

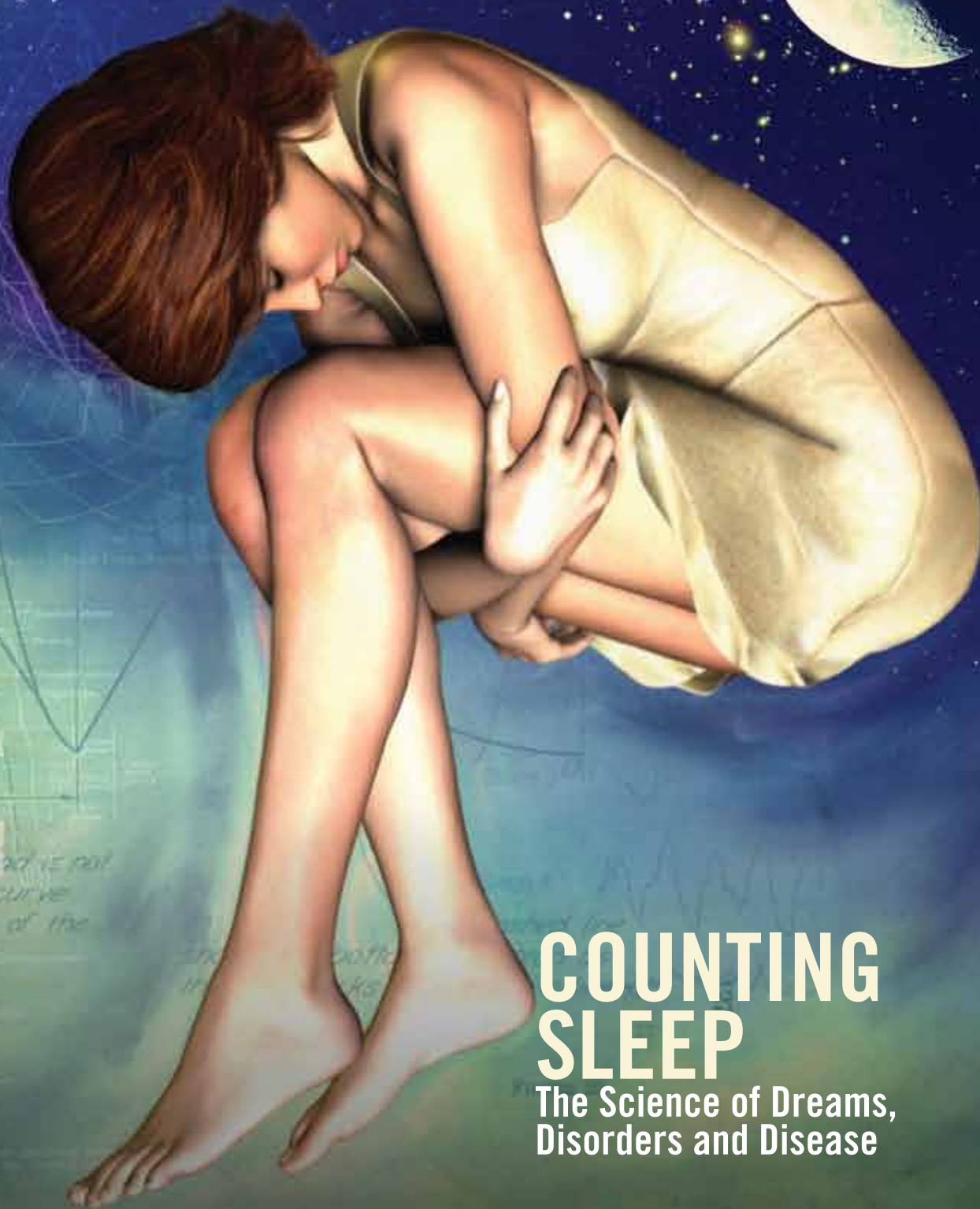
Discovering JiVitAland • Global Classroom • Death of a Disease • High-Tech Jewelry

JOHNS HOPKINS PUBLIC HEALTH

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COUNTING SLEEP

The Science of Dreams,
Disorders and Disease



A mother holds her son—who wears a paste on his face as protection from the cold—in north Pakistan, the former site of a pneumococcal vaccine trial.

A Jewel for Disease Tracking

In Pakistan, the centuries-old tradition of encircling a baby's ankle or wrist with a beaded bracelet is meant to protect the child, to ward off the "evil eye."

But the custom has gone high-tech in a Bloomberg School study designed to document the need for a pneumococcal vaccine in Pakistan, where pneumonia is the second leading cause of death in children under five.

Threaded among the black beads of the study-issued bracelets that adorn more than 4,500 babies in a low-income Karachi neighborhood is a button-size radio frequency identification (RFID) tag. The device can use radio waves to transmit real-time surveillance data via cell phones to a central computer server. The jewelry is at the heart of an innovative, disease-tracking system that Bloomberg School researchers hope will yield persuasive data on childhood pneumonia incidence to share with Pakistan's government.

"We hope our data will show the government that there is enough pneumococcal disease to warrant the introduction of a pneumococcal vaccine," says Hamidah Hussain, MD, MSc, associate in International

Health and director of the Karachi Invasive Pneumococcal Disease Surveillance Project. The study is supported by the Program for Appropriate Technologies in Health.

According to UNICEF, pneumonia accounts for 13 percent of deaths in children under five in Pakistan.

Pakistan's government added a new vaccine in December 2008 against Hib (*Haemophilus influenzae* type b)—a leading cause of bacterial meningitis in children and a cause of childhood pneumonia—with support from the Global Alliance for Vaccine and Immunisation (GAVI). But a separate vaccine is needed to protect children against pneumococcal disease, also a significant contributor to childhood illness.

"We believe that much of the pneumonia [in developing countries] is preventable with the newer vaccines that have been developed," says Neal Halsey, MD, a professor in International Health and the study's principal investigator. "But first we have to measure the burden of disease."

The study's electronic disease-tracking system—Interactive Alerts—is designed to collect such data quickly and efficiently and,

ultimately, researchers say, hasten the progression of vaccine trials, particularly in developing countries.

The project, which began in November 2008, is scheduled to conclude by mid-2010. Enrollment takes place at government-run Expanded Immunization Centers (EPI), where mothers bring their six-week-old infants for their first round of vaccinations. If a mother agrees to take part in the project, a field worker assigns an RFID-tagged bracelet/anklet to the baby, which will remain with the child as researchers collect data until the child is 18 months old.

Family doctors at 40 clinics participating in the study have study-issued cell phones with Interactive Alerts software. When a mother enrolled in the project brings a sick child to the clinic, the physician uses the cell phone to activate the RFID tag, which brings up the child's identification information on the phone screen and alerts study staff that the child is at the clinic. The physician examines the child and chooses one of four numbered options on the phone screen—pneumonia/severe pneumonia, meningitis, dehydration or other. The doctor then selects “send” to relay the data to the central server, allowing researchers to monitor the information as it comes in on the study website.

“A person sitting in Pakistan, me in Vancouver and Neal [Halsey] in Baltimore, can all look up on the website and see immediately that today 10 children enrolled in the study, there are five reported illnesses, they went to X or Y physician, and what happened,” says Hussain.

According to the most recent data, there have been 89 reported cases of pneumonia or severe pneumonia, and two cases of sepsis/meningitis. All children were treated successfully at partner hospitals.

“This technology is incredibly powerful for those of us who do these studies; it's really changing the way we work,” says the study's Karachi-based principal investigator, Aamir Khan, MD, PhD '06, an associate in International Health and executive director and founder of Interactive Research & Development (IRD), a nonprofit focused on advancing public health in developing countries through the use of low-cost technology.

The system has virtually eliminated paper from the disease-tracking process in this study, allowing for greater accuracy of data and making it possible for researchers to address problems and identify data trends, Hussain says.

“A physician may not be sending you any cases of pneumonia and that leads us to question [whether it is] right that he is not seeing any or is there some gap in training and he's not really



The button-sized tag on an infant's bracelet is improving accuracy and speeding results in a pneumonia study in Karachi, Pakistan.

sending what he should be sending,” she says. “We can identify issues like that and work with that one doctor.”

The Interactive Alerts system grew in part out of Khan's doctoral work on a childhood pneumonia surveillance project 10 years ago in the Himalayas of north Pakistan. He became frustrated with the error-prone, unwieldy techniques of traditional disease surveillance. The experience led to IRD's collaboration with a consortium of academic institutions to design a more efficient tracking system.

“We figured if we get the public health folks in the same room with engineers, we can find unique and novel solutions to problems,” Khan says.

The Interactive Alerts system now in use is the result of four years of work developing and fine-tuning the electronic data-collection technology. Key to the success of the project, however, is the low-tech ankle bracelet as a culturally acceptable, portable data-storage method. It was selected by study leaders after months of focus groups.

Looking ahead, says Khan, the technology has the potential to significantly shorten the time it takes to move from fieldwork to public health policy. “If you have good quality data coming from the field,” Khan says, “it shortens by months, if not by a year or more, the time that it takes to complete a vaccine trial.”

—Jackie Powder



Women wait to have their children vaccinated at an immunization center in Karachi, Pakistan.

Vision Quest

For many people with poor vision, all that's needed for them to see clearly is a pair of glasses. Yet an estimated 158 million people who need glasses don't have them. According to a new study, their poor vision costs the global economy between \$121 billion and \$269 billion each year in lost productivity.

In developed countries, a multitude of options exists for people with bad eyesight—glasses, contact lenses, laser surgery. In parts of the developing world, however, vision correction is prohibitively expensive or unavailable. And people who can't see clearly have limited job options. "If we could marshal the resources to address this problem," says Kevin Frick, PhD, MA, an economist in the Department of Health Policy and Management and a study author, it would "likely have a positive economic impact."

The new study, in the June issue of the *Bulletin of the World Health Organization*, focuses on the kind of vision impairment that can be corrected with glasses, called "refractive error." According to WHO, uncorrected refractive error is the leading cause of poor vision and the second leading cause of blindness after cataract. Some people have such poor vision that they are considered legally blind, although many have some remaining vision.

To estimate annual productivity lost, Frick and colleagues took WHO's regional

estimates of uncorrected refractive error and combined them with national data on population and per capita gross domestic product. The researchers assumed that blind people are 60 percent less productive than those with 20/20 vision, and that people with moderate vision impairment are about 25



percent less productive. They also reasoned that visually impaired individuals would need caretakers, so they factored in a 5 to 10 percent productivity loss for those people as well.

Adjusting for unemployment and labor participation, the total productivity lost is \$268.8 billion. An even more conservative estimate, which assumed that no one over the age of 50 is economically productive, brought the estimate down to \$121 billion. "For every person who doesn't have glasses around the world, we're talking about \$1,000 worth of productivity lost every year," Frick says.

But the problem isn't just a monetary one. It also affects quality of life. In some

countries, "there's at least some segment of kids who won't be able to see the blackboard," he says. "That may contribute to those children's academic achievement and literacy."

The authors estimate that an additional 53 million pairs of eyeglasses would be required per year to fill the unmet need.

A number of models exist for getting glasses to those who need them. For example, several charities collect unwanted eyeglasses in developed countries and ship them to other parts of the world. But none of the models has spread and taken hold, Frick says. "What's needed is a brilliant social entrepreneur," he says. "If somebody could just figure it out, they could do the world a really big favor."

Joshua Silver, an atomic physicist and director of the University of Oxford's Centre for Vision in the Developing World, has a few ideas. He invented cheap eyeglasses that adjust with the turn of a knob, allowing wearers to correct their own vision. His goal is to distribute a billion pairs by 2020.

Frick says Silver's glasses are functional, but he is skeptical. The last pair he saw was "kind of clunky and not necessarily appealing," he says. "However, the idea is a good one and future models may work much better."

—Cassandra Willyard

<p>Getting What We Deserve Health and Medical Care in America Alfred Sommer, M.D., M.H.S. Former Dean, Johns Hopkins Bloomberg School of Public Health</p> <p>One of America's leading public health experts finds a host of ills in this country's health care system. In his blunt assessment of the state of public health in America, Alfred Sommer argues that human behavior has a stronger effect on wellness than almost any other factor.</p> <p>\$21.95 hardcover</p>		<p>Building Healthy Communities through Medical-Religious Partnerships <i>second edition</i> Richard G. Bennett, M.D., and W. Daniel Hale, Ph.D.</p> <p>"Provides a framework for hospital and faith community leaders to develop programs that can have a meaningful impact on congregational members." —Benjamin S. Carson, Sr., M.D., Johns Hopkins University School of Medicine</p> <p>\$25.00 paperback</p>	
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Inside the H1N1 Vaccine Trial

Australian scientists made headlines in September when they reported that a single 15-microgram vaccine dose conferred protection against H1N1 influenza—a conclusion that surprised many in the public health community who had earlier predicted that two doses would be necessary.

The question of optimal dosage is among those being investigated by researchers at the Bloomberg School's Center for Immunization Research (CIR), which is leading one of the largest clinical trials of H1N1 influenza vaccines in the U.S. Vaccine maker CSL Biotherapies of Australia selected the Bloomberg School as the lead site to test its new vaccine against H1N1 in a population of 1,300 across 11 testing sites in the U.S.

Given the preliminary data, the FDA licensed the vaccine on September 15. The CIR-led trial will provide additional information about the response to this vaccine in healthy young adults. It will also yield information about the response to varying doses of the vaccine in elderly adults over age 65, a group that was not included in the Australian study.

As the lead vaccine testing site, CIR investigators are collecting additional blood



PHOTOS: CHRIS HARTLOVE

One of the largest H1N1 vaccine trials in the U.S. is providing new insights into immune response.

samples to conduct more in-depth research on the vaccine's protective capabilities. Since the trial began on August 25, the study subjects—all between 18 and 84—have either received two injections of 7.5, 15 or 30 micrograms of the vaccine, or two injections of placebo, given three weeks apart.

“We are trying to understand the scope of the immune response to this vaccine,” says Kawsar Talaat, MD, the study's principal investigator. CIR researchers are particularly interested in the phenomenon of memory immune response, especially in light of the 240-person Australian trial. “The fact that they had a good response after one

dose leads us to believe there's maybe some 'memory' in our immune system,” says Talaat, an assistant scientist in the Department of International Health. “It may explain why this is more of a mild pandemic.”

Although the Australian findings are promising, vaccine experts note that the much larger H1N1 vaccine trials in progress in the U.S.—including the CIR-led trial and NIH-sponsored studies—may provide more conclusive data on dosing, says CIR director Ruth Karron, MD, co-principal investigator of CIR's vaccine study.

—JP
(To see a video about CIR's H1N1 vaccine trial, go to <http://magazine.jhsph.edu/extras>.)

Spreading the Word, Not the Virus

When avian flu hit Egypt four years ago, officials there predicted it would be the source of the next influenza epidemic. The Center for Communication Programs (CCP) team in Egypt began laying the groundwork for a flu prevention education campaign.

Avian flu never progressed to pandemic status. But the CCP team's advance work paid off in April when the new H1N1 influenza virus emerged in Mexico.

Within a week of the first announced cases of H1N1, Egyptian health officials, in collaboration with CCP, had prepared a

USAID-funded multimedia H1N1 prevention campaign, building on the earlier avian flu education initiatives. The package included public service announcements (PSAs) on television, radio and the Web, and nearly 3 million fliers and posters printed and delivered within four days of the level four alert.

As the H1N1 threat picked up speed globally, public health officials in Egypt expanded the effort with CCP's help, running PSAs on closed circuit television in the Cairo subway, placing billboards on the sides of buses, holding seminars in youth summer

camp, and distributing flu-safety multimedia packages to schools throughout the country.

“[The Egyptian government] just ramped up that campaign and took it national; all the communications mechanisms went into play,” says Ron Hess, CCP's chief of party in Cairo.

Nearby Jordan is also using the H1N1 prevention package, and CCP is considering adapting the campaign for audiences in other countries, says Amrita Gill-Bailey, team leader for CCP's Near East Programs. “We're able to tailor the materials as needed for the environment,” Gill-Bailey says.

—JP



DAVID COWELL

Communal protection: A new transmission-blocking vaccine against malaria aims to one day protect at-risk communities such as Macha, Zambia.

Love Thy Neighbor: A New Malaria Vaccine

The vaccine cannot directly protect you from malaria—but it might protect your family, neighbors and yourself from becoming infected again. Would you get the shot?

Bloomberg School researcher Nirbhay Kumar and colleagues are counting on the altruism—and foresight—of those who live in malaria-endemic areas to be receptive to such a vaccine. “This vaccine requires education,” says Kumar, professor in the W. Harry Feinstone Department of Molecular Microbiology and Immunology and in the Johns Hopkins Malaria Research Institute.

In a study published this summer in *PLoS ONE*, Kumar, PhD, and colleagues detail their steps toward creating a transmission-blocking vaccine aimed at malaria caused by *Plasmodium falciparum*, the predominant and most lethal malaria parasite in the world. The vaccine takes a community-based approach—it won’t offer any direct protection from malaria in the vaccinated person, but it would prevent the malaria parasites within that person from infecting anyone else through a gradual malaria transmission reduction process.

“This is real public health,” says Kumar.

The linchpin of this vaccine is a *P. falciparum*-specific protein known as Pfs48/45. The protein prompts the human host to produce antibodies that essentially neuter the parasite. The host remains infected, but passes on, when his blood is next ingested by

a mosquito, *P. falciparum* gametocytes that are unable to reproduce in the mosquito’s midgut. This undermined fertility halts the transmission cycle. Days later, when the mosquito carrying impotent parasites takes her next human blood meal, instead of transmitting the disease, she merely causes an itch.

To date, there have been several unsuccessful attempts to reproduce Pfs48/45, but Kumar and his team were able to reproduce it in its near native shape, and then purify it to effect the necessary immune response. Kumar says that the purified protein, in the proper quantity, is strongly immunogenic. The study found that a single dose of the vaccine conferred a 93 percent transmission-blocking response in animals in the lab. “These antibodies were highly effective,” he says.

“It’s been very difficult to make that particular protein recombinantly for vaccine

development,” said Louis Miller, chief, Laboratory of Malaria Immunology and Vaccinology (NIAID-NIH). “This is a very important advance for a vaccine that may eliminate malaria in certain parts of the world.”

Assuming there are no setbacks, the vaccine, still in pre-clinical trials with animals, could be available for Phase I clinical trials in humans in about three years. Like many vaccines, this one would probably require boosters. But because the protein is naturally immunogenic, the vaccine would prime, or sensitize, the immune system: New infections by the parasite would provide their own boosting effect.

Kumar emphasizes that there are other angles to be explored. He looks forward to exploring another, much larger *P. falciparum*-specific protein known as Pfs230. Because of its size (it’s about five times longer than Pfs48/45), it will be even harder to reproduce, but Kumar believes that it may be even more critical in reducing transmission.

Malaria eradication is “a big dream,” says Kumar, and one that has seen failures. This kind of vaccine, in combination with other types of vaccines, prevention methods and treatment programs, could one day make the dream be realized. “This vaccine can make a dent in transmission and ultimately play a critical role in future malaria elimination programs,” he says.

—Christine Grillo

MALARIA’S GRAND CHALLENGES

Two Johns Hopkins Malaria Research Institute scientists have received Grand Challenges Explorations awards from the Bill & Melinda Gates Foundation for their novel methods of research into efforts to thwart malaria. Nirbhay Kumar, PhD, will receive support for his transmission-blocking vaccine (described above), while Marcelo Jacobs-Lorena, PhD, will study how genetically engineered bacteria that live in the mosquito gut could be used to interrupt malaria transmission.



Fertility and the Fruit Fly

Female fruit flies have brief lives and finely tuned ovaries, making them excellent subjects for Daniela Drummond-Barbosa's nutrition and fertility studies.

With a lifespan that runs from birth to death in little more than a month, the average female fruit fly doesn't get a lot of second chances: Her ovaries must be finely tuned to bequeath the optimal genetic inheritance on her offspring. "Reproduction is the whole point of anything being alive," says assistant professor of Biochemistry and Molecular Biology Daniela Drummond-Barbosa, PhD. "You have to be really tied to the environment if you're an ovary because you have to maximize production when things are good and shut down production when things are bad."

Those high stakes make *Drosophila melanogaster* the perfect model organism for Drummond-Barbosa's studies of the effect of diet on the female reproductive system. Women and their doctors have long known that both anorexia and obesity can short-circuit the menstrual cycle, but scientists have lacked a clear picture of the cellular mechanisms that translate what's for dinner into a successful pregnancy.

In her laboratory, Drummond-Barbosa has identified signaling pathways that link nutrition and egg production (oogenesis). In the process she has uncovered new insights into stem cell regulation (in the case of fruit flies, the ovary harbors stem cells through adult life) and ovarian biology. "Because we're studying the effect of the diet and the endocrinology of the organism, we touch on a lot of different areas," says the Brazilian native, whose appointment at the Bloomberg School

"Because there are so many similarities in biological processes between the fruit fly and humans, we learn about how diet can affect mammalian stem cells in general, and also the mammalian ovary."

—Daniela Drummond-Barbosa

of Public Health began this summer. "If you understand the mechanisms involved, you can control biology with diet before it gets to a disease stage."

In January 2009, the *Proceedings of the National Academy of Sciences* published Drummond-Barbosa's analysis (with H.J. Hsu, who joined the Bloomberg School faculty in July) of the effects of a protein-rich diet on fruit fly fertility. The series of studies honed in on an insulin-like hormone that mediates the influence of diet and the passage of time on the microenvironment that maintains stem cells in the *Drosophila* ovary.

"Because there are so many similarities in biological processes between the fruit fly and humans, we learn about how diet can affect mammalian stem cells in general, and also the mammalian ovary," she says. And while the human ovary lacks the stem cells present in its laboratory counterpart, that divergence poses an added boon at the bench. "The way stem cells behave in the fruit fly ovary is similar to how stem cells in humans behave," she says.

"We can understand how diet controls stem cells in other tissues like the gut, the skin and even in cancer."

As a basic scientist, Drummond-Barbosa lays the groundwork for the clinicians who counsel women in their quest to start a family—and much work remains. "It's still a leap to application," she says. "We know that what the flies eat has a big impact on their egg production and on how well their stem cells work, but we still haven't quite dissected out what components of the diet have each specific effect."

Ultimately, though, the clues emerging from her work have implications that could span generations. "Women are born with a set number of oocytes and that number doesn't increase over the life course," she muses. "If a woman has a history of infertility, it's not inconceivable that it's her own fetal development—when oocytes were being made—at play. Her mother's diet during pregnancy might have affected her fertility."

—Sharon Tregaskis

HEALTHY STATES

77.8:

PERCENTAGE OF LIFE EXPECTANCY AT BIRTH IN 2009

12:

PERCENTAGE OF HOSPITALIZATION TIME IN U.S. FOR POTENTIALLY PREVENTABLE CONDITIONS (1997-2007)

<50:

PERCENTAGE OF ADULTS WHO REPORTED ENGAGING IN SOME TYPE OF PHYSICAL ACTIVITY

25:

PERCENTAGE OF THE ADULT LABOR FORCE WHOSE WORKING HOURS WERE IN THE 10 HIGHEST RISK

34:

PERCENTAGE OF ADULTS WHO REPORTED SUFFICIENT SLEEP

\$7,026:

PER CAPITA HEALTH CARE EXPENDITURE IN 2009

3.4, 3.5:

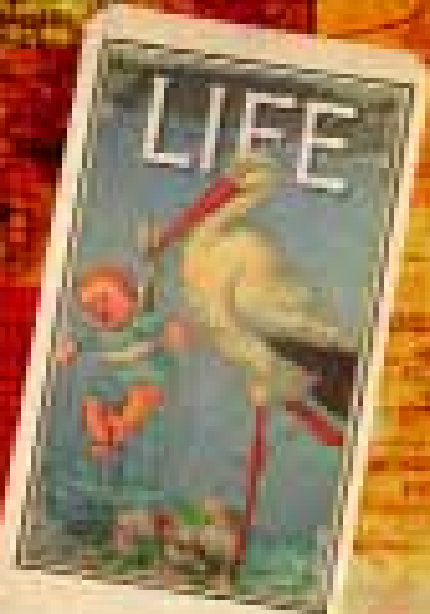
RANGE OF PERCENTAGE OF ADULTS WHO REPORTED FEELING "VERY HEALTHY" IN 2009

135 million

RANGE OF PEOPLE WITH AT LEAST ONE CHRONIC CONDITION

11.3:

PERCENTAGE OF ADULTS WITH CHRONIC RHEUMATOID ARTHRITIS



20 SNAPSHOTS OF AMERICA'S WELL-BEING

Put 14 public health experts in a room and give them six months to pore over statistics, studies and reports to come up with a snapshot of health in the U.S.

The resulting report is the first step in the inaugural project of State of the USA (SUSA), a nonprofit institution dedicated to providing accurate Web-based data on health, education, the economy and other important topics (www.stateoftheusa.org).

For its focus on health, SUSA commissioned the Institute of

Medicine (IOM) of the National Academy of Sciences to convene a panel of health care experts to put together 20 key indicators that define the country's health care landscape. The panel included David Holtgrave, PhD, chair of Health, Behavior and Society at the Bloomberg School.

"The selection of indicators was informed by the leading causes of death and premature mortality in the U.S.," Holtgrave says. "If we as a nation can do better on these 20 indicators, then we should be improving on some of the most important aspects of our collective health." The



SOURCE: WHO

ILLUSTRATION: DUNG HOANG

indicators measure determinants such as childhood immunization rates, health behaviors like smoking, drinking, exercise and diet, major psychological distress and injury-related mortality.

At the outset, SUSA established strict parameters to guide the panel's work. Each indicator was required to demonstrate: a clear importance to health or health care; the availability of reliable, high-quality data to measure change in indicators over time; and the capability to be broken down geographically and demographically. The panel delivered its recommendations for 20 key indicators to SUSA last year, which published the report in December 2008.

So, what do these indicators say about the current state of American health? Dean Michael J. Klag, MD, MPH '87, says the data highlight the need for new programs to improve the health of children and also demonstrate the burden of chronic conditions caused by the aging of America. "We need lifestyle interventions at the population level to improve the way we live and work," says Klag. "We also need to create a health care system built on a primary care base that provides access for both young and old and is flexible enough to deal with the wide range of problems encountered during the life course." —JP

A Lasker Award for a Public Health Philanthropist and Policymaker

New York City Mayor. Philanthropist. Entrepreneur...

To his list of superlative credentials, Michael R. Bloomberg can now add Lasker Award laureate.

The prestigious Mary Woodard Lasker Public Service Award was presented to Mayor Bloomberg on October 2 in recognition of his advancement of public health through public policy and private philanthropy.

Since taking office in 2002, Mayor Bloomberg has aggressively pursued policies that have saved lives and improved the public's health. Among his successes, he banned smoking in public places, removed trans fats from restaurants and organized mayors to stem the tide of illegal guns.

The Bloomberg School was renamed in his honor in the spring of 2001 in recognition of his generous support of the School and Johns Hopkins University.

"He took what we know and put it into action," says Dean Michael J. Klag, MD, MPH '87. "He really believes in the power of public health, and he lives that as mayor."

In his signature public health effort, Mayor Bloomberg led the campaign to reduce tobacco use in New York City in 2002 by banning smoking in public restaurants and bars, raising cigarette taxes from 8 cents to \$1.50 per pack, launching an anti-smoking media campaign and freely distributing nicotine replacement therapy. There are 300,000 fewer smokers in New York today than when he took office in 2002, preventing an estimated 100,000 unnecessary deaths. Tobacco use by teenagers has been halved. In addition, other cities (such as Baltimore), states and countries have since initiated smoke-free workplace laws.

When Mayor Bloomberg proposed the tobacco regulations in 2002, it ignited a firestorm of opposition from smokers, restaurant and bar organizations and others. They argued in part that the regulations would drive away customers. (In fact, business increased following the smoking ban.) "I got a lot of one-finger waves in parades, particularly when I went by bars, but today, it's inconceivable in New York that they



Lasker Laureate: Mayor Michael R. Bloomberg

would roll back the smoking ban," says Mayor Bloomberg.

The mayor also took on another dicey political issue: illegal guns. His administration targeted gun dealers suspected of selling illegal guns to criminals in the city. In 2006, undercover stings identified dealers who made illegal sales to "straw purchasers" who were buying the guns on behalf of someone else who could not legally buy or possess firearms. The city sued 27 gun dealers who made illegal sales. Nearly all of them agreed to change their business practices to prevent illegal gun sales. Mayor Bloomberg also founded the group Mayors Against Illegal Guns, which now includes 450 mayors.

"He has incredible courage to do what is right. And that's his appeal. He does what he thinks is right," says Dean Klag. "I would say that there has been no elected official who's had the impact on the health of the community that he's had, in the United States and around the world."

Alfred Sommer, dean emeritus of the Bloomberg School, credits Mayor Bloomberg with bringing "visibility and credibility" to public health issues. He recalls a telling meeting with Bloomberg before he became mayor that presaged his ideas on government

responsibilities in public health. After a School faculty member's presentation about research into reducing tobacco use, Sommer recalls Bloomberg saying, "That's not a research issue. That's an issue of political leadership. If it's not happening, it's because we do not have adequately informed political leaders." When Bloomberg became mayor, he acted on those ideas, says Sommer, who won the Albert Lasker Clinical Medical Research Award in 1997 for his vitamin A research. "He created the political will," notes Sommer, who is now chair of the Lasker Foundation board of directors but does not influence the jury's selection of Lasker recipients.

Mayor Bloomberg has made a global impact in public health through his private philanthropy. His foundation spearheaded a major new initiative to curb tobacco use in 15 low- and middle-income countries, where more than two-thirds of smokers live. Bloomberg Philanthropies committed \$375 million to this initiative, enlisted global partners from the public and private sectors, and inspired Bill Gates to contribute \$125 million to the effort. Almost 400 million people worldwide are newly protected by effective tobacco control measures—attributable at least in part to the resources made available through Bloomberg's efforts.

Based on the success of the global tobacco control work, Mayor Bloomberg has taken on another major global killer: road safety. To address the more than 1.2 million deaths occurring on the world's roads annually, Bloomberg again assembled a team of experts and health authorities to work with governments and other organizations to reverse the deadly toll of road crashes.

What makes Mayor Bloomberg exceptional is his willingness to act in the defense of public health, says Sommer, MD, MHS '73. "Mike just didn't say something should happen. In the face of enormous public opposition, he actually made it happen and set an example and demonstrated that, in the end, you could make a difference in public health, you could make a difference in people's behaviors, and you could improve outcomes and reduce morbidity and mortality."

Autism: One More Step on a Long Road

With autism diagnoses rising, researchers hunt for clues that will illuminate the mechanisms behind the disorder. What science knows about the disorder, in fact, is dwarfed by what science has yet to find out. “There are a lot of different routes to autism,” says William Eaton, PhD, Sylvia and Harold Halpert Professor and chair of the Department of Mental Health. “It has a complex set of etiologies.”

Most in the field agree that autism is perhaps the most strongly inherited mental illness—one out of 20 infants with an autistic sibling will also fall on the spectrum (compared with one out of 150 children in the general population). What’s still debated is how it’s inherited.

While some forms of autism are purely genetic, there is strong evidence that points toward a congenital cause for other forms. A new study by Eaton and colleagues, published in *Pediatrics*, supports the theory that some forms of autism are created in utero, by environmental factors triggered by maternal immune system disorders.

Ten years ago, Andrew Zimmerman, MD, associate professor of Neurology, Psychiatry and Pediatrics at the Johns Hopkins School of Medicine, and colleagues published the first study to link autism to an autoimmune

disorder—rheumatoid arthritis—in the autistic child’s mother. Since then, further studies have shown evidence of links between autism and two other parental autoimmune disorders, Type 1 diabetes and celiac disease (a disorder of the small intestine). Eaton’s study supports



Zimmerman’s findings on rheumatoid arthritis, and it turned up a nearly threefold risk of autism associated with celiac disease in the mother.

“These findings lead us to believe that it may be the fetal environment,” says Eaton. “Something happens in gestation with disruption of the immune system.”

Eaton theorizes that the mother’s celiac disease exposes the fetus to a damaging agent that can cross the placenta and the fetus’s blood-brain barrier. Zimmerman thinks that damaging agent may be maternal antibodies—possibly triggered by autoimmune disorders—that attack the fetus’s brain.

Should women with autoimmune diseases avoid becoming pregnant? Both Eaton and Zimmerman say no. What is important, though, is that women get diagnosed and treated—as much as is possible—for these conditions before becoming pregnant. Disorders such as celiac disease, when untreated, can lead to conditions in the mother that would lead to low birth-weight and other obstetric complications known to increase risk for autism.

Eaton sees several possible next steps, from scouring the literature—and perhaps the genome—for genetic links, to searching further for effects of autoimmunity on the development of the fetus. The recent study underscores the importance of the latter.

“This study has brought us to a new level,” says Zimmerman. “We’ve been struggling for years to bring the importance of the immune system to the fore in autism.”

—CG

EARLI Signs of Autism

In the search for the causes of autism, most research has focused on genetics and the environment—separately.

Now, in one of the largest studies of its kind, Bloomberg School scientists are investigating the interplay of biological and environmental components as risk factors for autism, from the earliest stages of child development through the first three years of life.

The School, in partnership with the Kennedy Krieger Institute and the Maryland Department of Education, is one of four field sites in the Early Autism Risk Longitudinal Investigation (EARLI). The study, which began in June and is an NIH Autism Centers of Excellence project, will follow a cohort of up to 1,200 pregnant women who already have one autistic child, which puts a sibling

at an elevated risk for autism.

“One emerging theme [in autism] is that if there is an environmental aspect or a gene/environment interaction, those environmental factors that may play a role are likely to happen in utero,” says M. Daniele Fallin, PhD, co-principal investigator of the EARLI study and associate professor of Epidemiology.

The mothers in the study will provide biological samples throughout the project, keep a daily diary on behavior and diet throughout their pregnancy and complete detailed questionnaires. Previous autism research has produced “good evidence” that there is a genetic component to the illness, says Fallin (right). This study seeks to advance understanding of the possible environmental component.



THOMAS ARLEDGE

“Unless you can put together both genetic and environmental data on the same people and you can do it over time, it’s going to be very difficult to tease apart” the connections to autism, says Fallin. “That’s never been done before, and that’s why people are very excited about it.”

—JP



Long-Term Children's Study Promises Big Dividends

Science has only just begun to understand the relationship between genes and the environment, especially when it comes to such conditions as autism and diabetes. Over the next 25 years, at 105 locations throughout the U.S., the National Children's Study will track 100,000 American children from before their birth through their 21st birthdays, seeking insights into the root causes—genetic and environmental—of both disorders, as well as myriad other conditions, including asthma, birth defects and obesity.

A joint enterprise of the U.S. Department of Health and Human Services (including CDC and NIH) and EPA, the National Children's Study (NCS) will bring together hundreds of scientists, health care providers and public health officials to recruit a representative sample of women to the observational study. Researchers will track details of their pregnancies and later their children's height and weight, diet, environmental exposures, access to health care and incidence of disease.

Lynn Goldman, a former EPA official and current professor of Environmental Health Sciences at the Bloomberg School, helped draft the executive order that established the study. Today, as a principal investigator for the NCS Center at the School and a member of the NCS steering committee, the pediatrician collaborates with her peers within the federal government and at study centers around the country to design research protocols. "This is something I've cared about for a long time," says Goldman, MD, MPH, who also co-chairs

the study's environmental exposure working group. Closer to home, she will oversee recruitment of study participants in Baltimore and Montgomery counties and, beginning in 2011, local data collection.

The study holds special promise in the realm of such statistically rare diagnoses as autism spectrum disorders and, in an international collaboration with other large pediatric cohort studies, pediatric cancer. "Normally in cancer we use case-controlled study designs," says Goldman, referring to experimental designs that begin with individuals already diagnosed with a certain condition and subsequently identify matched control subjects. "But we're never really sure that the controls are drawn from the same population as the cases, and that they are truly representative." Due to the scale and prospective nature of the NCS, even rare outcomes will be represented in statistically significant numbers.

Over the next quarter-century, the National Children's Study will follow 100,000 children from birth to age 21, seeking the root causes of myriad disorders.

Two years before her death in 2008, Hopkins School of Medicine pediatric epidemiologist Janet Hardy spent a day with Goldman, sharing tips gleaned from her own experience as principal investigator for the Hopkins center of the \$100 million Collaborative Perinatal Project (CPP). The 12-center, two-decade-long study was launched in 1957 with an enrollment of 60,000 pregnant women to investigate the precursors of cerebral palsy. Early on, the study revealed prevention strategies for blindness and deafness; the CPP data sets remain a valuable resource. Hardy's most important recommendation, says Goldman, was to create a strong research team at Hopkins.

"The winds can blow in all kinds of ways, both favorable and unfavorable on the federal side," says Goldman, who has already begun cultivating collaborations among her colleagues to design adjunct studies that will leverage the rich data set generated by the NCS. "If you're the captain of a ship, you want to trim the sails on your ship while participating in efforts to assure the success of the overall fleet," she says. "It's a balancing act."

Longitudinal cohort studies don't come cheap—but the findings offer enormous public health benefits, says Goldman. "When we invest in research that yields solid findings on how to promote healthy development of children, there's an enormous payoff in the end," she says. "This effort will generate tremendously valuable dividends."

—ST



Preventing HIV One Bag at a Time

Kalaiselvi, a young mother living in the slums of Chennai, India, used to sell her body to make ends meet. Like many women, she turned to the trade out of desperation: Her husband had squandered the family's money on alcohol, leaving her and her son without food.

Now, through the Pi Project, a new partnership between the Bloomberg School and an Indian nonprofit, YRG CARE, Kalaiselvi has a new way to make money: by sewing brightly colored cloth bags.

The Pi Project is designed to provide a sustainable, legal source of income for women sex workers. Master tailors train the women to sew tote bags, lunch bags and wine bags. The bags get shipped to the U.S. and sold, with 90 percent of profits returning to the women. The hope is that this training and income—and the HIV prevention classes that go along with it—will not only improve the women's lives but also lower their risk of contracting HIV. "So much of women's risk is economically motivated," says Susan Sherman, PhD, MPH, associate professor in the Department of Epidemiology and the project's lead researcher. "If you change the economic structure of someone's life, it has a far-reaching impact."

YRG CARE, the project's co-sponsor, is one of the largest private AIDS service providers in India. Suniti Solomon, head and founder of the Chennai-based nonprofit, says that she and her colleagues were looking for a way to help older sex workers. "They compromise their health by having unprotected sex just to get more clients," she says. "So we offer this entrepreneurship program to them."

This isn't the first time Sherman has used microenterprise for HIV prevention. In



Sewing seeds of transformation: Pi Bags

2002, she started a pilot project in Baltimore to investigate whether teaching drug-using women involved in the sex trade how to make, market and sell jewelry could reduce their risk of contracting HIV. The women sold more than \$7,000 worth of jewelry and reduced their number of sexual partners from a monthly average of nine to three.

"I was always interested in scaling that [project] up," Sherman says. And YRG CARE took an early interest. So Sherman and her co-

investigator, Bloomberg School epidemiologist David Celentano, ScD '77, MHS '75, a long-standing collaborator with YRG CARE, took the basic idea and tailored it for India.

Why bags? (Pi means "bag" in Tamil, the local language). Environmental concerns have led a growing number of Americans to shun plastic bags in favor of reusable ones. "I liked the idea of tying together the notions of women's empowerment, poverty alleviation, HIV prevention and an eye on the environment. There's something for everyone," Sherman explains.

Funded by the National Institute of Mental Health and only a year old, the project is already having an impact. Early results show that women who received training in bag making and HIV prevention earned more money and had fewer sexual partners than women who received HIV prevention training alone. At press time, the project had sold 1,400 bags via the Internet (www.pibags.org) and vendors in Maryland and California.

Katharine Rivett, MPH '08, MBA, heads the U.S.-based Pi Foundation, which handles marketing, sales and the distribution of the bags. Solomon and Aylur Kailasom Srikrishnan oversee research and operations in India.

For now, the Pi Project is limited to the 50 women who have already been trained. But as new orders roll in, Pi will need more bag makers. The goal is to recruit 250 more women in the next three years. Finding new trainees should not be a problem, Kalaiselvi says. "There are so many women out there who are hoping a new life will come their way."

—CW

In Memoriam

Alfred Buck, MD, DrPH '61, MPH '59, an expert on infectious diseases, died on July 14, at age 88. After graduating from medical school in Germany, Buck came to the School in 1958 as a student and then joined the faculty full-time. Over five decades, Buck held various appointments at the School in the Epidemiology, International Health and Molecular Microbiology and Immunology departments. He also served as a consultant to USAID, NIAID, WHO and the U.S. Air Force.

Lee M. Howard, MD, DrPH '58, MPH '56, who oversaw malaria eradication programs in Southeast Asia and served for 28 years at USAID, died on April 29, at age 86. Born to missionary parents in India, Howard earned a bachelor of science degree in 1945 from Baylor University in Texas. After graduating from the Johns Hopkins School of Medicine in 1947, he returned to India as a medical missionary.

After earning his master's and doctoral degrees at the Johns Hopkins School of Hygiene and Public Health, Howard joined USAID in 1960 as the malaria adviser to the Philippines—where he moved with his family—and later became the agency's regional malaria adviser to Southeast Asia.

Upon returning to the U.S. in 1964, Howard was appointed chief of USAID's worldwide malaria program, and three years later became director of the Office of Health, where he was instrumental in developing and guiding the agency's initial efforts in providing affordable and accessible health care delivery systems in developing countries. Howard's work at USAID in the 1980s focused on the development of innovative methods for securing donor funding for health care projects. When he retired from USAID in 1988, the agency presented him with the Distinguished Career Service Award.