make the online experience as rich and accessible as possible, both for distance learners and for students taking onsite classes supplemented by online materials.

In the 2010–2011 academic year, online course enrollments reached 5,214, with full-time, onsite students accounting for 46 percent of those enrollments, perhaps taking online courses to ease scheduling conflicts or explore additional subjects, Yager says.

More than 400 students are currently enrolled part time in the Internet-based MPH Program, earning up to 80 percent of their credits through online courses. They complete their remaining coursework—and meet other students in their cohort—onsite in Baltimore or in Barcelona, Spain.

Yager, who teaches both online and in the classroom, says he often has more interaction with students in online classes. “The online students use bulletin boards and they post questions there and you can look up who they are,” he says. On the other hand, he says, students in online courses are “not here, having lunch together,” and do not enjoy quite the same range of course offerings.

“It isn’t a matter of one being better than the other, it’s [just] a different experience,” he says.

The Price Is Right: Free

Ira Gooding gets queries from all over the world—from educators, health officials and independent learners—requesting permission to use the Bloomberg School materials on OpenCourseWare (OCW).

His answer: You don’t even have to ask. OCW, launched at the School in 2005 with a three-year grant from the William and Flora Hewlett Foundation, allows users to access material at no charge. In the year ending mid-November, ocw.jhsph.edu attracted 251,528 unique viewers from 1,981 cities around the world.

“People who cannot come to the School for a wide variety of reasons can still benefit from the educational resources produced in the teaching that goes on here,” says Gooding, MA, educational resources coordinator for the Center for Teaching and Learning with Technology (CTLT), which develops the materials for online users.

There are no exams with OCW, and users don’t receive academic credit. Participants include “the independent learner who wants to brush up on a topic, maybe a municipal health worker, or an educator putting together a course, and they’re looking for material so they don’t have to reinvent the wheel,” says Gooding.
In developing countries in particular, OCW provides public health information that might not otherwise be available. As one participant wrote: “Understanding the concept of social and behavioral theory will help me achieve the community blood donor mobilization strategy I am implementing in Nigeria.”

The courses—on subjects including biostatistics, refugee health, HIV/AIDS and mental health—are offered as a combination of audio lectures, PowerPoint slides and reading assignments. They are readily available for noncommercial use through a Creative Commons licensing agreement, and are continually enriched and updated by users, who make changes such as adding illustrations or translating to other languages.

Biostatistician John McGready, PhD ’07, MS, says he’s pleased to reach more people through OCW. His materials with additional features like online class discussions are also available online for credit, which users must pay to access, so “it doesn’t create economic competition,” he notes.

Says McGready of OCW, “I certainly have benefited from people putting their materials out there, and I felt like I should return the favor.”

Certified Tobacco Fighters

China National Tobacco Corporation, the world’s largest tobacco company, is owned by the Chinese government. So it should come as no surprise that tobacco use is widely accepted in Chinese life. In fact, providing a gift of cigarettes is considered a sign of respect, says Joanna Cohen, PhD, MHSc, director of the Bloomberg School’s Institute for Global Tobacco Control (IGTC).

Though there’s still a long way to go, public health officials and educators in China are beginning to change that culture, with help from “Global Tobacco Control: Learning from the Experts,” an online training program from IGTC. Since its 2007 launch, Learning from the Experts has exported its tools and information to more than 175 countries—offering 40 lectures organized into 11 topic modules and available in six languages: Arabic, French, Chinese, English, Russian and Spanish.

Users can access the materials free of charge, on topics including the tobacco industry and its influence, the health impacts of smoking, and smoking cessation methods. Participants must earn 80 percent or higher on the quiz at the end of each module to receive a certificate of completion.

Learning from the Experts is useful for reaching low- and middle-income countries, where public health officials might not have the resources to travel or create training materials, says Cohen. In India, for example, state and provincial health educators have adapted the materials to make them locally relevant—particularly targeting the use of inexpensive hand-rolled cigarettes called bidis.

“When with tobacco control, when governments or donors decide to fund activity, a lot of the work requires human resources, hiring people,” but there is often a paucity of trained personnel, says Cohen, an associate professor in Health, Behavior and Society. Learning from the Experts, she says, is “very helpful in settings that are ramping up.”

Percent of participants surveyed who plan to apply course insights to their work

95

331,626

OpenCourseWare site visits made from Nov. 2010 to Nov. 2011

5,626

Participants enrolled to date in the course “Global Tobacco Control: Learning from the Experts”
Diagnosing TB on the Cheap

An inexpensive microscope, a cell phone and the Internet are the main ingredients in a promising method to diagnose tuberculosis in the poorest and most remote areas of the world.

The system is the work of a Peru-based research team led by Mirko Zimic, PhD ‘08, MHS ‘01, MSc, a professor at the Universidad Peruana Cayetano Heredia (UPCH), and Patricia Sheen, PhD ‘08. Zimic describes the technology as a “complement” to microscopic-observation drug-susceptibility (MODS).

That innovative TB diagnostic was developed in 2000 by Luz Caviedes, MHS ‘10, under the supervision of International Health professor Robert Gilman, MD, researchers from UPCH and others. MODS is a cheaper, faster and more sensitive alternative to standard TB culture tests that can take as long as four months to detect multidrug-resistant tuberculosis (MDR-TB). Especially vulnerable are patients with a dual diagnosis of HIV and MDR-TB, Gilman says. Half of them may die within two months without appropriate treatment.

The breakthroughs of MODS, which can diagnose TB within 7 to 14 days, centered on the discoveries that Mycobacterium tuberculosis grows in liquid media faster than in solid media and that the rod-shaped TB colonies can be viewed microscopically. But the method presents formidable challenges for remote, low-resource regions in developing countries. It requires an inverted microscope, which costs about $5,000, as well as trained technicians, says Zimic.

Despite the benefits of MODS, which is in place in several developing countries, a critical shortage of TB diagnostics suitable for use in areas with few health services hampers efforts to control the disease, experts say. “You can’t treat well if you can’t diagnose well,” says Gilman, who has conducted infectious disease research in Peru for more than 25 years.

To bring MODS technology to areas in need, Zimic’s team set out to build a more affordable—and digital—inverted microscope. Parts include a $1 halogen lamp and stock optical components. Total cost: about $400.

In this model, a technician places the MODS assay plate containing a patient’s sputum samples on the microscope and takes a digital photo. He then sends it, via Internet or cell phone, to a computer server at UPCH that analyzes the image using a mathematical algorithm. Within 15 seconds, the diagnosis is delivered by text message or email to the lab.

Studies on proof-of-principle experiments, published in *PLoS ONE* and the *Journal of Microscopy*, confirmed the method’s accuracy.

Now, Zimic’s research team is at work on a pilot project in the Trujillo region of northwest Peru to test TB telediagnostics based on MODS. The goal is to bring the system to low-resource areas with high TB burdens. His lab is also working on image-analysis diagnostics to analyze Pap smears and skin lesions.

Says Zimic: “If you have an algorithm to interpret the images remotely, then you can use the same method.”

—Jackie Powder
A boy chews tobacco in Delhi. An open dumping area spoils a Shanghai neighborhood. In Baltimore, an overweight adolescent girl smokes a cigarette.

The striking images are the work of young people who took on an assignment to photograph images of health—good and bad—in the cities that they call home.

Researchers from the Bloomberg School will use the more than 10,000 pictures snapped by approximately 60 teens in six study sites—Baltimore; Delhi; Ibadan, Nigeria; Johannesburg; Shanghai; and Rio de Janeiro—to gain insights into the lives and health of disadvantaged adolescents as part of the Well-Being of Adolescents in Vulnerable Environments (WAVE) study.

Led by the School’s Center for Adolescent Health and the University’s Urban Health Institute, the research is funded by AstraZeneca’s Young Health Programme.

Photovoice, a component of the WAVE study, uses “participatory photography” to give marginalized communities the opportunity to tell their stories through pictures.

“It gives them a different way to express themselves versus us sitting and asking them questions about health issues,” says Beth Marshall, DrPH ’10, MPH, assistant director of the Center for Adolescent Health.

Marshall spent four days last July in East Baltimore with 11 teens taking photos with digital cameras provided by the study. The youths first met with a photojournalist who gave them a crash course in photography basics. And before the kids trained their cameras on the neighborhood, study investigators posed some general questions about health. What do health and well-being look like? What are threats to it? How do young people stay healthy?

After each photo session, the group reviewed the day’s pictures on a laptop and discussed the images. The teens wrote captions for the pictures they selected for inclusion in the study, Marshall says.

In the analysis phase of the project, researchers will review the photos and code the captions and discussions to identify themes. The next step is to develop questions based on the collected data to survey approximately 2,400 adolescents—400 from each study site—on their health needs. The answers will help design more effective health interventions for young people in vulnerable environments.

“So many conceptual frameworks start with identifying a need, making the assumption that we know about young people and their health needs,” Marshall says. “We have to understand how they see health before putting an intervention in place.”

Lashira Darby, 18, who took pictures of the Baltimore neighborhood where she’s lived her entire life, says that she came away from the project with basic photography skills and a broader understanding of what health means.

“The best thing was learning how to use the camera better,” says Darby. “It also taught us to help the neighborhood. We have to set an example for the younger kids and not smoke and drink but do positive things.”

—JP
In what is commonly described as the founding act of public health science, John Snow noticed a spatial pattern to the casualties of an 1854 cholera outbreak in London and identified the source of exposure: the Broad Street pump. Today, Brian Schwartz, MD, MS, a professor in Environmental Health Sciences, is exploring the environmental influences on health at a level of complexity and sophistication that Snow never would have dreamt possible.

Schwartz’s partner in this work is the Geisinger Health System, which provides primary care services to more than 400,000 people in Pennsylvania. The electronic health records (EHR) of those individuals who do not opt out are made available for research. While public discussion has focused on how EHRs might reduce medical errors and improve diagnoses, Schwartz saw an opportunity to use the health system data to evaluate environmental exposures in daily life.

Once they are coded according to a patient’s locale, (geocoded), EHRs can reveal exposure to a spectrum of environmental variables. The features incorporated into various models range from playgrounds to abandoned coal mines to animal feeding operations. Physicians historically have done a poor job connecting their patients’ illnesses to these kinds of influences, Schwartz points out. “For a health system to actually ask questions about how the community might be contributing to health problems, I think, is unique and ahead of the curve,” he says.

Detailed data from the EHRs are a huge leap forward from self-reported health data, the previous mainstay for this kind of research. The Geisinger population is also several orders of magnitude larger than earlier sampling methods—such as random-digit dialing—would have allowed. “A lot of epidemiological modeling to date has been kind of deterministic, and one risk factor at a time,” says Schwartz.

In contrast, by analyzing a large sample with numerous variables, Schwartz and his colleagues can use complex dynamic systems modeling to explore manifold interconnections, feedbacks and unexpected properties. They are researching or initiating projects on diabetes, obesity, asthma and MRSA, among other topics.

“As more and more health care is captured by EHRs, there’s going to be an increasing ability for this kind of research,” says Schwartz. “So I actually think we’re early in this period. It’s a huge growth area, and it’s going to continue to grow for the foreseeable future.”

—Ted Alcorn, MHS ’10
Social Media vs. Social Disease

With 19 million new sexually transmitted infections (STIs) each year in the U.S., notifying partners is a crucial public health responsibility. But financially strapped local health departments often lack the resources to personally notify partners of an infected person.

Can tech pick up the slack?

Charlotte Gaydos, DrPH ’93, MPH, MS, and Jessica Ladd, MPH ’11, decided to find out. They developed a survey, targeted at teens and young adults, to learn whether anonymous emails, e-cards, text messages or letters would be an acceptable tool for sending and receiving partner notifications regarding a possible STI.

The survey was posted as a Facebook Event for two weeks in early September, successfully recruiting more than 500 individuals. Of these, 343 met the criteria for the study.

While their preliminary analysis is ongoing, Ladd says that the vast majority of survey participants preferred a phone call from a health department disease intervention specialist (DIS) as the means of partner notification. If calls were not an option, participants rated emails as the next best option. Only a minority of participants favored sending or receiving partner notification via anonymous text messages, e-cards or letters.

But the survey response doesn’t negate the value of social media, says Gaydos, a professor in the Division of Infectious Diseases at the Johns Hopkins School of Medicine, with joint appointments in Epidemiology and in Population, Family and Reproductive Health at the Bloomberg School.

“Some people said texting was okay,” she notes. “It could be that some people know their partners well enough to say that, ‘Yeah, he’s on his cell phone all the time, so he will be most receptive to a text message.’ Because everyone’s experiences are different, building flexibility into the system is good.”

Ladd, a PhD student in Epidemiology at the School, notes another positive outcome of the survey: “[It] shows that a social network such as Facebook could be used to enroll large numbers of participants at little or no cost.” Furthermore, she believes the results confer “a high potential” for using email as a means of anonymous notification.

The survey results will help inform the design of a user-friendly website, tentatively scheduled to launch next summer through a nonprofit called Sexual Health Innovations, which Ladd just founded. Pending funding, the site will allow individuals to anonymously tell their partners that they have been exposed to an STI and should see their doctor or health department for testing. The site will be designed to maximize privacy and minimize false reporting.

Gaydos is optimistic that the website will be effective—a confidence based on the success of an increasingly popular website she and her team developed in 2004: I Want The Kit (IWTK), at iwantthekit.org.

“People can go online to request collection kits to test for STIs,” Gaydos says. “This is a form of social media where we allow individuals to collect samples in the privacy of their own homes and mail them in. Such an approach is especially useful for, say, a 15-year-old girl who doesn’t want her parents to know she’s having sex, but who knows she might have been exposed to an STI.”

Individuals can receive notice of their test results however they request; texting is popular with many. “That 15-year old girl, for example, is not going to want a call to her house,” Gaydos says. “The message is coded, so we are not giving out any private information, nor do we text any positive results.”

There are limits, of course, to the use of technology and social networking for certain purposes. As Gaydos points out, human contact, even via the phone, is still more important for many people. Because their recent Facebook survey was small and participants were mostly college-educated white women, Gaydos and Ladd are conducting a similar survey with Baltimore Health Department patients, who are primarily inner-city African-Americans.

But according to Gaydos, the survey results have “definitely” helped public health researchers better target future efforts on this and other health issues. “Social media is a great way to reach adolescents and young people,” she says, “and that is exactly where most STIs are—in men and women under the age of 25.”

—Patricia M cAdams

“It shows that a social network such as Facebook could be used to enroll large numbers of participants at little or no cost.” —Jessica Ladd