

# A SOLAR SOLUTION TO SAVE WOMEN'S LIVES IN NIGERIA

By Christopher E. Bush

Before Dr.P.H. candidate Laura Stachel, M.D., M.P.H. '06, arrived in Nigeria in March 2008, she read verbal autopsies collected by Nigerian researchers from the families of rural women who had died in childbirth. One of these stories particularly stuck in her head.

"The family members stated that when they arrived at the hospital, the expectant mother was in the back of the car lying in a pool of blood," recalls Stachel. "The health care provider came out, opened the car door, saw the blood, and told them they'd have to keep going, that they couldn't take care of her there."

In Nigeria, which has the second-highest reported maternal mortality rate in the world, stories like this are all too common. For Stachel, who worked for years in the United States as a practicing obstetrician/gynecologist, her own observations at hospitals and clinics in northern Nigeria inspired a determination to find a way to provide better care.

## The maternal mortality challenge

More than 59,000 women die from child-birth-related complications in Nigeria every year. Most women receive no prenatal care, deliver their babies at home without a skilled attendant, and face an estimated 1 in 13 risk of dying from a pregnancy-related cause during their reproductive years.

Stachel became aware of this issue when the School of Public Health's Bixby Center for Population, Health, and Sustainability invited her to participate in its research partnership project with Nigeria's Ahmadu Bello University. She traveled to northern Nigeria and spent hours each day in hospitals, observing the nurses and doctors providing obstetric care and seeing firsthand the difficulties they faced.

"Because most women attempt to deliver at home, the ones who reach the hospital tend to be fairly sick," Stachel says. "In fact, in my first two weeks in Nigeria I saw more complications than I probably had in my whole career up to that point."

At first, Stachel thought her background as an American-

trained OB/GYN might allow her to teach Nigerian health care providers new clinical skills in certain types of obstetric procedures. What she discovered, however, was that the hospitals faced a much more basic obstacle to providing care: poor infrastructure. Regular



Laura Stachel (right) at an equipment demonstration in Kofan Gayan Hospital in Nigeria



Testing solar-powered lights in a Nigerian hospital

power outages made much of the equipment needed for diagnosis or surgery unusable, and a lack of reliable refrigeration made blood storage for transfusions impossible.

"If an obstetric patient needed an ultrasound and there was no electricity, then the staff couldn't perform a diagnostic test that was really important," recalls Stachel. "Or if the doctor needed to do surgery, such as a C-section, at night and there was no light available in the room, then they needed to conduct the operation with a flashlight or ask the patient to seek help elsewhere."

Electricity shortages aren't the only infrastructure issue facing Nigerian health care providers. Many facilities also lack access to reliable phone systems. When complications arise, midwives, who are usually the frontline workers caring for patients, can only contact doctors or lab technicians by sending messengers out to look for them. They then sometimes wait for hours not knowing when the doctor will arrive. The uncertainty can cause the midwives and nurses to either attempt complicated procedures on their own, delay care, or send the patient away to another hospital.

These power and communications system problems not only make providing good care difficult, they also limit the number and types of patients a hospital can help. The verbal

autopsies from three Nigerian villages confirmed this. Stachel read story after story about women who waited for hours within hospitals to get care or, worse yet, were turned away four or five times before finding health facilities that would admit them.

### Powering ideas

When Stachel returned to the United States from her visit to Nigeria, she was convinced that solving these infrastructure problems could be a key to reducing maternal mortality rates. She discussed the issue with her husband, an expert on designing solar electricity systems. "He felt strongly that we could use solar power to address some of the problems," Stachel says. "So we sat down and tried to think about the different situations I had seen where the lack of power really affected care."

Stachel identified several areas where solar energy could be used. She believed a communication system that didn't rely on the country's electric grid was indispensable. She also wanted reliable lighting and a way to power hospital equipment, such as an operating room suction machine. Finally, she knew that a refrigerator to store blood for transfusions was another critical need.

Armed with these requirements, her husband went to work. "He designed a small stand-alone solar electric system for each area where we saw a critical need, including the operating

room, the delivery room, and the laboratory," Stachel says.

Meanwhile, Stachel began to look for funding to take the project forward. She entered a competition held by the Center for Information Technology Research in the Interest of Society (CITRIS) that offered a grand prize of \$12,500. Enlisting the support of other UC Berkeley graduate students, she wrote and submitted a white paper describing the ways in which solar electricity could be used improve hospital infrastructure in one hospital in Nigeria to address the high rates of maternal mortality. The project didn't win the grand prize—it received honorable mention—but the attention it garnered helped Stachel find funding through the Blum Center for Developing Economies. Once seed funding for the project was established, Stachel founded the nonprofit organization: Women's Emergency Communication and Reliable Electricity, WE CARE Solar.

### A solution in a suitcase

Before attempting a full deployment, Stachel needed to test the solar solutions and work out installation details. She returned to Nigeria in August 2008 and tested the electricity requirements of each piece of medical equipment in the hospital room where it was used. "Once we were able to find out the energy load from those areas, we could then modify our solar electric system to match specific energy demands for each room," says Stachel. "We tailored the system to the needs of each of the different wards of the hospital and we designed four separate set-ups: one for the operating theater, one for the labor room, one for the maternity ward, and one for the laboratory."

She also wanted to ensure that the solar systems would require as little maintenance and cost as possible, and enhance local capacity by using a Nigerian company to

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## STUDENT SPOTLIGHT, *cont'd*

handle the installations. After careful research and interviewing different vendors, she found a contractor that offered a good combination of price and expertise to handle the work.

Stachel used this trip to demonstrate to the Nigerian hospital staff how solar power could help alleviate their infrastructure problems. In one of her suitcases, she packed a small, portable solar electric system that could power overhead LED lighting and headlamps, as well as charge walkie-talkies.

*“In the first couple of months after the solar power system was installed, there were many fewer transfers of patients out of the hospital.”*

### A bright future for the solar system

In early 2009, the first permanent photovoltaic system to power lighting, medical equipment, a blood bank refrigerator, and

book, there had been 30 more patients per month cared for during labor and delivery compared to average monthly admissions over the previous year. The hospital appears to be caring for more pregnant patients and turning fewer women away. What I also need to do is see if that translates into a reduction in maternal deaths. The first months did show a marked reduction, but we really need to study trends over a longer period of time to know if it is sustainable.”

Anecdotally, Stachel has heard from the hospital staff that the solar system may indeed help reduce maternal mortality. One of the midwives Stachel interviewed told of a patient who came into the hospital with antepartum hemorrhage. “The midwife said that before the new solar power system was in place, she would not have been able to reach the lab scientist in the middle of the night and would not have been able to arrange for a blood transfusion,” Stachel says. “In this case, the laboratory scientist was contacted, the patient received two pints of blood, and her life was saved.” ☺



Laura Stachel discusses the solar chargeable walkie-talkies, which give hospital staff a reliable way to communicate.

The system was a huge success. “When I unpacked the equipment and showed the staff our plans, not only did they like the demonstration, but they asked, ‘Can you please leave this here? Can we use what you’ve developed until you come back with the larger system?’” Stachel says.

Because of the success of this small demonstration system, Stachel also had requests from several other small clinics and hospitals in the surrounding area for similar equipment. Based on these requests, back in the United States her team began developing a “solar suitcase” portable solution that could power lighting and communications devices like walkie-talkies.

communication equipment was installed in the hospital. Then in June, Stachel returned to Nigeria again with two of the new solar suitcases for field-testing in a small clinic and hospital.

With several projects up and running, Stachel now is beginning to study the effects of these systems on maternal care to see what impact they’re having. “I’ve noticed in the hospital where we did our major installation that there has been a reduction in delays of care,” she reports. “In the first couple of months after the solar power system was installed, there were many fewer transfers of patients out of the hospital. The nurses told me that they were no longer transferring patients out and when I looked at the registry

In October, WE CARE Solar was selected as a winner of *The New York Times* “Half the Sky” contest, which received more than 700 entries of people and organizations working around the world to combat global poverty. The contest was run by Nicolas Kristof, a *Times* columnist who, with his wife, Sheryl WuDunn, coauthored *Half the Sky*, a book about emancipating women in order to combat global poverty. Kristof wrote of the three winners, “They are truly remarkable, particularly in the extraordinary work they represent. I’m proud to have these entries grace this site, and I hope they will inspire others.”