How do you celebrate 100 years of lifesaving achievements? What are the priorities for the next 100? Send us your ideas for the Bloomberg School’s Centennial in 2016. Complete our survey: jhsph.edu/centennial-survey

Questions? Contact Susan Sperry, Sr. Director of Communications and Marketing, at sperry@jhsph.edu.

This summer, 1,000 American Indian kids will descend on Shiprock, New Mexico, for the annual NativeVision camp. NFL players and Johns Hopkins coaches will lead sports clinics. And Martin Sheen will teach acting. Read our “postcard from camp” in the Fall 2013 issue.

This is global health. Why surgery is becoming the new low-cost lifesaver.
Dr. James Boima (left), a senior surgeon at Connaught Hospital, Freetown, is one of an estimated 10 surgeons providing surgical care for the 6 million people in Sierra Leone.
The 2-year-old girl arrived at Phebe Hospital in rural Liberia barely alive. Her abdomen had been ripped open, and her intestines spilled out of the gaping wound. She had been attacked while playing with her village’s pet monkey.

“Something happened to upset the monkey, and it literally tore the child’s abdomen open,” says Johns Hopkins surgeon Fizan Abdullah, MD, PhD. The girl likely had an umbilical hernia that the monkey grabbed, allowing the animal to easily tear open the abdomen, he says.

“The mother thought that the baby was dead and immediately abandoned the child,” Abdullah explains. Then a neighbor—who had seen a visitor in a pickup truck earlier that day—picked up the baby and ran a mile-and-a-half to find the truck’s owner. They drove the child over 30 miles of bad roads to reach the hospital.

“We helped the local surgeons put IV fluids in, put her intestines back in and close up the abdominal cavity,” says Abdullah, who was in Liberia leading a medical education program to train surgeons in a cost-effective and efficient hernia repair technique.
The toddler survived. She was lucky. Many in the developing world—especially its rural areas—are not. Women who need Cesarean sections die in childbirth. Surgically repairable conditions like clubfoot, hernias, cataracts and abdominal complications become disabling and even fatal. Injury victims needing emergency or orthopedic surgeries often don’t survive the trip to a distant hospital or receive subpar surgical care.

“You’re talking about a major burden of disease that is not being addressed by global health through funding or policies or development of new training procedures or supportive, innovative programs where effectiveness can be documented,” says Henry B. Perry, MD, PhD, MPH ’71, a senior associate in International Health.

For decades, the former surgeon and primary health care expert has maintained that closing the global surgical gap is a public health issue.

“If a kid in Sierra Leone, Liberia or Sudan falls out of a tree and breaks his arm, he’s potentially disabled for life,” adds surgeon Adam L. Kushner, MD, MPH ’99, an associate in International Health.

Worldwide, the surgical imbalance is staggering.

Of the 234 million major surgeries performed in 2008, only 3.5 percent took place in the poorest countries, whose people account for 35 percent of the world’s population. The World Bank estimates that 11 percent of the global disease burden is treatable by surgery. Two billion people have no access to surgical care.

The issue will only become more acute because of the growing number of injuries related to increased vehicle traffic in developing countries and unsafe roads.

“Obviously it’s not feasible to think about heart transplants or complicated cancer surgeries,” says Perry, “but where the global health agenda has missed the boat is in looking at low-cost ways to provide access to hospital care for lifesaving or life-changing surgical services… It’s bringing a public health vision to surgery.”

Signs of Change

Traditionally, public health and surgery have lived at opposite ends of the spectrum. One deploys inexpensive, prevention programs for populations. The other is a one-to-one intensive clinical procedure. The separation becomes even more pronounced in the developing world. Surgeons are scarce, training is often limited, hospital capacity is insufficient and supplies and equipment are in short supply or unaffordable.

From a public health perspective, surgery has historically been viewed as expensive, time-consuming and generally not a good investment. It saves and changes individual lives, not populations. These assumptions, say global surgery advocates, are wrong and have contributed to surgery’s low ranking among public health priorities.

The past decade, however, has brought signs of change. “There’s an increasing recognition of the global burden of disease that can be addressed with surgery,” Perry says.

In 2006, Disease Control Priorities in Developing Countries, a World Bank publication, included for the first time a section on surgery in low-income countries. The chapter will be substantially expanded in the 2015 edition. In recent years, some U.S. medical schools and hospitals have established global health surgery programs, including the Johns Hopkins Global Surgical Initiative. And, the American College of Surgeons is offering more opportunities for international work.

“There is no doubt that expanding access to even routine surgical procedures holds the potential to prevent disability and save lives,” says Bloomberg School Dean Michael J. Klag, MD, MPH ’87. “Procedures that we take for granted, such as incision and drainage of an abscess or repair of a laceration, can be lifesaving.”

As surgery gains more attention, inter-
est in global health among younger surgeons and surgeons-in-training has clearly evolved. Julie Freischlag, MD, chair of the Department of Surgery and Surgeon-in-Chief at Johns Hopkins Hospital, remembers being surprised several years ago when a student told her that she wanted to work in global surgery. Things are different today. “In 10 years I think we’ll see more and more surgeons trained to perform more sophisticated interventions for both diagnosis of diseases and multimodality treatment of cancer in the global setting,” Freischlag says.

Value Investing
On the first day of the School’s fourth term, Adam Kushner stands before 15 students to debut his course, Surgical Care Needs in Low- and Middle-Income Countries.

At 5:30 in the evening, the students’ collective energy level is low. Kushner, however, is eager to get started, and congratulates the class for enrolling in the School’s first course on the global surgical imbalance.

“Just by being here, you guys are already at the forefront of global surgery,” he says. Early in the class, Kushner shows a large, close-up photo of a 3-year-old Malawi girl. It was taken two days after he had removed a blood clot from her brain at Kamuzu Central Hospital.

Eyes look up from smart phones and laptops.

Kushner, who worked at the hospital after completing his surgical residency in the U.S., first saw the little girl about an hour after she had fallen from a balcony. She was paralyzed on one side and seizing on the other.

“I looked at her, made the diagnosis and 20 minutes later drilled holes into her skull and evacuated the clot,” he said, adding that the country did not have a single neurosurgeon and that the hospital—which served 5 million people—did not have CT-scan capability. “I saw cases like this over and over again and said, why aren’t we doing more?”

Kushner has lived at the intersection of surgery and public health for 13 years. A faculty member with the School’s Center for Refugee and Disaster Response and founder of Surgeons OverSeas (SOS), he’s worked as a surgeon and teacher in 15 low-income countries.

Kushner shakes his head at the notion that traditional surgery is not a good public health investment.

“I’m a surgeon and I understand public health,” he says. “In Malawi I’ve seen patients come in with a perforated appendix or a hernia. I’d operate and they’d go be a productive member of society.”

In addition to his clinical work, Kushner is committed, as a researcher, to building the meager evidence base on surgical deficiencies in low-income countries. “It needs the legitimacy that it’s an important problem, and you need data to measure the magnitude,” he says.

To that end, last year Kushner and colleagues in Sierra Leone undertook a population-based survey to determine the prevalence of untreated surgical conditions in a country of 6 million, approximately 10 formally trained surgeons and 30 medical school graduates annually. Investigators deployed 16 local medical and nursing students to the country’s 14 districts.

The researchers found that 25 percent had a condition that needed surgical attention, and 25 percent of deaths in the previous year might have been averted by timely surgical care, primarily for pregnancy complications, injuries and abdominal conditions. The article on the study was published online in The Lancet in August 2012.

Based on the Sierra Leone results and findings from a similar study in Rwanda, SOS estimates that 56 million people in sub-Saharan Africa currently need surgery.

“That starts to put things in perspective—the volume of surgery that’s needed,” Kushner says.
THE FATHER OF GLOBAL SURGERY

In the world of global health surgery, everybody who’s anybody knows Colin McCord, MD.

He developed a successful program in Mozambique in the early 1980s to train non-physicians in surgery, with a focus on obstetrical emergencies. Today, the curriculum remains essentially the same and its graduates perform more than 80 percent of the obstetrical surgeries in the country, as well as a number of other basic surgeries. They work mainly at hospitals in rural areas, called district hospitals, where the need for surgical services is most acute.

Equally important, McCord, 84, a School faculty member in the 1970s, has authored several studies to document the quality of care of such task-shifting programs that train clinicians without medical degrees to provide essential obstetric surgeries. (“I consider him to be the father of surgery in global health,” says Perry.)

McCord is also responsible for some of the first research on the cost-effectiveness of surgery at small district hospitals. In a 2003 study, he found that the cost-per-year of a life saved through surgical care at a Bangladesh district hospital was comparable to preventive measures such as a measles vaccine or oral rehydration therapy.

A heart surgeon in the U.S. in the early years of the specialty, McCord transitioned to the international health field in 1971. When he began working in Mozambique in 1981, government health officials made their expectations clear, telling him, “We’d like to have you, but you have to do surgery.”

“We were only doing 2 percent of the C-sections that needed to be done,” says McCord, retired and living in Oxford, England. “The only way that Mozambique was going to solve the problem was to train people that weren’t doctors.”

He patterned the program after a similar initiative in Tanzania, which began in 1962.

With only 15 to 20 medical school graduates annually in Mozambique, McCord says he sought to train providers ranked a level below doctors—assistant medical officers (AMOs)—to deliver surgical care.

Based at Central Hospital in Maputo, the students received three years of training on top of the three-year AMO program, completing approximately 100 C-sections. By comparison, says McCord, licensed doctors in district hospitals typically perform only a handful of the procedures in medical school and internships.

The AMOs usually practice at hospitals in rural areas that are less likely to have experienced surgeons. There’s another reason for training AMOs. Their qualifications are not recognized by wealthy nations so they’re less likely to become part of the “brain drain.” While doctors often seek better pay in the West or in urban areas in their own country, AMOs generally spend their careers in their home countries, says McCord.

In a 2009 analysis in Health Affairs, McCord and colleagues found no measureable differences between physicians and non-physicians in the quality of obstetrical surgical care in Mozambique, Tanzania and Malawi. They reported a case fatality rate between 1 and 2 percent, meeting or approaching the UN target of 1 percent.

According to the researchers, most African countries have not approved similar non-physician models to provide emergency obstetric surgeries because of concerns about the quality of care.

The study notes, “If women could reach hospitals where these providers operate, maternal mortality could fall by 75 percent or more.”

PLAN B

Placing surgery in the hands of non-physicians isn’t the answer for certain surgical procedures.

That’s what Bloomberg School Dean Emeritus Alfred Sommer, MD, MHS ’73,
determined after leading a project to address the need for cataract surgery in sub-Saharan Africa, where half of blindness today is caused by cataract formation. Sommer, whose groundbreaking research has saved millions of children’s lives and eyesight through vitamin A supplementation, initially thought that task shifting might be effective. However, after investigating similar programs, Sommer concluded that non-physicians required close supervision by an ophthalmologist to sustain high-quality work.

So he came up with a Plan B. “I took a Wilmer resident and we spent a month roaming around Africa to understand the dynamic and discovered a startling statistic,” he says. In a region with a critical need for cataract surgery, most ophthalmologists only work 60 percent of the time.

One reason, according to Sommer, is patients’ dissatisfaction with the level of vision restored by their surgery, as well as cost, lack of transportation and supplies, and equipment shortages.

He approached the problem by locating ophthalmologists in Ethiopia, Kenya, Nigeria and Zambia who performed high-volume, high-quality cataract surgery. Under Sommer’s proposal for the Hilton Foundation, these doctors would train committed younger ophthalmologists. Every two years or so, the senior ophthalmologists would train another small group of young doctors and either add them to their own practices, or support them in establishing satellite surgical centers.

The Foundation, Sommer says, is looking into funding a pilot program to test his proposal. “It has to be sustainable and indigenous and not a solution that’s dependent on outside cataract surgeons flying in and doing a couple hundred cases,” he says. “It’s finding local people who have a proven track record and building on them.”

THE VIEW IN 10 YEARS

Although the magnitude of unmet surgical need is gaining some visibility on the global health agenda, experts say that real progress depends on donor support and commitments from local governments to expand surgical capacity as part of a comprehensive health system.

“One of the reasons I’m so optimistic about improving surgical outcomes in the developing world is because the data show there’s a lot of enthusiasm for these procedures,” says Sommer. “And people are willing to pay for them.”

Experts in surgical care in developing countries hope that in the next decade the momentum continues toward a greater acceptance of basic surgery as a public health intervention.

Moving forward requires funding commitments to back robust research and the development of innovative and cost-effective training, education and surgery programs. On Kushner’s wish list: 20 endowed global surgery chairs at top U.S. universities, trauma centers in developing countries, residencies and international exchanges.

“I think in 10 years we’ll look back and be surprised that all this stuff wasn’t being done a lot earlier,” says Kushner.
THE HOLY WATERS of the River Ganges flow through the heart of northern India and hold a special place in the national psyche and the Hindu religion. Pollution, however, threatens the sacred river known as the Ganga. Even the use of soap for bathing or washing saris (as these women have done in a branch of the Ganges near Kolkata) contributes to the problem. These and other practices are being discouraged by National Mission for Clean Ganga. The Bloomberg School's Center for Communication Programs (CCP) designed the messaging...
and materials for the campaign, which highlights the causes of pollution and encourages people to take practical steps, such as refraining from throwing trash in the river. These are vital first steps in a country where untreated human sewage, industrial effluents and improper solid waste management are by far the biggest polluters, says Sanjanthi Velu, PhD, CCP’s country director for India.

“While people revere the river Ganga and many who live in the river basin depend on the river for their livelihood, most people are not fully aware about the causes of the pollution of the river or what they could do to help prevent it,” Velu says.

The campaign’s launch earlier this year coincided with Maha Kumbh Mela in Allahabad, a Hindu festival believed to be the largest religious gathering on earth with 120 million flocking to the Ganga to wash away their sins. There, pilgrims were greeted by CCP-designed signs, billboards and other materials promoting the concept that human activities of all kinds are responsible for contaminating these holy waters. ■
Human papillomavirus
Keerti Shah’s got nothing against the human papillomavirus.

The virologist bears no grudge against the virus that causes half a million cervical cancers worldwide every year and now is blamed for a rise in head and neck cancers so surprisingly sharp that it may presage an imminent epidemic among U.S. baby boomers.

Revered for his Zen-like attitude as well as a body of research that has spanned six decades and spawned stunning discoveries about HPV’s cancer-causing ways, Shah simply is not the type to harbor ill will. Not against anyone or anything. Not even a bug that currently infects about 79 million Americans and will infect, at some point in their lives, almost every sexually active person. Especially not a bug that’s so successfully infectious.

In fact, Shah respects HPV. Not in the arched-eyebrow way you would an archrival, but with a fondness that belies kinship. A mere genetic snippet, and therefore in need of others’ cells to live, HPV just wants to communicate bits of itself. Survival requires transmission, replication.

“The viruses are not devious,” says Shah, his contagious smile conveying empathy. Papillomaviruses, he explains, have co-existed quite peacefully with humans throughout time and relatively rarely do harm.
They own this world as much as we do. Don’t you think?”

If anyone understands HPV, it’s Shah, DrPH ’63, MPH ’57. In addition to having written the chapter on papillomaviruses in the definitive text Fields Virology, Shah gets HPV on an altogether different level, master practitioner that he is of human-to-human transmission of knowledge.

During his tenure at Hopkins—57 years and counting—his scientific notions have spread over decades and across continents as his protégés instruct students, and now their students teach successive generations of HPV experts, all of whom embody and expand on Shah’s vision.

The 84-year-old Shah has mentored and collaborated with a who’s who of HPV, from upstart investigators to Harald zur Hausen—he won the Nobel Prize in 2008 for his role in the discovery of human papillomaviruses causing cervical cancer.

Their quarry, HPV, is a sprawling family with 150-plus different virus types identified, about 40 of which are sexually transmitted. HPV causes warts; the harmless kind that kids commonly get on their hands, as well as the genital warts that annually afflict about 360,000 sexually active people in the U.S. HPV contains two oncogenes, E6 and E7, which disrupt cell cycle control and produce cancers. Still, only a few high-risk members of this mostly benign family ever do cause trouble. One (HPV16) alone accounts for 50 percent of all cervical cancers and most head and neck cancers.

Identifying HPV11 as the cause of laryngeal papilloma in 1982 was one of Shah’s early successes. His career is linked to all cervical cancers and most head and neck cancers. Shah’s great strength, Gravitt explains, is keeping his eye on the public health focus: “Everything he does is directed toward trying to make sure we don’t get distracted by some random detail. Everything comes back to: Does it matter? Does it save lives?

It’s Shah’s habit to slough off accolades and extend credit to colleagues whom he refers to—no matter whether they are grad students or Nobel laureates—by first and last names as well as courtesy titles: “Dr. Patti Gravitt,” for instance.

A Shah protégé, Gravitt, PhD ‘02, MS, is now vice dean at Perdana University in Kuala Lumpur and an associate professor of Epidemiology at the Bloomberg School. She and Shah recently co-authored a study that makes the case for a new self-screening strategy in developing nations. They argue that millions of women worldwide who don’t get screened regularly would be able to detect cervical cancers early enough for treatment if this kind of strategy were in place. Ninety percent of those screened, Shah says, would know without ever leaving home that they are not at risk; 10 percent would know they need to go to a clinic for further evaluation.

This latest paper of Shah’s reveals an unrealized dream: “What would I still like to do?” he asks. “Implement an HPV-screening method in India (relying on leadership in that country) which shows this method is both reliable and possible.”

The implication: It’s gone. Any subsequent HPV infections detected during a person’s lifetime are assumed to be newly acquired, not reactivations of past infections.

Gravitt’s data tell a different story. She’s deconstructing what was a nice, clean, linear narrative, and mucking it up with a messy truth: HPV is controlled, not cleared. Though it may be completely undetectable, it’s not cleared.

If anyone can buck the scientific status quo, it’s Gravitt. Renowned for having developed the gold standard method for detecting and genotyping HPV, she learned firsthand from Shah that hard-won scientific truth trumps all.

Increasingly her studies reveal that latent but undetectable HPV is reactivating in the cohorts she’s studying: menopausal women who have been monogamous or sexually abstinent for decades, for instance. Menopause and aging may be vulnerable times, immunologically speaking, during which the probability of reactivation is increased, says Gravitt, “but we really need to do more research to confirm that.”

The issue is contentious. In addition to those in the clearance camp, there’s the dismissive camp: So what if one says controlled, and another says cleared? If one says reactivate, and another says reinfect? Isn’t this all just semantics, like one says po-tay-to, and another says po-tah-to?

“Well, no,” Gravitt insists. “It’s important to figure out whether the virus clears or is controlled. It makes a big difference in terms of disease risk in later life, and in terms of how you might prevent HPV-associated disease, particularly in older people.”

The distinction also carries psycho-social importance, explains Anne Rositch, PhD, MSPH, a postdoc working in Gravitt’s lab. Increasingly, clinicians are confronting middle-aged patients in long, monogamous
Plausible answers come from molecular epidemiology, a hybrid science involving population-based research at a molecular level. In the tradition of Shah, Gravitt and Rositch are bench scientists whose expertise is analyzing biological samples in the context of big and diverse cohorts of people.

If the accepted HPV story is accurate—that it’s acquired during sexual debut and clears within two years then the prevalence of HPV infection in populations should not be associated with individuals’ cumulative lifetime sexual behavior, Gravitt explains. Rather, only with their recent sexual behavior. But that’s not what she is finding.

Gravitt published dogma-defying findings in the *Journal of Infectious Diseases* in December 2012, under the title, “A Cohort Effect of the Sexual Revolution May Be Masking an Increase in Papillomavirus Detection at Menopause in the United States.” The study indicates a greater prevalence of HPV infection in the population of menopausal women whose sexual debut was post–sexual revolution than those whose debut was pre–sexual revolution. When her team looked at newly detected HPV in this cohort, only 13 percent of infection was attributed to new sex partners, whereas 72 percent was attributed to having a higher number of lifetime partners. The takeaway: These infections probably weren’t new.

“As long as you are controlling these infections, your immediate risk of [cancer] is going to be low,” Gravitt explains. “But if menopause, or just getting old, increases HPV reactivation, then we need to look at what this means for screening these older women who came of age during the sexual revolution and are much more likely to reach menopause with latent HPV than the postmenopausal women we have screened in the past.”

It will be important to determine if the historical low risk of cancer in postmenopausal women will continue to hold steady as the baby boomers age, she adds, and to reexamine questions like when and under what conditions is it safe to stop routine screening.

Helping Gravitt stay on track as she dog the undetectable is decades-old advice from Shah: “One of the frustrating things about being a scientist is you work very hard and it seems no one is paying attention. [As a young investigator] I had been complaining to Keerti—kind of like, ‘Woe is me. How is it that no one sees what I do? Do I have it wrong?’ And Keerti just looked at me, with the sweetest face, and said, ‘Patti. You talk too much and write too little.’

“To this day, whenever I get into that anxious state, which can be paralyzing, I just shut up and sit down and write out what I’m thinking. Because nobody will pay attention until it’s down on paper.”

These days, most of the attention-grabbing headlines associated with HPV have to do with the fact that head and neck cancer is rising dramatically, especially among men, and is now as common in the U.S. as cervical cancer is among women. Each accounts for about 10,000 new cases annually.

Shah protégé Maura Gillison, MD, PhD ’01, established herself early on as an intellectual leader in a new field that straddled epidemiology, oncology and otolaryngology. Now, she and her students continue to push the frontiers of that field.

She demonstrated that HPV infection causes a distinct molecular, clinical and pathological subset of head and neck squamous cell carcinomas. An individual’s HPV status is the single most important prognostic factor in terms of whether someone will die from the disease, she says, even more important than how far along cancer has progressed. HPV-positive status is a strong predictor of survival. In fact, about 75 percent of HPV-related head and neck cancers are curable compared to 25 percent related to smoking. Also, there’s growing evidence that HPV-associated head and neck cancers require less aggressive and invasive treatment than head and neck cancers not caused by HPV. Gillison’s latest data reveal that the proportion of oropharynx cancers that were HPV-positive in the U.S. rose dramatically in the past couple of decades, from 16 percent during 1984–1989 to 73 percent during 2000–2004.

It was during an “intense three-year mentorship” beginning in 1996 that Keerti Shah taught her about science—and life, says Gillison, now at The Ohio State University. She recalls Shah’s attempts to temper her exacting nature by reminding her that “sometimes the perfect is the enemy of the excellent.” He chided her for not taking time to celebrate successes—like when their team in 2000 published the first strong evidence that HPV causes head and neck cancer in humans.

At the time, Gillison shared a lab with Gravitt. Both shared their mentor’s passion for making public health impacts with scientific findings. On Gillison’s list to complete in the summer of 2003 was a case-control study designed to definitively prove that the same human papillomavirus that causes cervical cancer also causes tonsillar cancer. Enter Gypsyamber D’Souza, a grad student who, under Gillison’s tutelage, promptly published key research in the *New England Journal of Medicine.*

It served D’Souza well, training with successive generations of HPV heavyweights. (So too did growing up in a household where the discussion of sex was not taboo, she says.) D’Souza, PhD ’06, MPH, is focusing on HPV in high-risk groups, namely young adults, HIV-infected individuals, and men having sex with men. By studying patients with the disease and exploring infection in high-risk populations, the associate professor in Epidemiology aims to find out why infection leads to disease in some people but not others.

Her research necessitates a candor and nonchalance about conditions and behaviors (Continued on page 42)
Just over 50 years old, the Bloomberg School’s North Wing is young again.

Construction workers are making final tweaks to a sweeping renovation that encompasses a quarter of the School’s research labs—where investigation topics range from malaria and influenza, to sex differences and reproductive disorders, to basic research on how the human genome responds to its environment.

From the start, the renovation team’s goal wasn’t simply to update the North Wing’s labs but to build on decades of research—much of it from the School itself—on healthy and productive workspaces. Large windows and reflective surfaces spread light throughout most rooms. Open and flexible layouts promote collaboration. And state-of-the-art support systems minimize energy use.

The chance for the ambitious renovation arose when President Obama called for “shovel-ready” projects for the 2009 American Recovery and Reinvestment Act. The School proposed a complete overhaul to seven of the North Wing’s nine floors. (Some of the labs were not being used because they did not meet present-day lab standards.) Associate Dean Janet DiPietro, PhD, led the proposal’s drafting while Senior Associate Dean Jane Schlegel, MBA, directed Facilities’ planning and design work. The proposal received the maximum award of $15 million. A team from Facilities, including Dave Kempner, Mike Schoeffield, Kim Perreault and George Sparkes, managed the design and renovation phases.

In the following pages, see how space can shape science.
Seeing the Light

Despite our age-old fascination with sex differences, one topic rarely comes up in such discussions: immune responses to infection. Dionne P. Robinson’s research may soon change this.

Robinson is investigating how estradiol, a hormone primarily secreted by the ovaries, can help female mice fend off the influenza virus. She spends hours poring over lung samples from her mice—gauging how the presence of inflammation-related proteins and cells correlates with estradiol levels.

The new space has given Robinson a new neighbor: a molecular virology lab. It’s a great resource for relevant findings and ideas, as well as equipment. “Anytime we need to borrow something, they’re right there,” says Robinson. She often borrows automatic pipettes, while the neighbors stop by to use a plate-washer, which helps researchers avoid erroneous results caused by hand washing.

But best of all, says Robinson, are the windows. As she sits at her desk writing one final paper before completing her doctoral degree, she says, “It’s really nice to have some natural light coming in.”

DIONNE P. ROBINSON
6th-year PhD candidate, Molecular Microbiology and Immunology (MMI)
PI: Sabra L. Klein, PhD
A Mass Improvement

There's been a welcome new “addition” to Dingyin Tao's life—a mass spectrometer. "In many ways, a mass spectrometer is like a 'newborn baby' who needs to be taken care of very carefully," says Tao. "We need enough space, no dust, a consistent temperature and no direct sunshine."

It's worth the effort. With Bill & Melinda Gates Foundation support, Tao is working with principal investigators Rhoel Dinglasan and Sungano Mharakurwa to develop a malaria test using saliva rather than blood samples (which are unpopular in areas where blood taboos exist). Success is by no means guaranteed, but step one is to identify a protein that could signal the presence of *Plasmodium falciparum*—the deadliest malaria parasite—in saliva samples from asymptomatic carriers. Tao relies on the new spectrometer to characterize the proteins in his samples.

Before the renovation, Tao shuttled samples to the medical school for analysis, risking that they degrade en route. Now Tao not only conducts his own mass spec research in-house but assists collaborators from as far away as Australia.
In the Hood

The bacterium that causes Lyme disease, *Borrelia burgdorferi*, has a rare talent: It thrives without using iron for any cellular processes, such as metabolism or DNA replication. Hillary Clark is studying this unique aspect of *B. burgdorferi*'s success—seeking insights that might one day be used against it.

"I used to have to go to rooms on opposite sides of the building to gather my materials," says Clark, "and go back and forth all day."

Now, she adds, "everything I need to do one experiment is in one place."

Clark has similar praise for the new Tissue Culture Room. "The hood is huge, the lighting is great, and everything is organized. It's a lot more efficient to get things set up and start my experiments."

Not that Clark's in a rush. After spending a day in the new lab, she says her first thought was, "[I'm] happy that I'm only a second year, and I get to spend a lot more time here."
A Killer Fungus

Though the HIV virus has many partners in shortening life, few are as brutally efficient as Candida albicans, a yeast fungus. In people with weakened immune systems, C. albicans proves deadly 35–40 percent of the time.

Cissy Li is studying an unusual antioxidant enzyme that’s found in C. albicans and seems to be involved in its deadly impacts. She hopes to tease out the enzyme’s role and, in turn, highlight a potential vulnerability that would be unique to the fungi.

For Li, the new lab’s spacious, open layout means faster trouble-shooting. Often when bench neighbors are chatting about a problem, she says, someone all the way across the room will pipe up with a solution. On the flip side, Li appreciates having all the team’s back-up equipment—freezers, refrigerators, temperature-controlled shakers—tucked in nearby rooms where they can’t be heard.

CISSY LI
3rd-year PhD student
Environmental Health Sciences
PI: Valeria Culotta, PhD (BMB)
The Bacteria Stops Here

For over a decade, Karen Griffin has been working in the Glassware Lab, helping to ensure that every test tube, pipette and beaker in MMI gets cleaned and sterilized properly.

Griffin’s work begins when a researcher drops off a cart of dirty equipment, usually containing about 20 pieces of glassware. “Sometimes we have 20 carts,” she says. “Now we can do all 20 in eight hours.” With roughly 800–1,000 pieces coming in every week, Griffin and her coworkers need to clean approximately 47,000 pieces every year.

Thanks to the renovation, Griffin’s workspace is literally twice as efficient as before. She and her coworkers now have two glass washers, two autoclaves to sterilize equipment, two dry ovens and (thankfully) twice as much space.

Griffin has been around long enough—13 years—to fully appreciate such equipment. “In the old days,” she says with a laugh, “we had to use our hands.”

KAREN Griffin
Laboratory Assistant, MMI
Glassware Lab

The Outside View

You are what you eat. We all know this is true, but why it’s true is another matter—especially when it comes to links between obesity and cancer.

Enter Kate Laws (left) and Alissa Armstrong.

“Basically,” says Laws, “we study the ways that what you ingest changes [how] your body functions—in a really tiny snapshot.”

That “snapshot” is the Drosophila fly. Both women are tracing nutrient-sensing pathways that lead through fat tissue to ovarian stem cells, ultimately impacting how many eggs the flies produce. The pair hopes to shed light on how diet affects stem cells in general, across a wide range of organisms and—since normal stem cells and cancer cells share many of the same pathways—on the cancer-fat connection in particular.

When work on their lab is complete, Armstrong and Laws look forward to sharing space with another reproductive biology lab. Having peers with an “outside view” nearby will be great, says Armstrong. “They’ll [bring] in new ideas about what you might be looking at and what your data might be telling you.”

KATE LAWS
4th-year PhD student, BMB
ALISSA ARMSTRONG, PHD
Postdoc, BMB
PI: Daniela Drummond-Barbosa, PhD
Transformer Man

DAVID CHIN IS OPTIMISTIC ABOUT U.S. HEALTH CARE—IF IT FOLLOWS THE NEW PRESCRIPTION FOR AFFORDABLE CARE
There’s no Richter scale for measuring tectonic shifts in American health care, but that’s okay: Seismic changes will soon be apparent to all. When the dust settles, the fee-for-service model (which pays physicians more for doing more) will be a much smaller part of the landscape, says David Chin, MD, MBA, a former senior national partner with PricewaterhouseCoopers. Soaring health care costs and estimates that 20 to 50 percent of expenditures are wasted have made change essential, says Chin. One new model that is challenging for service is called the accountable care organization (ACO). Part of President Obama’s Affordable Care Act, ACOs are basically networks of hospitals and doctors that are rewarded for keeping patients healthy rather than for racking up office visits, angioplasties and tests.

Chin, now a Bloomberg School Distinguished Scholar, is leading an executive education program for transforming health systems to the accountable care model. The first cohort of doctors, nurses, managers and pharmacists is from the Johns Hopkins Health System and is learning from a similarly diverse group of educators from the schools of Public Health, Medicine, Nursing and Business. Their goal: lead ACO transformation. In a March interview with Johns Hopkins Public Health editor Brian W. Simpson, Chin explained how U.S. health care is changing and why he’s optimistic about its future.

Should we, as some argue, let the U.S. health care system collapse and rebuild it from scratch?

That’s the Alcoholics Anonymous model, right? You’ve got to crash and burn first. And then you’ll be willing to change. I think the system is too big to ever want that to happen. Too many people would get hurt. Until this point, the pain hasn’t been great enough in terms of cost to really drive change. But I think we’re getting there at 18 percent of GDP. Since the states can’t run deficits and they are on the hook for ever-increasing retiree health and benefits costs, they must come up with creative solutions. Otherwise, they go bankrupt. They have the most motivation to find a solution. That’s why I think the states will lead with innovation. I can imagine that different states will come up with some model that will work, and then we’ll say, OK, if it works there, then we’re willing to adopt it nationally.

Is fee for service really going away?

It’s funny. I think fee for service will be always with us, but maybe moderated some. You could make the argument that you might pay primary care physicians fee for service so you incentivize them to bring in patients at the primary care level, but then you might put specialists on some kind of global payment so there is an incentive for them to be more cost-effective.

How are ACOs incentivized to keep their population healthy?

[As a physician] in the current fee-for-service system, I only get paid if the patient comes in to see me. I do not get paid to keep a patient healthy or to keep a patient out of the system. The more I do, the more I make. Under an ACO model, I’m given almost a lump sum, a set amount of budget to take care of a population. And I know that a certain proportion of patients who are very, very sick and could use a lot of expensive therapy and in-patient days the next year aren’t necessarily the patients coming in to see me. It incentivizes me to go looking for patients [with] whom I can intervene earlier and reduce their costs. It also incentivizes me to use services more cost-effectively for those patients who do come and see me.

How does this affect physicians?

Not only is it a different reimbursement model, it’s a different mindset. Physicians aren’t classically equipped to deal with thinking about population health, number one. But also, number two, [there is] the notion of practicing in teams, like a patient-centered medical home. Many medical schools don’t have a curriculum around what’s the role of a physician inside a system of care. Classically, that’s a public health kind of discipline. I think that’s another potential source of discomfort for the docs. Not only is the money, the reimbursement thing, different, but now you’re moving into an area where you’re no longer the expert.

Are ACOs something that physicians welcome or dread?

I suspect you probably know the answer to that question. Most doctors grew up under fee for service, and that’s worked very well. Whenever you start changing the rules, particularly about money, people get kind of upset. But people do know that the current trajectory is not sustainable. Physicians are rapidly offering themselves up for employment with hospitals and health systems trying to get shelter. They can see the handwriting on the wall that the fee-for-service model is broken and that the inexorable rise in fees is no longer inexorable.

What’s the most important thing you teach in the executive program?

We actually spend a big chunk of the curriculum focusing on change management, how you work on teams, how you negotiate. Because we recognize that if you’re going to transform your system for accountable care—you can have a great idea, but if you can’t get the people, the docs, the managers and the nurses to buy it, it’s not going to happen.

Are you optimistic about U.S. health care?

Yeah. I tend to be inherently optimistic. I do think, given our pluralistic model and our penchant for experimentation, that we’ve got some potential to fundamentally change the system. But I don’t think it’s going to happen right away. I think a 10-year horizon is probably the right horizon.

Training health care executives sounds like business school. Why is this public health?

“Accountable care” really means a structure and a set of incentives to care for a population of people. To do that, there needs to be a set of measurements, incentives, structures and processes. That’s the public health focus. Accountable care starts by saying, I’ve got a whole population of people I am responsible for. Not only the people I see face to face in the office, but also the people who are out there as part of my population, that I’m going to be responsible for next year, and if I don’t get a handle on them, I’m going to be in trouble. That’s the public health twist to this thing.
Every year, Regina Richardson spends a lot of time looking for trouble.

Richardson directs Care Management for Johns Hopkins HealthCare (JHHC), which serves more than a quarter-million members across Maryland.

Her team’s goal is simple: Find women at high risk for premature births and other costly complications, yet who probably don’t know free help is available. Then give them the extra care they need—saving lives and money.

Their task is not so simple: Every year, JHHC cares for more than 8,000 pregnant women insured by Medicaid across the state. Often doctors know to refer special cases to Richardson’s team. Often they don’t. So Richardson and her team comb through patient claims and electronic medical records (EMRs), where signs of potential trouble come in many forms. Maybe a note buried somewhere reads “husband smokes,” “lost apartment” or “history of substance abuse.” Reviewing a single patient’s records can easily take an hour, says Richardson. “We’ve always known there’s gotta be a better way.”

But what is it?

That’s not an easy question to answer. Even with the arrival of ever-more sophisticated technology, many products are focused on perfecting a traditional paradigm: visit doctor, feel better. It’s familiar, and it’s essential. But, as Jonathan Weiner, DrPH ’81, MS, points out, it’s not public health.

The problem, he explains, is that the patients at highest risk—the ones JHHC’s nurse case managers are searching for—aren’t the ones coming in or accessing follow-up care.

Fortunately, there are glimmers of a new trend in health IT: Tapping EMRs to find these “missing patients” before trouble arises and to target resources efficiently across entire communities. It’s a trend Weiner, a professor of Health Policy and Management, hopes to accelerate through his newly founded Center for Population Health IT (CPHIT, pronounced “see-fit”).

Mapping Community Health

If you’ve ever sat watching your doctor tap away on a laptop, you’ve witnessed the rise of EMRs firsthand. According to the CDC, the percentage of office-based physicians using some form of electronic record-keeping system has rocketed from roughly 17 to 70 percent over the past decade.

Joshua Sharfstein, Maryland’s Secretary of Health and Mental Hygiene, is one of many public health leaders hoping to use this wealth of data to look across populations. His ideas offer a glimpse of the ways EMRs might be used to reach beyond the doctor’s office.

“One of the things that we’re really interested in is mapping community health,” says Sharfstein, MD. “If you have a map, you might say, ‘All these different doctors are seeing what looks to them like a one-on-one phenomenon.’ But you can see actually it’s a certain community where there are very high rates of asthma. And maybe there’s something going on here.”

Sharfstein’s ultimate goal is to put granular health data in the hands of local organizations. “If there’s an anti-smoking effort,” says Sharfstein, “maybe the goal today is to hit the whole county. But if you knew that there was a very high concentration of smokers in a particular area and they were having very poor health outcomes, you might target particular buildings.”

In 2009, Maryland took an important, and increasingly common, step toward making such scenarios feasible. It created a health information exchange to expedite the sharing of records from doctors and hospitals across the state—ensuring those records are available anytime and anywhere. That’s useful for individual patients, and it also can be useful for broader trendspotting efforts with obvious public health benefit.

Still, data can’t speak for itself. In essence, Sharfstein faces the same basic challenge as JHHC—figuring out how to extract data efficiently and, ideally, learning what it can tell you about the future.

That’s where Weiner and CPHIT can help.
From Claims to Crystal Balls

Twenty-five years ago, Weiner and the late Barbara Starfield, MD, MPH ’63, began dreaming up a tool that would act as the next best thing to a crystal ball. It would squeeze health data from computerized insurance claims to categorize patients by risk. This would help highlight patients likeliest to require expensive care in the future. The result of their efforts is the Johns Hopkins Adjusted Clinical Groups (ACG) Case-Mix System.

The flow of information into the ACG system is simple, at least in concept. Each time a patient receives a diagnosis—and there are over 75,000 of them—it’s coded by five criteria: duration, severity, diagnostic certainty, treatment type, and specialty care needed. Each patient’s diagnoses are viewed in combination to slot them into an overarching risk group, or an “adjusted clinical group.” Predictive algorithms then kick in to gauge the likelihood of future expenses or events such as unanticipated hospitalizations.

At first, Weiner, Starfield, and their collaborators simply gave the ACG software away. Yet it’s proven so useful that the School has partnered with six IT corporations around the globe to distribute the system. ACG now touches more than 80 million people in 17 countries. In terms of revenues paid to Hopkins, this represents the largest tech transfer in the history of the university.

Now, EMRs, along with other “e-health” data sources such as websites and smartphone apps, are poised to take such predictive modeling to an entirely new level, says Weiner. But the strength of these new digital data—that they contain a staggering wealth and diversity of health information—is also what makes this a challenge.

One major problem, says Weiner, is prose.

Even in the best EMR systems, key information is usually embedded in free-text notes, which can take staff precious hours to read. Like it or not, Weiner says, “many doctors just use EMR systems as fancy typewriters” to jot down their thoughts.

Rather than fight human nature by requiring doctors to use drop-downs and radio buttons, Weiner recruited colleagues in “natural language processing,” a field of computer science that involves culling useful information from prose.

One of Weiner’s new collaborators is Mark Dredze, who spent time at Google and is now an assistant research professor of Computer Science at Johns Hopkins. You know how Google finds exactly what you want, no matter how complex the search, asks Dredze. That’s what ought to be possible when programs peruse health care records. Weiner, Dredze, and other interested faculty have taken on finding JHHC’s “missing patients” as a pilot project.

The team began with a field trip to JHHC’s East Baltimore campus, where a nurse walked them through sample health records, pointing out warning signs and, equally important, linguistic permutations. “We might see in the text that this patient is a tobacco user,” explains Dredze. “We also might see ‘former tobacco user’ or ‘this patient lives with a tobacco user.’” Distinguishing between such phrases requires a program that can “do what you can think of as diagramming sentences,” says Dredze, not
to mention “learning” that smoking is an important trait in the first place.

The project is still in its early stages. (Some of its initial triumphs involved clearing bureaucratic hurdles, such as obtaining permission to access and link three types of electronic records—OB and primary care charts, and insurance files—a first for Weiner.) Looking ahead, both he and Dredze are confident; it’s a small project with a concrete objective, but one that has implications for every major health system in America, including Johns Hopkins, which is in the process of investing hundreds of millions of dollars in a new state-of-the-art EMR system.

Tinkering Together
Hoping to tackle more real-world challenges in the future, Weiner launched CPHIT last year. He envisions CPHIT as a place where academics from across the University, private and public health care organizations and e-health companies can work together to do R&D and tinker on innovative projects for the common good—a public health version of MIT’s famed Media Lab.

As potential collaborations emerge, Weiner builds a team and gets rolling. CPHIT has begun working with Maryland’s health information exchange to flag patients who are at high risk for re-hospitalization. (Not a bad idea, now that many payers have begun penalizing hospitals for high rates of readmission.) CPHIT is also working with several HMOs, among other organizations, to find better ways to treat chronic diseases. For example, using height and weight, patterns of care seeking, and behavioral risk factors to prioritize outreach or interventions for diabetes patients. And CPHIT is in the early stages of discussions with Sharfstein about developing geographic health measures applicable not just to a single provider but across an entire community.

Of course, even as organizations make and execute plans to cull and analyze data, our understanding of what risk factors matter and what treatments work—or don’t—is always evolving. Here, too, looking at EMRs across populations opens up new opportunities.

Remember the Vioxx debacle? Weiner asks. One of the first indications that Merck’s blockbuster arthritis medication might be linked to heart problems came from EMRs.

Kaiser-Permanente and the FDA were working on a joint study of 1.39 million Kaiser enrollees when they discovered that the risk of serious heart disease for patients taking high doses of Vioxx was more than triple that of patients taking a rival drug. Kaiser has since joined forces with dozens of other health care organizations to create a “virtual data warehouse” for multi-institutional research projects.

It’s this kind of success story that Weiner loves to share. It highlights the inherent overlaps between the aims of public and private health providers, and it suggests why, among all the data sources that he holds dear, EMRs rest closest to his heart.

“[They] will one day capture everything that’s known to the medical world,” he says. And pulling out key data to analyze and act on—which can take years today—will happen nearly instantaneously, at almost no extra cost. “Making sure that all this helps to improve the public’s health,” Weiner adds, “That’s our vision.”