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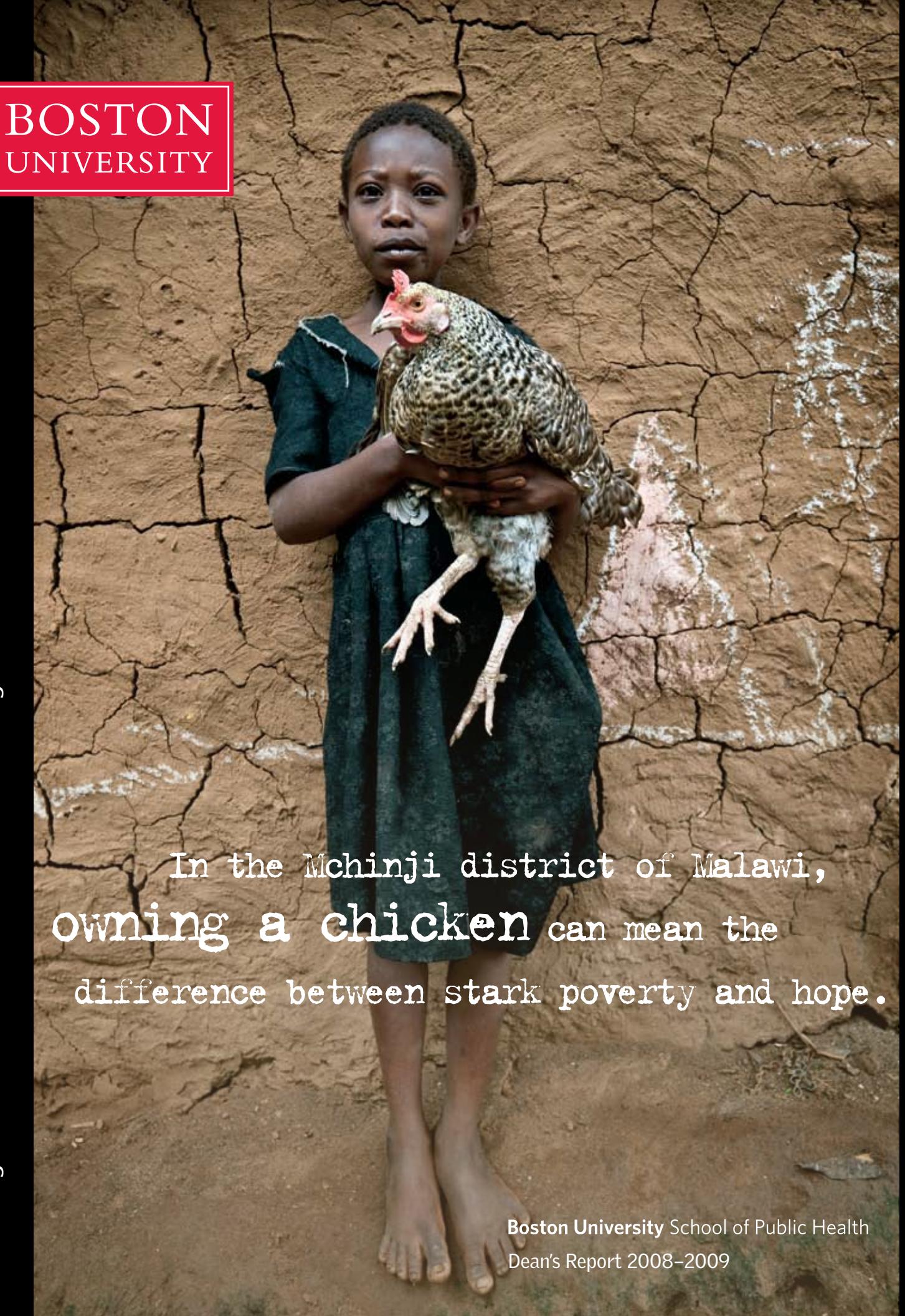
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Growing BU's Global Health Agenda

In the Mchinji district of Malawi,
owning a chicken can mean the
difference between stark poverty and hope.

Boston University School of Public Health
Dean's Report 2008-2009

Expanding the Investment in Global Health

New University Global Health Center Consolidates and Builds on BUSPH-based Efforts

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One of the most important public health developments of the last decade has been the widespread and growing commitment by world leaders, governments, philanthropies and ordinary citizens to improve the health and economic prosperity of people who live in resource-poor nations.

Worldwide, universities and especially schools of public health are playing an important part in the effort, creating a steadily growing body of evidence-based approaches to some of the developing world's most devastating diseases: HIV/AIDS, malaria, pneumonia, and tuberculosis, as well as a long list of chronic diseases and social conditions that threaten the health and productivity of millions.

BUSPH has been playing a leading role in these efforts, both by conducting groundbreaking global health research and by teaching and training future practitioners and academics. The School has been home to two important efforts that have contributed significantly: the Center for International Health and Development (CIHD), directed by Jon Simon, professor of international health at BUSPH; and the Global Health Initiative at Boston University (GHI), directed by Gerald Keusch, professor of international health at BUSPH.

Jon Simon's multidisciplinary research center has been on the frontlines of global public health in more than 25 countries. The team conducts collaborative research that informs policies and programs designed to improve the health of populations and strengthen the capacity of national researchers and governments to conduct and utilize applied research. Jerry Keusch moved to BUSPH in 2004 after serving as director of the Fogarty International Center at the National Institutes of Health. He has worked as an ambassador and advocate for interdisciplinary collaboration on global health efforts at BU and far beyond, forging valuable partnerships for BU around the world.

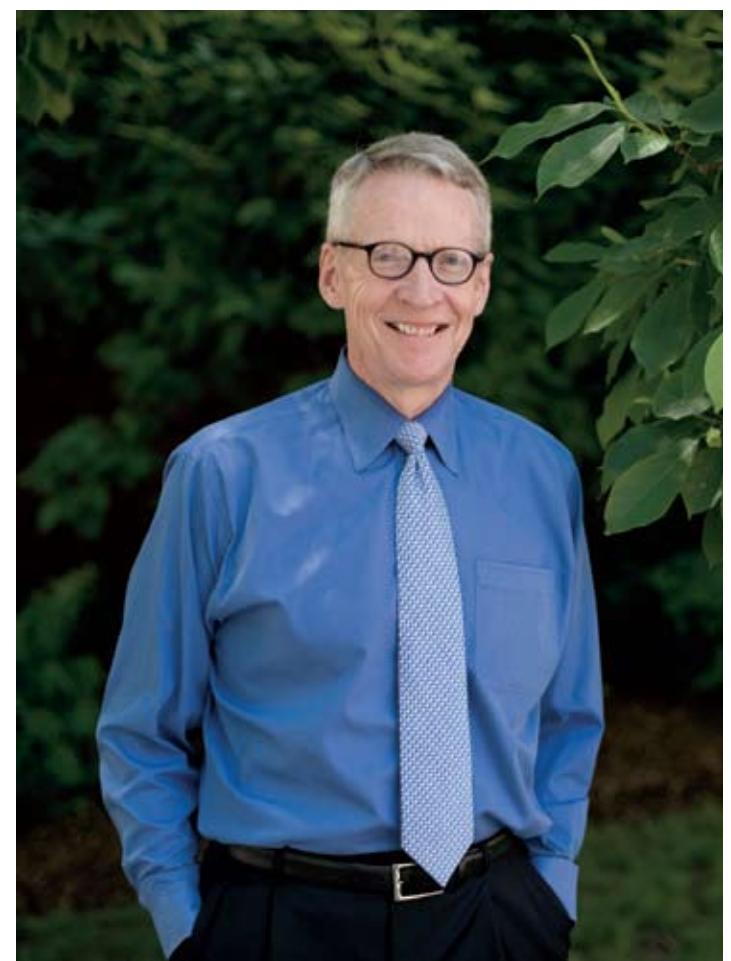
Building on these successes, BU President Robert Brown has committed to taking the University's investment in global health to a new and higher level by establishing the Center for Global Health and Development at Boston University (CGHD). Bolstered by a \$10 million joint commitment over the next five years from BU and BUSPH, this new center, to be directed by Jon Simon, will consolidate the efforts of the CIHD and the GHI, creating

a new entity that will stir and strengthen interdisciplinary collaborations across the University on pressing global health issues. Jerry Keusch will move to a new position as special assistant to the president and senior advisor to the CGHD director.

BUSPH is proud to be the administrative, academic and physical home for the new center, which will remain located at Crosstown Center on the BU Medical Campus. The center's core faculty, many of whom teach our students, will continue to have academic appointments at BUSPH.

To celebrate this milestone for BUSPH and BU, I am pleased to dedicate this issue of the Dean's Report to articles about the recent work and future plans of the CGHD. I have every confidence that under Jon's leadership and with the University's and the School's investment, this impressive group of educators and investigators will keep BU in the forefront of leading North American academic global health programs.

Robert F. Meenan, MD, MPH, MBA
Dean





Q&A with Jonathon Simon

In 2001, a team of 13 interdisciplinary global health scientists and staff led by Jonathon Simon, DSc, MPH, pulled up stakes from their home at Harvard University and joined the Center for International Health at the Boston University School of Public Health (BUSPH). For both Simon's group and the School, the move was a bit of a gamble. The Harvard researchers were heading to a growing but admittedly lower-profile home at the then-25-year-old School of Public Health at Boston University, and BUSPH's Dean Robert Meenan signed them on without assurances they would be able to bring their research portfolio with them.

But the compatibility of their missions was undeniable. Both the School and Simon's group were committed to improving the health of populations by conducting applied research that actively changes public health policy and programs to make them more effective and efficient. The School's focus on research and education that serves the disadvantaged, underserved, and vulnerable meshed seamlessly with the aim of the global researchers, who were focused on preventing infant and child mortality in some of the world's poorest places.

The gamble paid off. In eight years, the center—rechristened the Center for International Health and Development (CIHD) at BUSPH—grew into a thriving research organization working on vital interventions

against childhood killers such as pneumonia and malaria; on strengthening public health capacity; on gender and health; on health systems research; and on the social and economic impact of AIDS. Today the team collaborates with governments and NGOs in more than 25 countries. It manages an annual \$8.5 million research portfolio that continues to grow, and it employs 60 faculty and staff members. These professionals include clinicians, epidemiologists, demographers, economists, lawyers, anthropologists, social epidemiologists, and policy analysts. Their work stretches from Pakistan and India to Malawi and South Africa, and from Ecuador and Peru to Vietnam and China as they pursue solutions that involve local communities in improving their own health. The researchers have also become educators, fully integrated into the School's Department of International Health, teaching both master's and doctoral candidates in the classroom and abroad, preparing a generation of professionals who will follow them into the field.

As the center grew, BUSPH also worked to involve researchers across the University in improving global health by serving as home to the Global Health Initiative (GHI) at Boston University. Led by BUSPH Associate Dean for Global Health Gerald Keusch, MD, the GHI worked to create collaborations inside and outside BU on global health challenges, leveraging the University's intellectual capital for the cause.

This year, the success of these two enterprises led Boston University President Robert Brown to unveil a plan to take BU's global health commitment to a new level. In September, Brown announced that the CIHD and the GHI have been consolidated into one major University research center known as the Center for Global Health and Development (CGHD) at Boston University; it will be based at BUSPH. Simon, who is a professor and chair of international health at BUSPH, serves as the new center's director. Keusch will move to a new position as assistant to the president and senior advisor to the CGHD director. The center's work will be expanded by an investment of \$10 million from the School and the University over the next five years.

In the following interview with BUSPH Dean's Report editor Sharon Britton, Simon talks about the beginnings and work of the center, about future challenges for global health, and about his hopes and plans for broadening BU's involvement in critical public health challenges.

Q: How did your group begin, and what was the initial focus of your work?

A: The group began in 1986 when I was recruited to Harvard's Institute for International Development by Richard Cash to work on improving the global response to diarrheal illness, which at that time was killing about 4 million children a year. Don Thea and David Hamer joined our effort early on, and we have been fortunate to attract and keep a number of talented scientists and management professionals who are tremendously dedicated to our mission.

Q: What is your mission?

We undertake policy- and program-relevant applied research that improves the health of underserved populations in low-income countries. But we don't stop there. We work to ensure that the research actually gets employed to improve policies and programs. We are especially committed to finding community-based solutions to public health problems.

Q: Why did your team come to BUSPH?

A: There were a number of attractions here. BUSPH has an entrepreneurial culture and intellectual openness, and there is an appreciation for applied science that we found very gratifying and reassuring. Dean Bob Meenan made it clear that he and the School saw what we were doing as a legitimate part of the spectrum of academic public health inquiry and recognized that applied research is not second class to basic science. Organizationally, we have had institutional autonomy and the space for intellectual creativity that has allowed our work to flourish in a way that would have been difficult within the departmental structure of some academic institutions. Coming here was the best professional decision I've ever made.

Q: With so many health problems facing the developing world, how have you decided on what and where to focus?

A: People here love kids. It is a core value. This group has had a deep commitment to child survival starting with work on diarrhea in 1986. Diarrhea, pneumonia, and malaria—these are three preventable and treatable diseases that affect children especially, and working on these has been the core intellectual agenda of this group for nearly 25 years.

Q: But you also have a large portfolio of work in HIV/AIDS, correct?

A: Yes. In the last decade a tremendous amount of global health funding has been directed to creating an industry committed to responding to the global AIDS pandemic. We had long debates about what our role in that should be. We made a deliberate choice to stay true to our core child survival and economic impact work and not get on the HIV money bandwagon focused on service delivery. I have never believed that a focus on service delivery is the proper domain of North American research universities. When we engage in service work, it is always in support of state or private-sector providers—this allows us to conduct applied research that benefits populations through functioning public health programs.

As a result, we developed a new portfolio to understand the economics of treating HIV in South Africa, led by Sydney Rosen and involving Bruce Larson, Matt Fox, me, and others. We also undertook important work such as the seven-year Zambia Exclusive Breastfeeding Study, led by Don Thea. Findings from that study, by the way, led the World Health Organization (WHO) to revise its breastfeeding recommendations for HIV-infected mothers.

Q: Do you have a litmus test that determines what kind of work the center will or won't do?

A: The key questions are these: Is the work policy- and program-relevant? Is it likely to have an impact on improving the practice of global public health on the ground and in present time? Can we improve a program's efficiency or effectiveness? Can we improve how technology is implemented or how it is delivered? I guess you could say we are focused on getting results.

Q: How will the consolidation of BU's global health efforts under the umbrella of the new Center for Global Health and Development change what you are doing?

A: First of all, I want to say that I find the level of interest in global health at BU extraordinary, and it starts with the office of the president and leads down the chain. At a time when many American universities are retrenching and cutting positions, the willingness of President Brown, Dean Meenan, and the University's provosts and deans to commit resources to our global health efforts is both inspiring and deeply motivating.

For the last eight years the center has been a nexus for clinicians, economists, demographers, social scientists, and epidemiologists to come together and work on global health problems. Now our challenge is to engage more deeply with faculty from pediatrics, family medicine, and emergency medicine and with faculty beyond the medical campus who are interested in health sciences and human development. That is the challenge President Brown has laid before us.

Q: Why is the wider interdisciplinary involvement important?

A: Because BU has exceptional talent and expertise that can be brought to bear on the problems we are trying to solve. It is astonishing to realize that about 8 million of the 10 million children who die every year of preventable diseases could be saved with treatment and technology we already have. The barriers to doing this are problems with delivery systems and the organization of health care that our school of management could help solve. BU has strength in international relations and regional studies, especially for Africa. Global health has international security and foreign policy implications. Our development economists, sociologists, anthropologists, and sociologists could weigh in on economic, social, and cultural issues that are important for fostering health and development. I think there is a huge opportunity to bring Boston University people together around the challenge of improving global health.

Q: Do you have in mind any other areas where BU could be involved?

A: The problems associated with urbanization and the development of megacities populated with millions of poor people is another area where BU, a great urban research university, could have impact. This is an under-investigated area because so much emphasis has been placed on the rural poor, who have been perceived as having less access to services. But in some ways, the urban poor have the least access of all. Slums are very difficult places to work in. They are epidemiologically problematic because of crowding and poor sanitation; they create microenvironments, which present problems of social cohesion. Urbanization presents tough, tough health and development problems.

Another possible focus is on cardiovascular disease and hypertension, which are chronic diseases plaguing the

developing world. BU has tremendous strengths in these areas. This is reflected in the work done by Aram Chobanian [cardiologist, BU president emeritus, and dean emeritus of the BU School of Medicine] and in the work by the School of Medicine and the School of Public Health on the Framingham Heart Study. Why not deliver the expertise BU has brought to bear on cardiac care and disease prevention in the United States to the global arena?

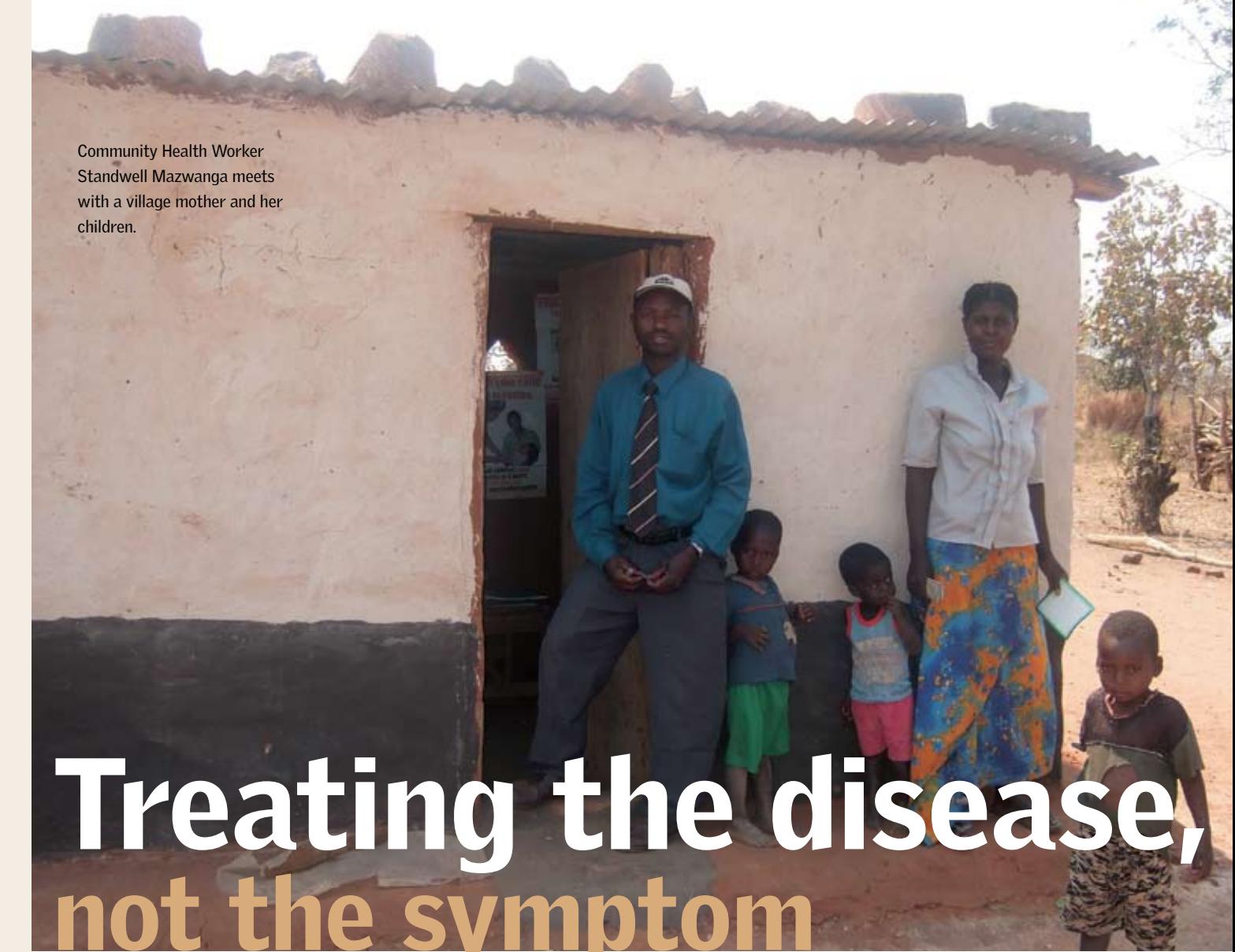
Again, so much of this is about delivery. Think about it. In the developed world, if you are over 50 and have cardiac disease risk factors, the standard protocol is to go on low-dose aspirin, antihypertensives, and cholesterol-lowering drugs. Just getting aspirin out in the developing world would be huge! We don't need fancy technology.

Q: With so much fertile territory before you, does this mean that the center will likely move away from child survival issues?

A: Absolutely not. The world has generated a lot of resources for treating HIV, and working on the chronic disease burden will be increasingly important. But for professionals like me—and I think I speak for most of our group—there is a need to stay focused on reducing the avoidable and preventable mortality of children. This is an unfinished agenda in global health, and we will stay the course. The world has made tremendous progress in the last decade on child survival, and we have tremendous progress yet to make.

Q: You've been at this for more than 20 years. Is there any work of which you are especially proud?

A: Who knows what contributions we are yet to make? But when I'm sitting in my rocking chair 25 years from now, I think I will tell my grandkids that I am very proud of the work this group did to manage pneumonia at the community level, with inexpensive, readily available antibiotics delivered by community health workers to families in community settings. This work will have a profound impact in reducing child mortality, and it has involved many people here, at the World Health Organization, and at other universities in the United States and abroad. It was truly collaborative, interdisciplinary work involving hundreds of people conducting a series of studies done over a decade. This work saves lives. You know it. When you are in a place like Zambia, you can see the results right in front of you.



Community Health Worker
Standwell Mazwanga meets
with a village mother and her
children.

Treating the disease, not the symptom

How rural Zambians are fighting malaria and pneumonia themselves

BY SHARON BRITTON

A one-room shack with a corrugated tin roof held down with stones, the community health post in Siavonga District, Zambia, doesn't look like much. It is furnished meagerly, has no electricity, and maintains only a small stock of medical supplies to treat sick villagers who come seeking the help of the sole community health worker who staffs the facility.

But in this simple structure and what it represents to rural Zambians, Kojo Yeboah-Antwi, an assistant professor of international health at the Boston University

School of Public Health (BUSPH), sees much possibility. Findings from a recently concluded study led by Yeboah-Antwi shows that such small outposts and the volunteers who staff them could become major assets in effectively treating malaria and pneumonia, the two leading causes of death among children under age five in sub-Saharan Africa. More broadly, the results bespeak promise for the treatment of a number of health issues throughout Africa by workers who have little formal medical training but are given support and supervision.

"The Ministry of Health asked us to help develop a strategy for treating malaria and pneumonia at the community level," says Yeboah-Antwi, a researcher for the Center for Global Health and Development at Boston University (CGHD). Born in rural Ghana, he is the first person from his village to become a physician and has focused his



"We have found that by... empowering the community health workers, we are able to save children who might not otherwise get treatment."

career on improving public health in sub-Saharan Africa. "We have found that by employing a small bit of technology and empowering the community health workers, we are able to save children who might not otherwise get treatment," he says.

Zambia is about the size of Texas, and most of its 11.9 million people live in rural settings. In 2006, the CGHD launched the Zambia Integrated Management of Malaria and Pneumonia Study (ZIMMAPS) to test the feasibility of employing community health workers to diagnose and treat both malaria and pneumonia in children between six months and five years of age who live in rural settings. The effort was funded with \$1 million from the United States Agency for International Development (USAID) and the President's Malaria Initiative, a U.S. government effort to cut malaria deaths in targeted sub-Saharan African countries, through a cooperative agreement with the CGHD.

Yeboah-Antwi served as the principal investigator and designed the study with a team of CGHD experts who worked in partnership with Zambia's Ministry of Health and district health management teams. Chikankata Mission Hospital, run by the Salvation Army World Service Office, carried out the field work.

Current malaria practice in Zambia

In current practice, all Zambian children who come to community and rural health centers presenting with fever are treated with antimalarial drugs dispensed for free. This practice follows a standard protocol approved by the World Health Organization's Integrated Management of Childhood Illness, reflecting the long-standing reality that high rates of malaria have required management in settings where clinicians and diagnostic tools are not available.

"The problem is that, with malaria and pneumonia, there is a lot of symptom overlap," says Yeboah-Antwi. "A child who has fever may not only have malaria but may also have pneumonia. Or he may only have pneumonia." In that case, Yeboah-Antwi points out, the malaria drugs won't make the child better. A mother may dutifully give her child the full course of malaria medicine prescribed, only to watch him grow sicker, weaken, and die.

If a community health worker suspects a child is suffering from pneumonia—rapid breathing is a characteristic sign—the child is referred for treatment to a larger and better-staffed health center. But these centers can be

as much as a day's walk away for rural mothers, making the trip impossible for many.

Improving the odds

ZIMMAPS was designed to determine whether community health workers could employ a simple, rapid diagnostic test (RDT) for malaria, follow rigidly dictated treatment protocols based on the results, and improve the treatment rates for both malaria and pneumonia as a consequence.

The study engaged community health workers in the Chikankata Mission Hospital area of Siavonga and Mazabuka districts in the Southern Province of Zambia, an area of about 70,000 people. Community health workers, most of them men, have some secondary education and are literate, but they lack formal medical training. They work as unpaid volunteers, enjoying community standing for their roles. Villagers sometimes pay them with food or services for their help.

In the control group in this trial, the workers followed standard protocols for management of malaria

and pneumonia. They treated children who had fever with antimalarial drugs and referred those suspected of having pneumonia to rural health centers.

In the intervention group, however, community health workers were taught how to use an RDT by obtaining tiny finger-prick blood samples that were then swiped on a test card. Children who tested positive were treated for malaria. Children who tested negative, but were suspected of having simple pneumonia, were given a course of the antibiotic amoxicillin. Severe cases of pneumonia, characterized by symptoms such as lethargy, convulsions, and the inability to drink, were referred to the health center.

Notably, in the intervention group, as many as 72 percent of children presenting with fever tested negative for malaria; 25 percent were consequently treated for pneumonia; and 10 percent were deemed to suffer from both illnesses.

"We had remarkable results from this study," says Yeboah-Antwi. "We found that community health workers could perform the RDT, they could interpret the results, they could give the proper treatment for malaria and

Yesim Tozan, PhD, assistant professor of international health

malaria's hidden toll

Understanding malaria's effects on childhood survivors

In her role as a lead author of the U.N. Millennium Project's task force report on malaria, Yesim Tozan had written much about the burden of a disease that accounts for one in five of all childhood deaths in Africa.

"The disease is estimated to cause 300–500 million episodes of acute illness and 1.1–2.7 million deaths worldwide every year," the 2005 report said. "Malaria takes its greatest toll on young children and pregnant women."

But as she worked with researchers and policymakers to craft a global strategy for scaling-up malaria interventions to reduce mortality, Tozan became interested in the hidden toll from the disease: the neurocognitive deficits in children who had survived severe *falciparum* malaria.

"It was clear that we needed to understand better what malaria does, in terms of its impact on neurocognitive development and the associated socioeconomic costs," says Tozan, assistant professor of international health at the Boston University School of Public Health. "It was an area we knew little about."

Since joining the Center for Global Health and Development at Boston University in 2007, Tozan, PhD, has sought to fill those gaps in knowledge about malaria with a determination and hustle that already have earned her two prestigious university awards. Trained in environmental engineering and technology, the native of Istanbul, Turkey, became interested in malaria a decade ago while a public policy doctoral student at Princeton University.

At BU, Tozan has embarked on a project to explore the socioeconomic costs of severe malaria in endemic countries by looking closely at neurocognitive consequences that may affect child development, educational outcomes, and future productivity. She plans to conduct follow-up research on a study cohort of about 12,000 children who were part of a recent multiyear drug trial of rectal artesunate, which has been found to be effective in reducing the risk of death and disability following severe malaria episodes.

"My objective is to improve our understanding of the prevalence and pattern of neurocognitive deficits," she says. "We don't know what happens to these children when they survive a severe episode, what the effects of these deficits will be on their health and development."

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"Zambia has a national strategy to figure out which health care tasks can be moved down the chain and performed effectively by people without high levels of medical training."

effectively treat pneumonia with antibiotics as well." Specially trained data collectors were deployed by bicycle to visit patients and follow up on outcomes.

Researchers noted that the drugs distributed were well accounted for, an encouraging finding if the intervention is to be replicated. But most remarkable was how well the health workers followed the protocols established in the intervention arm of the study. In only a few instances did they prescribe treatment that was not warranted by the test results. The performance was better, in some respects, than might be expected of doctors, says Yeboah-Antwi, offering a theory: "Clinicians want to observe a

patient and use their intuition and experience. But the community health workers abided by instructions and test results—exactly."

The study is important in part because it helps address two other significant problems associated with presumptive treatment for malaria: waste and overtreatment. Public health experts worry that overprescription could lead to widespread resistance to the artemisinin-based combination therapy drugs currently in use in Zambia and nearly all other African nations. Indeed, within the last decade, Africa lost the inexpensive and well-tolerated anti-malarial drug chloroquine because the mosquito-spread

malaria parasite, *Plasmodium falciparum*, had developed widespread resistance to it. Among public health experts, this is a growing concern even as malaria subsides with the introduction of better prevention methods, such as the distribution of insecticide-treated bed nets.

ZIMMAPS' findings have immediate implications for Zambia and will also be of interest to the World Health Organization, to the health ministries of other nations, and to nongovernmental organizations involved in child health throughout the region, say researchers.

ZIMMAPS team member David Hamer says that, despite the country's extreme poverty and an epidemic of HIV/AIDS that has devastated its adult population, Zambia has an impressive track record of seeking evidence-based solutions for improving child health.

"Zambia has a national strategy to figure out which health care tasks can be moved down the chain and performed effectively by people without high levels of medical training," says Hamer, a CGHD infectious disease expert, physician, and associate professor of international health at BUSPH.

"The community health worker is just one of a number of semiskilled workers throughout Africa providing services such as maternal health and family planning. What we learn here may be applicable in other countries."

Involving the community, a key to success

But making an intervention like this work is not as simple as dropping off supplies and drugs, according to Lora Sabin, a CGHD development economist who worked on ZIMMAPS to interpret the understanding and reaction of caregivers who brought children to community health posts for treatment. Community health workers need

ongoing supervision and encouragement, says Sabin, also an assistant professor of international health at BUSPH. The community needs to be educated, as well, she says, before new methods and techniques can be introduced effectively.

"One of the hardest things about this intervention was to get the caregivers to accept a negative diagnosis of malaria, because that meant their children would not get malaria drugs," says Sabin. Walking away from a health post with a drug made them feel reassured. "In the end, they were positive about it, but it was hard for them." Villagers also needed to be educated about the new blood test. "There were suspicions. Some people worried we were testing for AIDS. You can't just walk into a community and implement an intervention. The community has to be on board," Sabin notes.

The Zambian Health Ministry has requested that the CGHD team work with its local partners to devise a strategy for integrating community case management of pneumonia and malaria. The investigators will also publish results of the study to share findings with the international community. A thorough cost analysis of the intervention versus the standard practice is also planned.

Zambia's National Malaria Control Center is already scaling up use of the antimalarial drug artemether-lumefantrine with the use of RDTs by community health workers in fourteen of the country's seventy-two health districts. "This study will show them how to manage malaria more effectively and how to treat pneumonia at the community level, which isn't being done now in Zambia," says Hamer.



Candace Miller evaluates program to boost Malawi's poorest families

Transforming lives for pennies a day

BY LISA CHEDEKEL

In the Mchinji district of Malawi, one of the 20 poorest countries in the world, owning a chicken can mean the difference between stark poverty and hope.

The poverty in this southern African nation is deep and widespread, with more than half the population surviving on less than 33 cents a day. More than 4 million Malawian children live in poverty, and an estimated one in eight children under 18 has lost his or her parents or caregivers, many to HIV-related illnesses.

Candace Miller, an assistant professor of international health at the BU School of Public Health and a researcher at BU's Center for Global Health and Development (CGHD), made her first visit to Malawi a dozen years ago as a Peace Corps volunteer working in a hospital. She remembers the quick and quiet onslaught of the AIDS epidemic, which ravaged communities and devastated families at a pace she thought unimaginable.

"I watched influential people in the country die without any way to access treatment. I watched families coming apart," she recalls. "It was a helpless feeling. It seemed as though no one was paying attention."

Today, in her role as principal investigator on the Evaluation of the Mchinji Social Cash Transfer project, Miller is back in Malawi, paying attention. She and a team of collaborators have spent two and a half years evaluating a government initiative designed to alleviate poverty and malnutrition among the poorest 10 percent of households in Mchinji and other districts.

The Social Cash Transfer program provides direct payments of cash—on average, \$13 a month—to families identified as ultra-poor and labor-constrained, meaning they cannot provide for themselves. Miller and colleagues have closely monitored the program through family interviews and detailed data collection. They have laid out a series of findings: Recipients are using the money to buy

food and medicine, to send children to school, to purchase livestock and farming supplies, and to travel to hospitals to obtain antiretroviral drugs (ARVs) to treat HIV and AIDS.

The findings have given the government of Malawi a rationale to expand the cash transfers to six more districts since the pilot program in Mchinji began in late 2006, with tentative plans to expand to all of Malawi's 28 districts by 2012. Last fall, Malawi's minister of child development cited the work of Miller's team in a presentation to the UN General Assembly, touting the program's positive impact.

"The program has been a success from a number of perspectives," says Reagan Kaluluma, program manager of the Social Cash Transfer for the Malawi Ministry of Women and Child Development. "Going through the thorough evaluations by Professor Miller, one can see that most of the households attained a certain level of household food security, meeting one of the program's key objectives. Its impact on health care and schooling is also outstanding."

detailed recommendations for operational improvements, which Kaluluma praised as invaluable in helping to shape Malawi's planning

The team's evaluations have attracted broad interest from policymakers in other countries. In recent years, thirteen African governments joined in a pledge to draft national cash transfer plans that will offer assistance to vulnerable citizens. The World Bank is making millions of dollars available for targeted cash assistance programs across Africa.

"The cash transfer program is proving to be the fastest way to reach out to poor households and individuals," Kaluluma says, adding that the CGHD evaluations "are making excellent contributions on a way forward."

The Malawi program, which receives technical assistance from the United Nations Children's Fund (UNICEF) and financial support from the international public-private funding initiative, the Global Fund, is an unconditional transfer program, which means recipients

are free to choose how to spend the money. Families are selected for the program with input from a committee of community members that ranks all eligible households according to need.

"I can now sit with a family in a hut where a mother who is receiving the cash transfer is able to get to a hospital, get her ARVs, and take care of her children," she says with a smile. "For me, that's amazing."

Big Impact from Small Investments

Social assistance in the form of cash grants is not a new concept; similar programs have been implemented in Mexico, Brazil, India, and other countries. But large-scale cash-transfer schemes are rare in Africa, as are scientific evaluations of such programs.

While Miller and her colleagues found impressive impact from the Mchinji program, they also found problems in oversight, management, and the methods by which families are selected. The team has issued

Miller's CGHD team has been working in collaboration with the University of Malawi's Centre for Social Research to evaluate the program's impact on families and its overall operations. The research team, with funding from the United States Agency for International Development (USAID) and UNICEF, has issued a series of reports and is now working on an evaluation of the program's broader effect on the local economy.

In her office at the CGHD in Boston, Miller points to a stack of thick binders filled with photocopies of cash transfer records that the government uses to manage the program. Despite efforts to computerize the program, "it's basically a pencil-and-paper operation," she says.



Although there are no rules or conditions on the payments, families understand the importance of education and self-sufficiency and are using the funds to buy clothing and pay fees for their children to attend school, Miller says.

"It's an unwritten rule that if you are getting the cash transfers, your children will go to school instead of having to provide labor for the family," she explains. "There's an



Through extensive field interviews and questionnaires, Miller and her colleagues have closely tracked families' spending habits, food intake, health status, weight and height measurements, and other data. The results provide strong evidence that the initiative has been effective in improving nutrition, food security, and school attendance among recipient families, many of them "skip-generation" households headed by grandparents raising orphaned grandchildren.

The evaluations have found that recipient families have fewer missed meals; lower rates of underweight or malnourished children; fewer reported sicknesses; higher school enrollment and fewer absences; better access to medicines and healthcare; and a reduction in instances of young children working to help support their families.

Miller says these findings mean the majority of families are using the money wisely.

"People are making good choices," she says. "They're using a large portion of the money for food, and they're eating high-quality proteins like eggs and chicken. They're able to buy basic medicines or farming equipment or fertilizer. They're making improvements to their houses. The impact is solid."

understanding that investing in children is important, which suggests that the program has great potential to break the intergenerational cycle of poverty."

In comments collected by the research team's field staff, some of the children whose families have received the cash subsidies have talked about the changes to their lives.

"We have good plastic plates we use when eating," said one thirteen-year-old boy.

"We have the opportunity to look smart because our parents buy us soap," said a fourteen-year-old girl.

"If money is enough in a household, then girls cannot be enticed with cash to sleep with men," said a seventeen-year-old boy.

Maxton Tsoka, a researcher at the University of Malawi's Centre for Social Research and co-investigator on Miller's team, says the program offers important insights about income distribution and community decision-making. But as he and Miller pore over reams

of data to gauge the economic impact, they are awed by the transformative power of a mere 43 cents a day.

"Nothing can beat seeing an 'outcast' school child becoming a 'star' child just because she has a clean uniform, ate breakfast in the morning, and has small change for a locally made doughnut during break time," Tsoka says. Such anecdotal stories show success beyond what can be demonstrated by statistics, he suggests.

Miller explains that the cash payments can cause tensions between neighbors as families receiving money "catapult themselves up" while living side-by-side with families who remain in desperate poverty. The amounts of the cash transfers, while small by U.S. standards, may need to be further adjusted to spread the wealth better.

"If you're not on this program, you're usually begging," Miller says. "People survive by getting gifts of food from

"People are making good choices. They're using a large portion of the money for food, and they're eating high-quality proteins like eggs and chicken. They're able to buy basic medicines or farming equipment or fertilizer. They're making improvements to their houses. The impact is solid."

Lessons Learned, Challenges Ahead

Miller likes analyzing statistics. She also likes examining programs and policies designed to benefit children and families. The Malawi project has allowed her to do both.

Her research team identified a number of weaknesses in the cash transfer program and made recommendations for improvements. The group called for closer monitoring of the program by district leaders and central ministries, automation of records, and a clarification of the criteria by which families are deemed eligible for aid.

A key concern is that the program is reaching only about 10 percent of households, while at least 15 percent qualify as ultra-poor and labor-constrained. Also, Miller and Tsoka say, the government needs to develop a system for retargeting households over time, as some families' financial status improves and others' deteriorates.

"In communities where the difference between the 'poor' and the 'non-poor' could be a chicken, almost everyone would want to be a beneficiary," Tsoka says. "One lesson we've learned is that the cash transfer program can change income distribution patterns in the long run and end up being negative. Retargeting is necessary before things get out of hand."

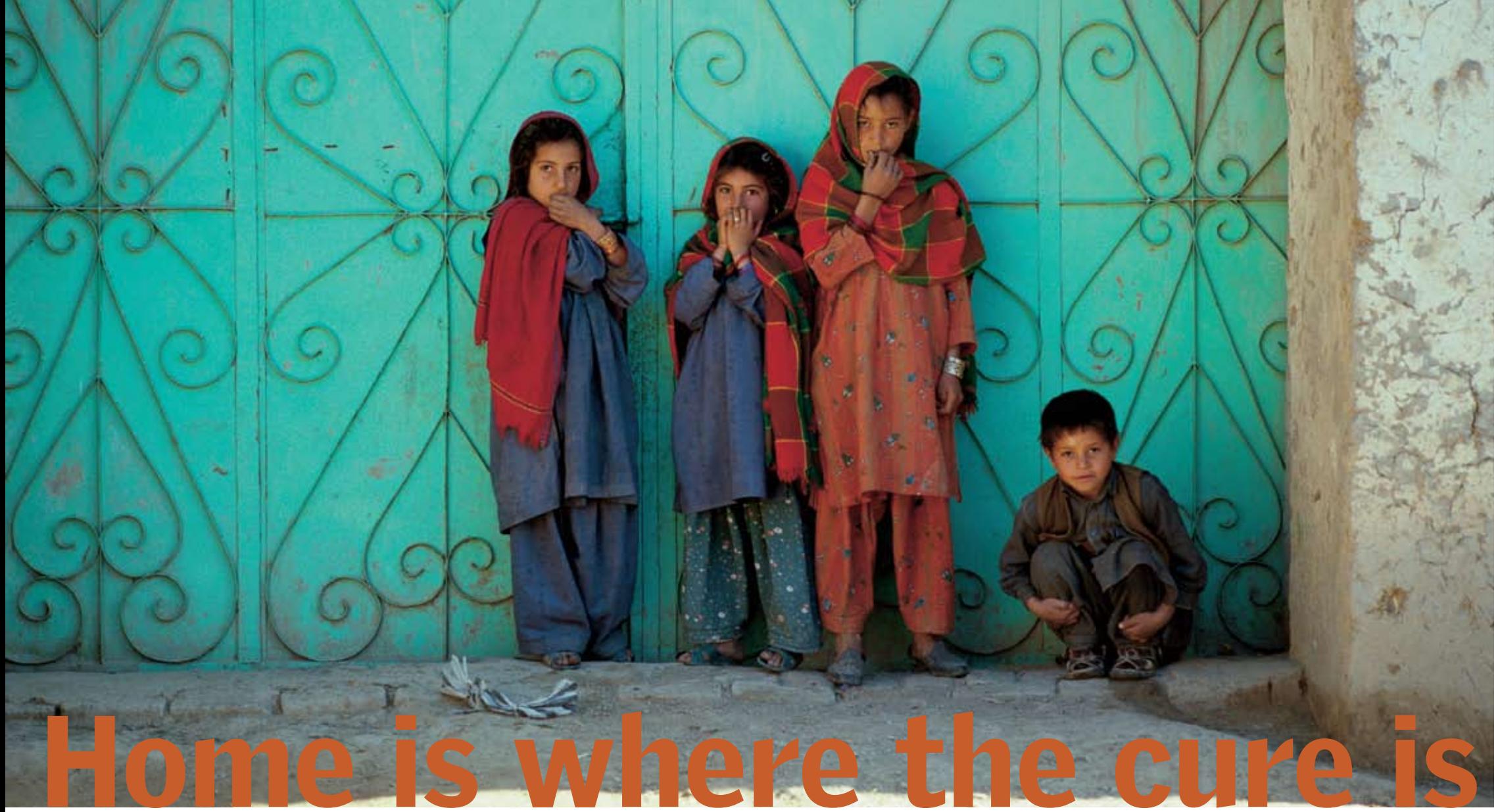
their neighbors. The recipients become less of a burden, and suddenly they're the rich uncle. There are social issues that arise when you see people in your situation jump so far beyond you."

Kaluluma acknowledges that there are challenges ahead and says the Malawi ministry hopes for continued guidance from Miller's team.

"This program is still evolving and requires input from outstanding institutions like Boston University and dedicated and highly skilled personnel like Professor Miller," he says.

Miller expressed hopes that lessons from the Mchinji program will encourage other countries to embark on cash transfer programs.

"I believe if you can address poverty, you can go a long way to improve health," she says. "If we can help governments improve policies and programs so that they meet their human rights obligations to provide food, health care and education, that's very rewarding."



Home is where the cure is

A home-based solution to severe pneumonia

BY LISA CHEDEKEL

Rarely in one's public-health career does a research project prompt a fundamental change in global health policy.

But as he traveled to Geneva, Switzerland, last year to address an expert panel convened by the World Health Organization (WHO), Donald Thea, a professor of international health and researcher at the Center for Global Health and Development at Boston University (CGHD), recognized that he was experiencing that singular moment.

Thea and colleagues had been invited to present the findings of their landmark "NO-SHOTS" study, based in Pakistan, which showed that children with severe pneumo-

nia in developing countries could be treated as effectively at home, on oral antibiotics, as in hospitals. The WHO has long held that children in developing countries suffering from severe pneumonia should be brought to a hospital and treated with injected antibiotics.

A decade of research, capped by the Pakistan study, suggested that it was time for the WHO to change its recommendation.

"So many children die of pneumonia because they can't get to a hospital," says Thea, who led the study with BUSPH faculty members William MacLeod and Matthew Fox, and Pakistani colleagues. "They're twenty kilometers from the health-care center and they don't have the resources to pay for the transportation, or the mother has six or seven other children at home and she can't afford to stay in the hospital for five days while the child is receiving treatment."

"Changing the standard of care will be hugely beneficial," he says, "especially for the many children who are referred to hospitals but never reach them."

The pitch by Thea's team and other researchers paid off: The WHO's Guidelines Review Committee has approved revisions that will recommend home treatment for severe childhood pneumonia, and the organization is now preparing a technical update to communicate the new guidelines to health officials around the globe.

In the words of Shamim Qazi, medical officer for the WHO's Department of Child and Adolescent Health and Development, "The potential impact of these study results is enormous. Being able to treat children with severe pneumonia safely and effectively in their own homes would be of huge benefit to both families and health systems, by reducing the need for admission to hospitals."

But to Thea, who knows that paper policies are useful only if there are people on the ground to implement them, the guideline change is just a first step. Even before the findings of the NO-SHOTS study were published in *The Lancet*, one of the world's leading medical journals, in January 2008, he had begun work on another study, a controlled trial to establish whether community health workers in Pakistan, known as Lady Health Workers, can successfully manage severe childhood pneumonia at home.

If the failure rate with home-based treatment is no greater than that of children who are hospitalized, Thea's team hopes to show that community health workers can be trained to diagnose and manage cases of severe pneumonia.

And he could be back at the WHO again, for a second singular moment.

Taking on an Orphan Illness

Thea calls pneumonia an "orphan" illness, in terms of public attention. Although it is the largest single killer of children under age five around the world, causing an estimated 2 million deaths every year—more than tuberculosis, malaria, AIDS, and measles combined—it has not garnered the media hype or attracted a high-profile champion the way other illnesses have.

For Thea, a physician, the work on pneumonia has been a detour. Trained in tropical medicine and infectious diseases, he has focused his research mainly on mother-to-child transmission of HIV/AIDS, doing work centered largely in Africa. Among the projects he has led is the Zambia Exclusive Breastfeeding Study, which found that abruptly weaning HIV-exposed infants after four months of exclusive breastfeeding did not improve survival.

Still, Thea's commitment to see the pneumonia studies through to real-life changes in treatment is unwavering.

"The change in the WHO guidance is great," he says, "but the final goal is to get WHO to endorse community case management of pneumonia. If we are able to establish that community health workers can adequately diagnose and treat severe pneumonia, then we will have brought the care to the community in a much greater degree, and hopefully that will allow access to life-saving treatment for children living in remote areas."

Because of Pakistan's leadership in addressing acute respiratory illness and its existing healthcare infrastructure, the country has served as Thea's ideal proving ground. Thea and CGHD colleagues have a longstanding



collaboration with researchers from the Children's Hospital of the Pakistan Institute of Medical Sciences, as well as other institutions in Pakistan.

The research team has taken a methodical approach to examining treatment options for severe pneumonia, first establishing that oral amoxicillin was effective in children under age five, and then studying whether it could be safely administered outside of a hospital setting. About 60 percent of pneumonia cases in the developing world are caused by bacteria and can be treated with antibiotics.

In 2004, Thea, the WHO's Qazi, and other researchers published the findings of a four-year study demonstrating that oral amoxicillin was just as effective as the injectible penicillin recommended by the WHO. Results of that study, conducted at health-care centers in eight developing countries in Africa, Asia, and South America, showed that treatment failure was 19 percent in each group.



"We were trying to find something very practical that we could implement 30 kilometers up a valley in Nepal," Thea says. "What we showed was, if you can get a bottle of amoxicillin into the hands of a child's mother or caretaker, that child will do just as well as the child treated in-hospital with the current standard of care."

Jonathon Simon, director of the CGHD and a co-investigator on the studies, said the pneumonia work has had the kind of real-world impact that the center strives to achieve.

"The WHO's prior guidance doesn't make a lot of sense, if you understand where the mortality is, and if you realize that even if kids can get to a hospital, they often get there too late, or there are no drugs or no doctors," he says.

"We've taken low-cost, easily administered drugs and shown that they can be used on the community level," he

In 2006, with funding from the United States Agency for International Development (USAID) and the WHO's Department of Child and Adolescent Health and Development, the researchers turned their attention to home treatment. They studied outcomes for 2,037 children who had come to hospitals in Pakistan and been diagnosed with severe pneumonia. Half the children remained at the hospital and were treated with injected antibiotics; the other half were sent home with oral medication. All were monitored by physicians.

Their findings: By day six of treatment, 8.6 percent of children failed to improve in the hospital, while 7.5 percent of children failed to improve at home. Of the five children (0.2 percent) who died during the study, four were in the hospitalized group and one was at home.

continues. "It's a great example of how you take an observation from a community and build a research portfolio that eventually affects global guidelines.

"When I put my head on the pillow, this is a piece of work I'm very proud of."

Out into the Community

They're not paid much, and they are not revered in the way that doctors in Pakistan are, but to Thea, the country's 100,000 Lady Health Workers are the perfect army to take on childhood pneumonia.

"These are women, trained through a government program, who are dispersed throughout the country to improve child and maternal health," Thea says. "They're being entrusted with a greater number of health

Pakistan Institute of Medical Sciences, says some health-care professionals have raised concerns about community care, arguing that hospitals provide closer monitoring.

"My response to those concerns is that our data show that hospitalization in no way confers a certain degree of safety to these children," Hazir states. In addition, the Lady Health Workers are in close touch with health-care professionals.

Thea says severe pneumonia is characterized by lower chest wall indrawing, a symptom that aids in diagnosis, especially when there are no X-rays, blood tests, or even thermometers available. Cases of very severe pneumonia, which can be characterized by an inability to drink, lethargy, or convulsions, are still referred for inpatient treatment.

The WHO's revised guidelines still require hospitalization for severe childhood pneumonia in high HIV-prevalence

"We've taken low-cost, easily administered drugs and shown that they can be used on the community level."

interventions. Our hope is to be able to use that solid infrastructure to train, supply, and support them in identifying and managing both mild and severe pneumonia in the community."

Thea's team is currently conducting a trial in Hala, Pakistan, outside Karachi, to gauge whether Lady Health Workers who receive special training and supervision in the diagnosis and home-based treatment of severe pneumonia can achieve treatment outcomes at least equivalent to those achieved when children are referred to health facilities for care. The Lady Health Workers are a critical resource in remote rural areas, where the majority of the country's population lives.

The new study, conducted in collaboration with Aga Khan University, is ongoing. So far, Thea says, the health workers have eagerly embraced the training and treatment protocol.

Tabish Hazir, Thea's co-investigator and an associate professor of pediatrics at the Children's Hospital,

settings. Because of the low prevalence of HIV-positive children in Pakistan, Thea and his co-authors could not make a determination about outpatient treatment in an HIV-exposed population.

Both Thea and Qazi note that outpatient management of pneumonia offers significant cost-savings for families and health systems. In addition, they point out, it reduces the risk that children with pneumonia will develop complications from exposure to infections in crowded hospital wards.

Simon, the CGHD director, said he looks forward to seeing health ministries across the globe implement the new WHO guidelines in the years to come.

"Ten years ago, we set out to ask the question, 'Could you safely and effectively manage pneumonia on the community level?' Well, now we have the answer.

"If we're ever going to get a handle on the global burden of pneumonia," he says, "we have to be able to get it out into the community setting."

Center for Global Health and Development Research Team



Meet the CGHD Research Team



ABU ABDULLAH, PhD, MPH, MBBS, associate professor of international health at Boston University School of Public Health, sph.bu.edu/asma

Abdullah's primary research interests are in the prevention and control of chronic diseases in the developing world, with a focus on smoking cessation, secondhand smoke, and other modifiable risk factors. His research also encompasses infectious disease epidemiology, particularly HIV/AIDS and major childhood illnesses in the developing world.



GODFREY BIEMBA, MSc (Public Health), MBChB, research assistant professor of international health at Boston University School of Public Health, sph.bu.edu/biemba

Biemba has more than eighteen years of public health research experience, covering clinical trials and social research in malaria, HIV, research ethics, and research management. He currently oversees a United States Agency for International Development-funded applied research program called OVC-CARE, reviewing literature on alternative care for orphans and vulnerable children, studying costing and cost-effectiveness of OVC programs, and conducting applied research situation analyses in five countries.



FRANK FEELEY, JD, associate professor of international health at Boston University School of Public Health, sph.bu.edu/feeley

Feeley's research focuses on health regulation and finance, particularly health insurance, management of governmental health agencies, and the role of the private sector in developing healthcare. Recently, he has written extensively on public private partnerships for AIDS treatment in Africa.



GERALD KEUSCH, MD, professor of international health at Boston University School of Public Health, sph.bu.edu/keusch

Keusch has been involved in clinical medicine, teaching and research for his entire career. Before being named special assistant to BU's president and senior advisor to the CGHD, he was director of the Global Health Initiative at BU, a multidisciplinary program to create collaborations inside and outside of BU on global health challenges. He was also associate dean for global health at BUSPH and associate provost for global health. Before coming to BU, he was director of the Fogarty International Center at the National Institutes of Health."



BRUCE LARSON, PhD, MA, associate professor of international health at Boston University School of Public Health, sph.bu.edu/blarson

Larson is an economist with extensive experience working on environmental and public health problems in Africa, Eastern Europe, and Russia. His current research focuses on the economic impacts of HIV/AIDS and antiretroviral therapy in Kenya and South Africa.



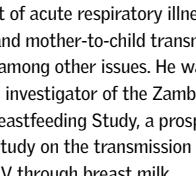
DEBORAH MAINE, DrPH, professor of international health at Boston University School of Public Health, sph.bu.edu/dpm1

Maine has more than thirty years of experience working on reproductive health in developing countries. In addition to international women's health, her research focuses on gender and health and on the evidence base of health policies.



CANDACE MILLER, ScD, MHS, assistant professor of international health at Boston University School of Public Health, sph.bu.edu/candace

Miller is a social epidemiologist focusing on public policies that affect poor and vulnerable populations. She is currently investigating social welfare strategies in low- and middle-income countries in order to facilitate scaled up social assistance that combats poverty in sub-Saharan Africa.



JONATHON SIMON, DSc, MPH, director of the CGHD and professor and chair of the Department of International Health, Boston University School of Public Health, and, sph.bu.edu/jonsimon

Sabin is a health and development economist. Her research focuses on evaluating the impact of interventions designed to improve prevention and treatment efforts related to HIV/AIDS, malaria, and other infectious diseases. She is investigating ways of improving adherence to antiretroviral therapy among HIV-positive individuals in China.



TARYN VIAN, MSc, assistant professor of international health at Boston University School of Public Health, sph.bu.edu/tvian

Vian has more than 24 years of experience in the health care sector as a manager, project leader, and policy analyst. Her research interests include cost analysis, program evaluation, and transparency and accountability in governance.



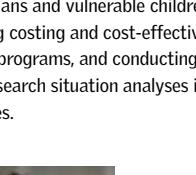
KOJO YEOBAH-ANTWI, MBChB, MPH, assistant professor of international health at Boston University School of Public Health, sph.bu.edu/kyantwi

Yeboah-Antwi is a physician, a public health specialist, and a researcher with more than twenty years of experience in managing health systems, program and project implementation and evaluation, development research, and policy and strategy development. His research interests include malaria, micronutrients, and maternal and child health.



JENNIFER BEARD, PhD, MPH, assistant professor of international health at Boston University School of Public Health, sph.bu.edu/jenbeard

Beard teaches writing and health communication at BUSPH. Part of the CGHD's orphans and vulnerable children project team, she is working on building health communication teaching partnerships with public health schools in India.



MATTHEW FOX, DSC, MPH, assistant professor of international health at Boston University School of Public Health, sph.bu.edu/mfox

Fox is an epidemiologist with experience researching HIV, pneumonia, and malaria and also has done work in developing epidemiologic methods for bias analysis.

He is currently working in Johannesburg, South Africa, alongside one of the largest providers of antiretroviral therapy in the country conducting applied research on ways to increase access to HIV care and improve HIV treatment outcomes.



KIRK DEARDEN, DrPH, MPH, associate professor of international health at Boston University School of Public Health, sph.bu.edu/kdearden

Dearden is currently studying the social determinants of health and nutrition in Peru and elsewhere, along with the long-term impact of stunting on cognition.

His research interests include program strategies designed to improve health and well-being, with emphasis on maternal and neo-natal health, malaria, acute respiratory infections, and adolescent health.



SHYAMA KURUVILLA, PhD, assistant professor of international health at Boston University School of Public Health, sph.bu.edu/shynamak

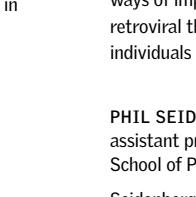
Kuruvilla's research focuses on international public health policy, including global public-private partnerships, the role of United Nations organizations, and political philosophy. She previously worked at the World Health Organization in Geneva and has coordinated and collaborated on multidisciplinary health research and policy projects in a number

of countries, including Bolivia, China, Cuba, India, Liberia, and Zimbabwe.



BRUCE LARSON, PhD, MA, associate professor of international health at Boston University School of Public Health, sph.bu.edu/blarson

Larson is an economist with extensive experience working on environmental and public health problems in Africa, Eastern Europe, and Russia. His current research focuses on the economic impacts of HIV/AIDS and antiretroviral therapy in Kenya and South Africa.



LISA MESSERSMITH, PhD, MPH, associate professor of international health at Boston University School of Public Health, sph.bu.edu/lmessers

Messersmith is a medical anthropologist with more than twenty years of experience working on gender, sexuality, HIV/AIDS, and sexual and reproductive health and rights. She currently leads teams researching the health and social service needs of women living with HIV/AIDS in Vietnam and conducts AIDS public policy training and planning in Vietnam.



WILLIAM B. MACLEOD, ScD, SM, assistant professor of international health at Boston University School of Public Health, sph.bu.edu/wmacleod

MacLeod is a public health demographer and data analyst. His work has focused on clinical and community research trials addressing treatment and behavioral change to improve outcomes for infectious diseases in developing countries—primarily acute respiratory infections, malaria, and HIV. His expertise is in the design and data analysis of comparative, equivalency, and cluster-randomized trials.



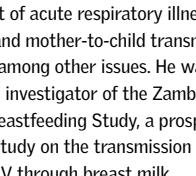
ASHOK PATWARI, MBBS, DCh, MD, research professor at Boston University School of Public Health

Patwari provides technical assistance on research initiatives in maternal, neonatal, child health and nutrition in India. He is trained as a pediatrician and has been actively involved with various public health programs and activities for the past 20 years.



DONALD THEA, MD, MSc, professor of international health at Boston University School of Public Health, sph.bu.edu/dthea

Thea provides senior technical leadership on a portfolio of projects that address community treatment of neonatal sepsis,



KATHERINE SEMRAU, MPH, PhD candidate, instructor of international health at Boston University School of Public Health, sph.bu.edu/ksemrau

Semrau is an epidemiologist with research and programs focusing on mother-to-child transmission of HIV/AIDS in sub-Saharan Africa. She is director of the International Research Coordinating Center, which provides data management and conducts analyses for several CGHD projects.



GESINE MEYER-RATH, MD, PhD, research assistant professor of international health at Boston University School of Public Health, sph.bu.edu/gesine

Meyer-Rath is a physician and health economist with research experience in the economics of interventions for HIV in low- and middle-income countries. Her work includes modeling the cost and outcomes of antiretroviral therapy in South Africa and of interventions for children around the world orphaned and made vulnerable by HIV/AIDS.



SYDNEY ROSEN, MPA, research associate professor of international health at Boston University School of Public Health, sph.bu.edu/srosen

Rosen leads several studies that are evaluating the economic benefits and costs of HIV/AIDS prevention and treatment interventions in sub-Saharan Africa. She has recently returned to Boston after four and a half years as a resident researcher in South Africa.



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Program managers are the core administrative staff of the CGHD and have primary responsibility for the day-to-day management of the administrative operations of the each research or service delivery project. They support principal investigators coordinating management of the budgets, accounts, income and expenditures, contracts and subcontracts, and personnel processes, and they work closely with the senior management of CGHD to ensure that the contractual obligations and the scientific goals of the project are realized at a high level of quality. They maintain frequent communication with the collaborating institutions and local scientists and research organizations to ensure that they also meet their contractual obligations and fulfill their scientific commitments. The IRB coordinator serves as a liaison among principal investigators, field staff, and the institutional review boards of record to ensure high ethical standards and protection of human subjects in all studies.

The women are the answer



LUNESP participants offer a traditional welcome to CGHD's Anna Knapp at the start of their training session.

notes from the field



Anna Knapp (SPH'07), a senior program manager at CGHD, has been involved in LUNESP for the last two and a half years. She chronicled some of her experiences in Zambia.

BY ANNA KNAPP

In October, the red earth of the Copperbelt province is thirsty, the purple jacaranda and flame trees are in full bloom, and the heat is strong and unrelenting in the afternoons.

One year ago this week, I made my first trip to this north-central area of Zambia bordering the Democratic Republic of Congo, in order to meet and work with the Lufwanyama Neonatal Survival Project (LUNESP) field team. As the LUNESP program manager based in Boston, I was experiencing my first opportunity to observe the study in action and to work alongside the traditional birth attendants, rural health-center staff, data collectors, and core LUNESP team who comprise the study.

With training and tools, Zambian birth attendants learn to reduce neonatal mortality

BY LISA CHEDEKEL

During the height of Zambia's copper boom, when the country's lucrative copper mines fueled the local economy, the town of Kitwe boasted all sorts of sporting attractions for wealthy miners and their families.

Now, thirty years after the boom ended, the Kitwe Badminton Club retains little of its former elegance, its ceiling buckling and a white owl taking up residence in the rafters.

But on an evening last October, the club came alive with the sounds of cheering and applause as dozens of Zambian women strode across the concrete court floor to receive certificates. They had completed an ambitious program headed by researchers at the Center for Global Health and Development at Boston University (CGHD) that is saving young lives.

The women, who serve as traditional birth attendants in the Lufwanyama District of Zambia's Copperbelt province, received special training in interventions aimed at reducing the country's high infant mortality rate. The three-year initiative, known as the Lufwanyama Neonatal Survival



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The Lufwanyama birth attendants were trained in several key interventions, all of them low-cost and low-tech means of preventing avoidable causes of death.



Project (LUNESP), was spearheaded by Christopher Gill, former BUSPH faculty member. The study is overseen by faculty and staff from the CGHD, Tufts Medical Center and Boston Medical Center, who work alongside Zambian colleagues. Funded principally by the U.S. Agency for International Development, it also has support from the American Academy of Pediatrics.

The women had reason to celebrate that autumn night. They had mastered the skills to identify and manage the three most common, preventable contributors to neonatal mortality: birth asphyxia, neonatal hypothermia, and sepsis.

Even without knowing the preliminary study results—which appear “promising,” according to lead investigator David Hamer, associate professor of international health at the Boston University School of Public Health (BUSPH)—the women took pride in taking on greater responsibility, using LUNESP’s simple toolkit of interventions.

“Before LUNESP started, many babies were dying, but now the number of neonatal deaths is very low,” one birth attendant said at the certificate ceremony. “We thank you, God, for LUNESP!”

Zambia’s existing network of birth attendants was a key reason LUNESP researchers chose the country as the site for the intervention study, according to Hamer and Anna Knapp, CGHD’s program manager for LUNESP. The women, who have limited formal education but receive some midwifery training from district health officials, function as front-line caregivers for those who are giving birth in areas that have no easy access to health-care centers.

In the Lufwanyama District, about 66 percent of new mothers are at least a three-hour walk from the nearest health center. Transportation is scarce and, where available, expensive.

Over the last two and a half years, birth attendants from across Lufwanyama have left their own families to travel

hours for extensive training that has been overseen by Zambian investigators Grace Mazala and Charity Mulenga, assisted by Nicholas Guerina, a neonatologist at Tufts Medical Center and an adjunct assistant professor at BUSPH. Although the interventions themselves are simple, knowing when and how to intervene in a child’s first moments and days of life involves an understanding of illness, disease, and danger signs.

Of the more than 9 million deaths of children under age five worldwide every year, about 3.6 million—40 percent—occur during the neonatal period, or the first four weeks of life.

Until recently, Hamer says, there was little effort to tackle the specific health problems of newborn babies; many of those deaths go unrecorded and remain invisible. But Hamer says the survival of newborns is a critical part of the push toward lower child mortality in the 2015 United Nations Millennium Development Goals.

“Most studies of interventions to reduce neonatal mortality have been in Asia,” Hamer says. “In sub-Saharan Africa, there’s a real need for data.” He adds that LUNESP is one of the first such studies, affording outcome data on more than 3,000 births—a relatively large sample for a study conducted in Africa.

The Lufwanyama birth attendants were trained in several key interventions, all of them low-cost and low-tech means of preventing avoidable causes of death. They were given dry towels to wrap the newborn in to help prevent hypothermia and equipped with suction bulbs to clear the infants’ airways. They carried pocket resuscitators for use in case the newborns had trouble breathing. In the event that a baby appeared to be ill, the women carried stand-by antibiotics with instructions to give the infant a first dose of amoxicillin and refer the child to the nearest health facility.

One other intervention, carried out on a limited basis, was a pilot project in which birth attendants were trained



cal Center and an adjunct assistant professor in international health at BUSPH, who is one of the project’s co-investigators. Together with the core LUNESP field staff, Nick and I will spend this week working with our group of 120 attendants who travel from twelve sub-districts in Lufwanyama under challenging circumstances to arrive at the training site.

One year later, I am privileged to be here for the final training of the attendants as we wrap up study activities that have been ongoing for the past three years.

On this trip, I am accompanied by Dr. Nicholas Guerina, a neonatologist based at Tufts Medi-



many responsibilities, and families that they leave behind, and many of them will travel for several days.

We’ve held these trainings every three to four months for the last two and a-half years, and, despite all obstacles, most of the women

make it for each and every training session. Our training site, Mindolo Training Farms, is located down long, rough dirt roads in the bush between the towns of Kitwe and Kalulushi and near a large and active copper-mining operation. Mindolo served as an agricultural/trade school, and most of our training sessions take place in what was once a classroom used to teach tailoring. Some days, you can feel the earth tremble slightly from explosions taking place at the nearby mine.

I have come to know what to expect on the first day of each training, but preparation never diminishes my experience: the inaugural



passage to the tailoring classroom is marked by the joyous singing and dancing of the attendants, who wear their dazzling white LUNESP T-shirts and multicolored chitenges (the traditional cloth of Zambia) around their waists. They sing a cappella in one of the local

languages, Bemba, and their song is one of greeting after the long period since last we were together.

When I sit down for the first day of training, I usually look around the room and remind myself that I was born safely in a modern hospital with doctors and nurses attending to my mother. If I had been born in this area of Zambia, there is a good chance that one of these women would have assisted in my birth.

Lufwanyama district is typical of many resource-constrained parts of Africa, with poor access to basic health facilities and high

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to utilize a rapid HIV test, called OraQuick, for mothers who were about to deliver. If a mother had tested positive for HIV, she and her baby were to be given nevirapine, a drug that has been found to reduce the chance of mother-to-child HIV transmission. Because of time constraints and other obstacles, that portion of the study did not produce enough data to draw firm conclusions, says Mark Mirochnick, a neonatologist at Boston Medical Center who assisted in the study.

Hamer, project manager Anna Knapp, and other members of the study team collected data on infant mortality at twenty-eight days, evaluating how outcomes for babies delivered by birth attendants who used the interventions compared with outcomes for babies delivered by attendants not using the interventions. While they are still preparing a final report, Hamer says one conclusion is clear: The birth attendants were able to manage the new tools.

"They were outstanding in their ability to carry out these protocols," he says. "There's evidence they were able both to learn the skills and to retain them over time."

Hamer and Mirochnick say preliminary results indicate that a training regimen and some basic supplies can make an enormous difference in infants' health outcomes.

"In terms of neonatal resuscitation, the bang for the buck that you get from the training and a little bit of equipment is just amazing," Mirochnick says.

Although the initial research has been completed,

LUNESP has spawned several new initiatives. Save the Children, a nonprofit organization working to improve the lives and health of youngsters in forty-two countries worldwide, has been in contact with the research team and has raised funds to continue the intervention program throughout Lufwanyama district for five years. CGHD will remain a partner in that effort.

In addition, Hamer's team is hoping to secure funding to conduct a new study that would make use of traditional birth attendants in Zambia's Southern Province for another neonatal intervention: cleaning umbilical cords with an antiseptic called chlorhexidine. Umbilical cord infection has been found to be a major contributor to neonatal mortality risk in developing countries.

"LUNESP has opened the door to new opportunities—the kind of opportunities that could save thousands of lives," Hamer says.

For their part, the Lufwanyama birth attendants have a newfound confidence in their abilities. For the certificate ceremony last fall, they prepared poems and speeches about how much participating in the study meant to them. Standing in the center of a forgotten badminton court, they shared their thoughts bravely, in English.

"From training to training, these women were masters," Knapp says. "They're incredibly proud to have received the skills that empower them to save lives in their own communities."



notes from the field continued

rates of neonatal mortality. A mother going into labor may have to walk upwards of seven hours to get to the nearest health facility; thus, many women end up delivering in their own homes—homes lit by candlelight and with no running water.

In this area, there is a high utilization of traditional birth attendants. In Lufwanyama, they attend approximately 30 to 40 percent of all births outside of a health facility. Sadly, many babies don't live through their first month of life and often die due to complications that could easily be averted. This is where the LUNESP attendants provide tremendous assistance, as they practice simple interventions intended to reduce neonatal mortality.

Our clinical field supervisor and head Zambian trainer, Charity, begins the opening lecture, and I watch the women intently. Their faces are all familiar to me now: I know the comedians from those more reserved, the young mothers from the elders. I know that each and every one of them will try her best to grasp the concepts that are demonstrated today and during the week. These women are hungry for the simple skills and knowledge that may help them to save lives.

To read more about Anna Knapp's experiences, go to: sph.bu.edu/lunesp.

In South Africa, an economic perspective: What do we spend? What do we get?

BY MICHELLE SALZMAN

In South Africa, Sydney Rosen is attacking HIV/AIDS on the economic front. She's conducting research to help the government avoid the kind of budgetary crisis that can lead to an interruption in the delivery of drugs, such as one that took place in Free State Province in 2008, creating deep concern among patients and health-care providers.

"They were temporarily forced to stop sending out drugs to their treatment sites, which for HIV is a disaster," explains

Rosen, a research associate professor of international health at Boston University School of Public Health and an investigator at the CGHD.

Rosen, whose technical training is in policy analysis and applied economics, is overseeing a series of studies in South Africa that examine the economic and social impact of HIV/AIDS. Part of her team's goal is to provide information to help the government prevent what happened in Free State Province from happening again.

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CGHD researchers tackle HIV/AIDS in South Africa and China

How a simple computer chip could improve ART adherence

BY SHARON BRITTON

For people who are HIV-positive, antiretroviral drug therapy (ART) is nothing short of life saving—but that's only if they overcome a surprisingly common stumbling block to effective treatment: taking the drugs on time and schedule.

Maintaining near-perfect ART adherence is crucial—first, for suppressing the HIV virus that damages the immune system and can lead to full-blown AIDS, and, second, because spotty adherence can lead to viral resistance, rendering the life-saving drugs ineffective.

A number of interventions have been tried to improve ART adherence, but few have been successful, according to Lora Sabin, assistant professor of international health at Boston

University School of Public Health (BUSPH) and an economic development specialist for the Center for Global Health and Development at Boston University (CGHD). "Adherence is a huge public health challenge around the world," she says.

In China, the government is combating a rapid rise in HIV/AIDS infections by making ART drugs available free to infected people. In Yunnan province, in the foothills of the Himalayas, Sabin and her colleagues tested their idea for a relatively simple adherence intervention that netted promising results. By dispensing ART drugs in pill bottles outfitted with time-measuring computer chips embedded in the caps, doctors and patients were able to track, dose-by-dose, whether the patients were adhering to the strict ART regimen.

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"The government is trying very hard to avoid future budgetary crises. We're working directly with them to improve the accuracy of their estimates going forward," she says.

Rosen has spent many years examining HIV/AIDS and its social and economic implications. From 2003 to 2007 she was a resident researcher in South Africa, working for CGHD in collaboration with the University of the Witwatersrand in Johannesburg. There, as co-director of the Health Economics and Epidemiology Research Office (HE²RO), a division of the Wits Health Consortium, she established a research team that studied the costs, benefits, and outcomes of HIV/AIDS interventions.

Now, working from Boston with a joint team linking BU with the University of Witwatersrand in South Africa, she is evaluating the

economics of HIV treatment in the country to help it buy the most effective treatment for the least amount of money.

Because treatment programs have been rapidly expanding, cost is increasingly pertinent, says Rosen. "The funding for treatment programs is starting to hit a ceiling, but the reality with HIV is that you can never stop treating. Stopping is a death sentence," she says. So we're faced with a difficult challenge of understanding how to do things more efficiently to save lives."

In a set of ongoing studies, her team of researchers is looking at different models for delivering ART in South Africa, Zambia, and Kenya with the aim of estimating what it costs to achieve successful patient outcomes. The team includes BUSPH international health faculty members Bruce Larson, Matthew Fox, and Gesine

Meyer-Rath and CGHD Director Jonathon Simon, along with other BU and local researchers and staff. Collaboratively, researchers from CGHD, the University of the Witwatersrand, and other local research organizations are using costing models they developed to evaluate different modes of ART delivery and compare how much money is spent per patient in each. They are trying to compare the costs versus treatment outcomes for patients who get their care in facilities as different as centralized hospitals, urban clinics, and rural facilities. Their work is funded by U.S. government agencies that include the United States Agency for International Development (USAID), the Centers for Disease Control and Prevention, and the National Institutes of Health.

For Rosen, the central issue in these studies pivots around one simple question: "What is the relationship between how much we spend and what we get for it?" she asks.

Rosen, along with CGHD colleagues and others, is exploring a different aspect of the same topic in another study that is examining the social and economic impact of treating people with HIV/AIDS.

"We're looking at whether the patients are able to lead productive, normal lives. We're putting all this effort into treatment to save lives, but the larger goal is achieving stable societies," she explains. "If patients are alive, but not doing well, then we've only achieved part of the goal."

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"The reality with HIV is you can never stop treating. Stopping is a death sentence."

CGHD's Lora Sabin (standing) checks data with members of the study team.

ART Adherence continued from page 29

"Electronic drug monitoring (EDM) had been used in the past to measure ART adherence, but not to encourage it," says Sabin. Her research team found that patients could improve their adherence significantly when they sat down with their doctors on a monthly basis and reviewed their drug taking patterns dose by dose. "With EDM, it's like stepping on a scale. It doesn't lie," she says. "Nobody likes to admit to the doctor that they blew it—that they didn't take their drugs. But it seems that having the data in front of them made it possible for the doctor and the patient to have an honest discussion about compliance and then for the patient to improve behavior."

Four years ago, Sabin and her CGHD colleague Christopher Gill, a physician and infectious disease specialist, came up with the idea of testing EDM with associated counseling as a tool to improve adherence. Sabin, who speaks Mandarin, had spent many years

doing research in China and was eager to continue public health work there. "Everybody we talked to here and in China thought this was a great idea," she says.

In 2005, the United States Agency for International Development (USAID) provided \$300,000, to fund the study, with Sabin as principal investigator.

Named Adherence for Life, the study tracked the drug-taking adherence of HIV/AIDS patients at a clinic at the Dali Second People's Hospital in Yunnan province. Sabin's group chose the site for several reasons. HIV/AIDS is spreading in this region, which is situated along a major heroin transit route from Vietnam and Myanmar, and most of the patients are also IV-drug users, which presents special adherence challenges. The study team also got exceptional cooperation from clinicians here.

Using a strict definition of adherence as "prescribed dose time, plus or minus one hour," researchers first followed the ART compliance of 80 participants passively for six months to understand

their adherence patterns. Researchers categorized participants as "high" or "low" adherers, based on drug compliance levels above or below a mean rate of 95 percent, a level identified as a tipping point between good and poor outcomes. Participants were then randomly assigned to either the control group or the intervention group, with an even distribution of high and low adherers in each.

Once a month, when patients came to the clinic to get their supply of drugs, the caps of their pill bottles were scanned to retrieve data about when bottles had been opened. This allowed the researchers to monitor precisely when patients took their drugs. Patients in the control group consulted with their doctors as usual and were not given data about their compliance patterns. In the intervention arm, however, patients and doctors received a readout of the drug adherence pattern from the previous month and discussed the results together. Doctors helped patients think through their compliance failures and develop strategies to do better in the coming months.



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In Kenya and South Africa, investigators are analyzing data to assess how productive the people in HIV treatment programs are at work, what their home lives are like, and how they participate in society. The researchers are also working to understand how personal economic status affects the treatment behavior and outcomes of individual patients. The study in South Africa, funded mainly by USAID, is a collaboration between CGHD and local organizations working to improve HIV/AIDS care and treatment. Participating treatment facilities include ACTS Clinic, Mpumalanga Province; Witkoppen Health & Welfare Centre, Gauteng Province; and the Themba Lethu Clinic of Helen Joseph Hospital, Johannesburg.

The findings from these studies will inform policymakers and program planners about how best to improve the efficiency of

"Behavior change is one of the most difficult goals in public health, and that's what this intervention is about. For these HIV-positive patients, drug adherence is a matter of life and death."

ART Adherence continued from page 31

At the time they were randomized, participants in the intervention and control groups had mean adherence rates of 86.8 percent versus 83.8 percent, respectively. But six months after randomization the mean adherence rate was substantially higher for those in the intervention group, at 96.5 percent, versus 84.5 percent in the control group.

Among the low-adhering patients, the results were startling: 75 percent in the intervention group achieved a subsequent adherence rate of 95 percent or above, in contrast with only 11.8 percent of those in the control group.

"This is very compelling. Not only did the intervention group achieve high adherence, they also maintained a mean of 96.5 percent over the entire six-month period," says Sabin. Notably, the data also showed that, over time, the averages for high-adhering patients in the intervention arm went up, whereas the averages for high-adhering patients in the control group went down.

treatment and could strengthen the case for making long-term investments in treatment programs.

And while HIV/AIDS is the current focus of Rosen's applied economics team, the costing models her team is using could be employed to address other public health issues in the future.

"There's a lot of demand for what we do in the HIV world right now, but we are building an applied economics team that certainly has the potential to work on other issues such as environmental health or chronic disease economics," she says. "I hope we'll be doing more of that in the future."

In this small pilot study, the researchers hadn't expected to see such decisive numbers, says Mary Bachman DeSilva, a CGHD demographer and BUSPH epidemiologist who helped write the study protocol and analyze the final data. "I was in my office by myself when I finally hit the 'run' button and saw the large, significant difference between the two groups. I ran the analysis several more times, and I couldn't sleep that night," she says. "It was exhilarating. Behavior change is one of the most difficult goals in public health, and that's what this intervention is about. For these HIV-positive patients, drug adherence is a matter of life and death."

Why did the intervention work? "The truth is, we really don't know," says Sabin. A larger five-year follow-up study is planned to answer some of the many questions this first study generated. The team—now without Gill, who left BUSPH in June 2008—wants to find out whether the EDM feedback intervention will work in a broader Chinese population. The larger study will also involve cost analysis as well as qualitative data collection and analysis aimed at helping researchers understand why the intervention improves outcomes.

Highlights 2008-2009

For the third year in a row, **BUSPH Rotaract**, a student service organization affiliated with the Rotary of Boston, captured the Madness Against Malaria fundraising tournament, besting 187 teams that participated from around the world. Dubbing themselves the Beantown Skeeter Beater Three-Peaters, the BUSPH team raised \$6,135, enough to buy 1,227 insecticide-treated bed nets. Altogether, over its three years of existence, the Madness Against Malaria effort, an initiative of the Against Malaria Foundation, raised \$164,675 for the purchase of 37,630 bed nets. All proceeds of the competition go to purchasing \$5 bed nets that are distributed in Asia, Africa, and the Caribbean.

Amy Rosen, PhD, MSW, professor of health policy and management, was named a deputy editor of *Medical Care*, rated one of the top ten journals in health-care administration. She was also presented with the Rx for Excellence award by the *Massachusetts Medical Law Report*. The honor recognized Rosen's efforts to advance safety and quality in health care.

Richard Clapp, DSc, MPH, professor of environmental health, received the 2008 Research Integrity Award from the International Society for Environmental Epidemiology. The prize celebrated his efforts to pursue and publish, in the face of resistance from IBM and a journal publisher, an in-depth study of mortality among IBM employees. Clapp was also presented with the Helen Clark Award by the Silicon Valley Toxics Coalition, an advocacy group that promotes environmental justice. The award further honored his work on the IBM study.

Deborah Cotton, MD, MPH, professor of epidemiology, was named chair of the National and Global Public Health Committee of the Infectious Diseases Society of America, the professional association of U.S. infectious diseases physicians. She will serve a three-year term on the committee.

"Election 2008: Agenda for Health-Care Reform" was the topic of the annual William J. Bicknell Lectureship in Public Health, held in September. The two-day event featured a lecture by **Rashi Fein**, PhD, professor emeritus, economics of medicine, Harvard School of Medicine, who discussed ways the new president should approach health-care reform. The lecture is named for William Bicknell, professor and chair emeritus of the Department of International Health at BUSPH.

Lisa Sullivan, PhD, MA, professor and chair of biostatistics, was presented with the 2008 ASPH/Pfizer Award for Teaching Excellence by the Association of Schools of Public Health and Pfizer Inc. The award recognizes graduate public health faculty from ASPH-member accredited schools of public health who are outstanding in teaching and mentoring students toward distinction in public health research, education, and practice.

The Network Addressing Collegiate Alcohol and Other Drug Issues honored **William DeJong**, PhD, MA, professor of social and behavioral sciences, for his work in alcohol and drug abuse prevention. The organization presented him with an Outstanding Contribution to the Field award, which recognizes alcohol and drug prevention professionals who have gone above and beyond the scope of their positions to actively promote proven strategies for reducing violence and alcohol and drug use on college campuses.

Yesim Tozan, PhD, assistant professor of international health, was awarded a Peter Paul Career Development Professorship by Boston University. The award, which provides \$50,000 a year for three years in salary support and research funds, was established in 2006 with a gift from entrepreneur and philanthropist Peter T. Paul. The resources will help Tozan continue pursuing her studies in the neurocognitive consequences of childhood malaria and associated socioeconomic costs. Tozan was also presented with a spring 2009 Ignition Award; the biannual honor, overseen by the Office of Technology Development, is designed to help BU faculty members turn research findings into sustainable, marketable products. With the award funding she will develop a "toolbox" for deployment of a new antimalarial drug for prereferral treatment of severe childhood malaria in rural areas of Africa.

Alan Jette, PhD, MPH, professor of health policy and management at BUSPH and director of the Health and Disabilities Research Institute, was awarded the Darrel J. Mase Leadership Award from the University of Florida College of Public Health and Health Professions. The award is given to individuals who have made substantial contributions to healthcare through their professional accomplishments, leadership, and personal experience.

A delegation of BUSPH faculty members headed by Dean **Robert F. Meenan**, MD, MPH, MBA, traveled to Shanghai in October 2008 to exchange ideas about health care and

Donors 2008-2009

public health topics, and to expand a growing collaboration with the faculty at Jiao Tong University School of Public Health. They attended the 2008 Sino-USA Academic Forum on Public Health, which featured alternating presentations by BUSPH faculty and their Jiao Tong counterparts on topics as diverse as environmental hazards, health-care financing, and emergency preparedness. BUSPH faculty members making the journey included **Mark Prashker**, MD, MPH, associate dean for institutional development and associate professor of health policy and management; Ann Aschengrau, ScD, associate chair and professor of epidemiology; **Roberta White**, PhD, associate dean for research and chair of environmental health; **Jonathon Simon**, DSc, MPH, chair of international health and director of the Center for International Health and Development; **Harold Cox**, MSSW, associate dean for public health practice and associate professor of social and behavioral sciences; and **Xinhua S. Ren**, PhD, MA, assistant professor of health policy and management.

BUSPH's Alumni Board hosted a symposium in April titled "Yes, We Can! Collaborations and Partnerships in Public Health." The event featured talks on a variety of public health topics by BUSPH faculty members, including **Lisa Sullivan**, PhD, MA, chair and professor of biostatistics; **Gerald Keusch**, MD, professor of international health and associate dean for global health; **Susan Fish**, PharmD, MPH, professor of biostatistics and epidemiology; **Michael Siegel**, MD, MPH, associate chair and professor of social and behavioral sciences; **Tom Webster**, DSc, associate chair and associate professor of environmental health; **Veronica Vieira**, DSc, MS, assistant professor of environmental health; and **Lois McCloskey**, DrPH, MPH, associate professor of maternal and child health.

Deborah Bowen, PhD, chair and professor of social and behavioral sciences, was accepted into the 2009–2010 class of fellows in the Executive Leadership in Academic Medicine (ELAM) Program for Women. The yearlong program is designed to help senior faculty women develop the professional and personal skills to lead and manage in the health-care field. ELAM provides intensive leadership training, networking, and mentoring opportunities, with special attention to the unique challenges facing women in leadership positions.

Chairman and Chief Executive Officer of Blue Cross Blue Shield of Massachusetts Cleve Killingsworth delivered the

2009 Commencement Address at BUSPH's graduation ceremony on May 17 at the Boston Sheraton Hotel.

Professor of Maternal and Child Health **Judith Bernstein**, PhD, RNC, MSN, received the Norman A. Scotch Award, the School's highest teaching award, presented at commencement.

George Annas, JD, MPH, chair and Edward R. Utley professor of health law, bioethics, and human rights, was named one of the University's first two William Fairfield Warren Distinguished Professors by Boston University President Robert A. Brown. The award is the highest honor bestowed upon senior faculty members for continued involvement in research, scholarship, and teaching, as well as BU's civic life.

The Department of Social and Behavioral Sciences and the Department of Maternal and Child Health merged June 1 to form a new department. Known as the Department of Community Health Sciences, it is chaired by professor **Deborah Bowen**, PhD, and will continue to offer master of public health and doctor of public health tracks in maternal and child health and social and behavioral sciences. Faculty in the merged department will have academic appointments in the Department of Community Health Sciences.

Jaimie Gradus, DSc'09, epidemiology, received the Lilienfeld Student Paper Prize by the Society of Epidemiologic Research for her paper "The Association Between Post-Traumatic Stress Disorder and Completed Suicide in the Adult Population of Denmark." The Lilienfeld Prize honors excellence in student epidemiologic research.

The first annual Leonard Glantz Award for Academic Excellence was presented to **Sarah White**, MPH'09, a concentrator in environmental health, at the BU School of Public Health commencement ceremony in May. The award honors **Leonard Glantz**, JD, professor of health law, bioethics, and human rights, who served the School as associate dean of academic affairs for 30 years. It recognizes a student whose academic achievements typify the high standards set by Professor Glantz.

Boston University School of Public Health depends on the generosity of alumni and friends to support its mission of teaching, research, and service. The following lists acknowledge gifts to various funds, including the School's Annual Fund, made July 1, 2008, through June 30, 2009.

Gifts to BUSPH's Annual Fund provide unrestricted support to the School's highest priorities. Donors whose names are marked with the symbol ‡ have contributed to the School consistently for five years; donors noted with the symbol * have made donations to the Annual Fund at levels that qualify them for membership in the following Annual Leadership Giving Societies: President's Associates (\$10,000+); The Talbot Society (\$5,000+); and the Leaders Society (\$1,000+).

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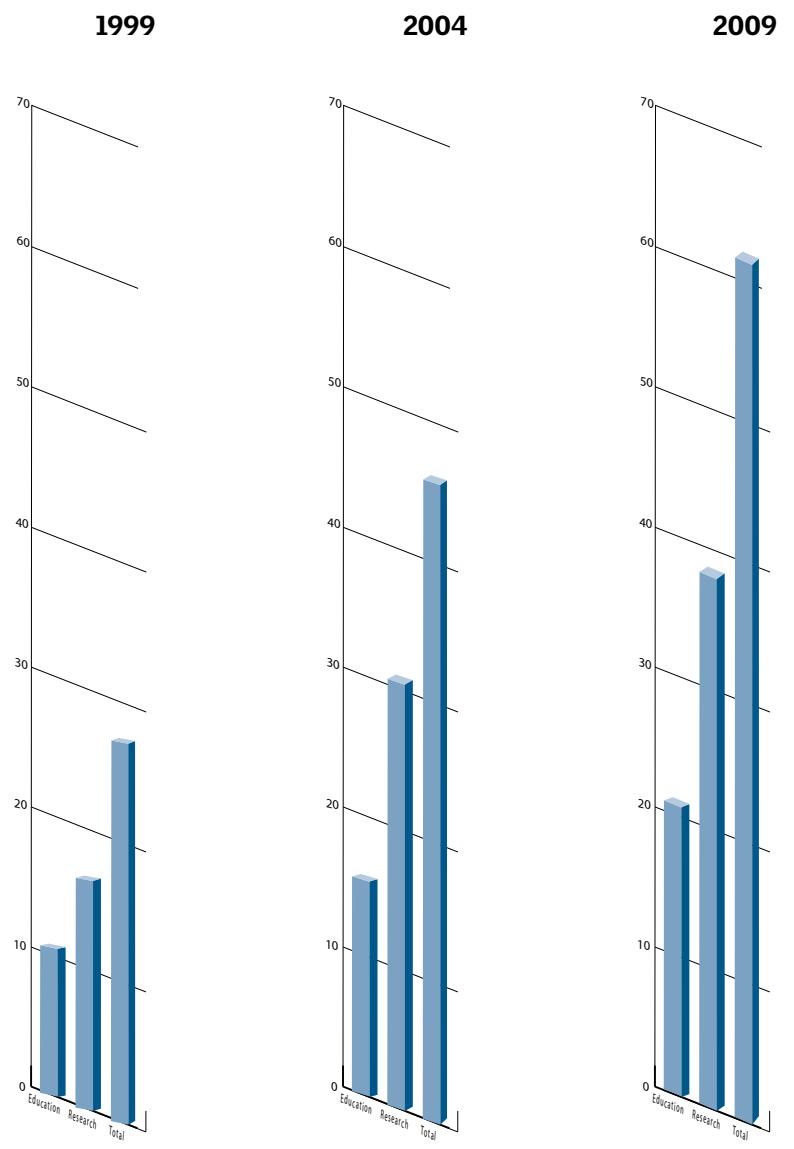
Myrlene Sanon '08
 Maria Christina Santana '04
 Tatiane Santos '04‡
 Ira Schlosser '03‡
 Thayer Scott '92
 Elizabeth Serlemitsos '93
 Nargiz Shamilova '02‡
 Tara Shea '98
 Elizabeth Sheils '03
 Scott Sherman '91
 Michael Shor '81
 Sheila Shulman '87‡
 Mary Shupe '90‡
 Carla Skinder '90
 Toby Sklarew
 Robinson Smith
 Mr. and Mrs. Curt Smith
 Deborah Socolar '89
 Guna Spalvins
 Beryl Spencer '80‡
 Jean Spencer
 Barbara and Judson
 Leonard Sproat
 Theodore Stefos‡
 Alisa Stepanian '08
 Robyn Sterling '06
 Rose Strain '78
 Jeffrey Sussman '02
 Judith Swazey
 Nina Sydney '95‡
 Mayon Sylvain '91
 Thomas Tadros '98
 Julia Terry '84
 Carol Tobias‡
 Sonja Tong '05
 Anh Trinh '09
 T. Scott Tropp '98
 Jocelyn Trufant '07
 Jason Tuchin '01
 Erin Twohig '09
 Yuta Uchiyama '00
 Taryn Vian
 Aishwarya Vidyasagaran '09
 Christopher Vincze '85‡
 Stanley Wald '82
 Elizabeth Walker-Corkery '88

Jeff Waller
 Susan Walton-Cizik '93
 Didie Watsop '05
 Thomas Webster '00
 Tara Weckstein '93
 Robert Welton '01
 Vanessa White '96
 Julie Wicklund '95
 Mary Wickramasinghe '08
 Joanne Wilkinson '06
 Laura Williams '05
 Michele Williams '98
 Susan Wilson '83
 Ken Winters
 Julie Witas '07
 Dr. and Mrs. James Wolff Jr.
 Elizabeth Wood '06
 Ryan Woods '04
 Marvin Wool '82‡
 Stephen Woolley '06
 Joan Wright-Andoh '86
 Marianne Yood '90
 Min Jung Yoon '08
 Irini Youssef '01
 Ana Cynthia Zara '92
 Amy Zastawney '93
 Monica Zigman '09
 Suzanne Zipes

Credits

Design: Sawyer Design Associates, Inc.
www.sawyerdesign.net
 Stories:
 Sharon Britton, Lisa Chedekel, Michelle Salzman
 Photography:
 Kathleen Dooher, Sven Torfinn/Panos Pictures/
 Felix Features, Bernd Obermann/CORBIS,
 Anna Knapp, Nick Guerina, Michelle Salzman
 Editing:
 Editor: Sharon Britton
 Editorial assistance: Mary Kate Allee, Theresa
 Pease, Michelle Salzman, and Kristina Winn
 Printing:
 Printed at Kirkwood Printing soy inks on Galerie
 Art made with up to 30% recycled fiber and
 chlorine-free pulp.

INCOME (IN MILLIONS)



	1999	2004	2009
INCOME			
Education			
Tuition & Fees	\$10,461,800	\$15,161,827	\$21,562,845
Other	\$481,860	\$175,000	\$369,241
Research			
Direct Cost	\$13,793,780	\$25,531,871	\$31,636,960
Indirect Cost	\$3,032,885	\$4,821,228	\$7,419,707
Total Income	\$27,770,325	\$45,689,926	\$60,988,753
Full-Time Faculty	88	147	154
Matriculated Students	535	578	638
Student Scholarship Program	\$920,683	\$1,743,379	\$2,099,398