

360° VIEW

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News from Rice 360°: Institute for Global Health Technologies



extending the **circle** of health care



FIRST DEGREE

Maria Oden and I are recently back from Malawi where we planned summer internships, worked with colleagues at Malawi Polytechnic and checked on the progress of the CPAP program. We have also traveled to Brazil, where we will initiate internships with our partners in the area of skin and cervical cancer detection and prevention.

This issue provides insight into our point-of-care diagnostics, particularly improving the diagnosis of cervical cancer in low-resource countries. As the international leader in technological innovation, the United States must turn more attention to developing low-cost diagnostic technologies that have both global and domestic benefit. This issue offers you information about the HRME, a new technology with the potential to diagnose and treat cervical cancer in one visit.

Thank you for your support in the past year. More than ever, our program is dependent on funds from individual donors. Your gift of any size makes a difference – for the education of our students and the extraordinary impact their work can have around the world.

Wishing you the very best for the year to come,

Rebecca Richards-Kortum, Ph.D.

*Director, Rice 360°: Institute for Global Health Technologies
Stanley C. Moore Professor of Bioengineering*

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Circling back: jenna hook mueller

Today, Jenna Hook Mueller is a doctoral student at Duke University, working alongside students and professors developing new technologies to detect cancer and translate medical technologies into viable products.

She enrolled at Rice University to study biomedical engineering in the fall of 2005. Her course of study almost veered into another discipline—until her sophomore year when she heard Rice 360°'s Dr. Rebecca Richards-Kortum speak about the Beyond Traditional Borders (BTB) curriculum and opportunities. "I remember thinking: 'Yes, this is why I want to be an engineer,'" says Jenna, who enrolled in Introduction to Global Health Issues and started on the path she is on today.

A BTB internship in Maseru, Lesotho, furthered Jenna's commitment to her work when she discovered first hand the inequalities of health care in a resource-poor country and was stirred to consider how she could improve health care for people in low-resource settings.

Today, Jenna's interests center on the translation of technology from bench top to bedside, not only in clinics in the United States, but also in low-resource settings. Working at Duke with Dr. Nimmi Ramanujam, the Robert W. Carr, Jr., Professor of Biomedical Engineering, founder of The Global Women's Health Technologies Center and former graduate student of Dr. Richards-Kortum, Jenna is able to further her passion for making health care accessible for all. She credits BTB with developing skills she uses in her work, such as improving her ability to lead and learning to participate in diverse teams. In particular, Jenna says her academic success was most impacted by her female mentors at Rice.



At Duke University, Jenna Mueller, right, works alongside Dr. Nimmi Ramanujam to develop new technologies for detecting cancer.

*Photo by Jared Lazarus,
Duke University Photography*

We would like to hear from our BTB graduates! Send your contact information to Liz McGuffee at lizmcguffee@rice.edu.



Viewpoint: investing in women and girls

In our dialogue with Jenna Hook Mueller, 360° VIEW asked her what she considered to be the single most important thing that could be done to improve the world. Her reply provides food for thought and we are pleased to present the following essay, provided by Jenna.

To echo Shashi Tharoor, a former UN under-secretary general from India, the answer is to educate girls. "The evidence is striking," says Mr. Tharoor. "Increased schooling of mothers has a measureable impact on their children's health, education and adult productivity." Education and health care are intimately tied together – not only are educated women more likely to seek out health care when they need it, but also are more likely to have healthy children who live to adulthood."

However, education alone is not enough. Cervical cancer is a perfect example of the power of education. If a woman knows something is wrong, goes to a rural clinic to be examined and learns she has cervical cancer but has to go hundreds of miles to a hospital for treatment, what will happen? Months later, she might make it to the hospital. Meanwhile, the cancer has time to spread to other organs, and chemotherapy is not available. She is given morphine for palliation and returns to her village to die. Her children become orphans, stuck in a viscous cycle of poverty. But what if the cancer could have been caught sooner and she could undergo a simple procedure to remove the cancer as soon as it was discovered?

While many things must change to enable this outcome, technology, such as a point-of-care diagnostic for cervical cancer, is an important piece of the puzzle. New, simple, robust technologies have the potential to enable a phenomenon called task shifting, which allows less educated health-care workers, such as a community health worker with a few months of training, to perform tests and procedures traditionally performed by physicians or nurses.

Taken together, educating girls and women, developing and effectively deploying new health-care technologies in conjunction with health systems strengthening has the potential to greatly improve health outcomes for women in low-resource communities.

For the complete text of A World of Schoolgirls by Mr. Tharoor, visit <http://www.project-syndicate.org/commentary/the-impact-of-educating-girls-on-economic-growth-in-developing-countries-by-shashi-tharoor>.

Extending the circle: High-resolution microendoscope provides real-time diagnosis of cervical cancer

Cervical cancer was once one of the most common causes of cancer deaths of American women. However, incidence and mortality in the United States have decreased by more than 70 percent since the 1950s when screening programs, such as annual Pap testing to detect pre-cancerous cells were introduced.

In stark contrast, cervical cancer continues to be a leading cause of women's cancer deaths in low- and middle-income countries. Globally, an estimated 530,000 new cases of cervical cancer – almost

always caused by human papillomavirus (HPV) – are diagnosed annually.

Addressing the problem

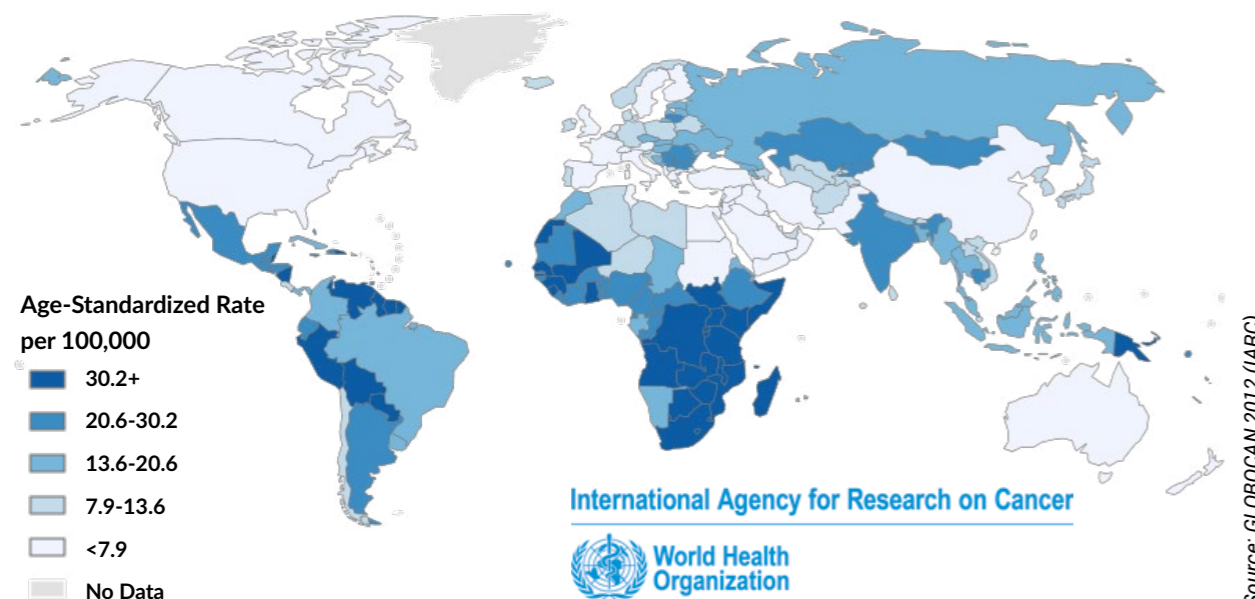
There is an immediate need for appropriate cervical can-

cer screening and diagnostic tools that can be used in resource-limited settings. In 2015, Rice 360° Institute for Global Health Technologies continues to address the impact of cervical cancer globally and locally with innovative point-of-care diagnostic technology.

With a grant from National Institutes of Health (NIH) and a partnership with MD Anderson Cancer Center's Kathleen Schmeler, MD, Rice 360° is refining the use of a high-resolution microendoscope (HRME). The HRME is a point-of-care diagnostic tool used to

Rice 360° is reaching out to health-care professionals along the U.S. border with Mexico, where the incidence of cervical cancer mortality is high and women are less likely to have access to screening and treatment.

Estimated Incidence of Cervical Cancer Worldwide in 2012



Far right, Rice University Research Scientist Jenny Carnes, Ph.D. explains the uses of the HRME to visitors, including, left to right, Susan Brochstein, Barbara Gibbs '73 and Linda Sylvan '73.

improve real-time diagnosis of cervical cancer in urban and rural settings where lack of health care infrastructure hinders diagnosis.

"From a human and technological resource point of view, the developing world doesn't have the infrastructure to carry out the screening and diagnostics as we do in the developed world," explains Dr. Kathleen Schmeler. "That's the beauty of this approach: it gives providers with lower levels of training a way to diagnose cervical cancer and manage care efficiently."

Introducing HRME

The HRME is a device consisting of a digital fluorescence microscope, a fiber optic probe, a laptop or tablet and battery pack. During a cervical exam, proflavine, a topical contrast agent with a history of safe

clinical use, is applied to the patient's cervix. When the HRME probe is placed on a cervix with proflavine present, high-resolution flu-

MULTIFACETED IMPACT OF THE HRME:

HRME is currently being tested in
28 STUDIES
to provide point-of-care
diagnostics for
12 DIFFERENT CANCERS
in
5 COUNTRIES

orescence imaging of tissue allows the clinician to see changes in cells that may be problematic. Irregular cells can be immediately identified, a process that previously required examination by a pathologist using a microscope and a diagnosis delay of several days.

Eliminating multiple visits

"With an HRME, irregular cells can be identified by their shape and how close they are together," says Ben Grant, Rice Ph.D. candidate who is working with Dr. Richards-Kortum on the HRME study. "As back-up to the human clinician's diagnosis, the HRME has software that can instantly calculate whether cells are suspect or not. This real-time identification of irregular cells has the potential to streamline patient care, reduce return trips for patients who need further treatment and thus improve outcomes."

Sustainable implementation

The HRME is currently being tested in Brazil, El Salvador and along the United States-Mexico border for use in early detection and diagnosis of cervical cancer. Further, Rice 360° and MD Anderson have teamed with the Global Coalition Against Cervical Cancer, an NGO that assists low- and middle-income countries in the implementation of comprehensive, sustainable and effective cervical cancer prevention and control.

"The ability to routinely provide image-based data in all resource settings to aid in screening, diagnosis and treatment monitoring could transform global health care and the systems that provide this care," says Dr. Richards-Kortum.



IN SUPPORT: summer internships

A record number of applications for Beyond Traditional Border (BTB) and Global Health Technologies (GLHT) summer internships are in the director's hands. The mission of the internship initiative is to offer students first-hand exposure to health care in resource-constrained settings. Internships are offered in the U.S. and abroad. Science and non-science majors are eligible to participate.

As the BTB GLHT internships are fully funded experiences (including travel, immunizations and prophylaxis, housing and stipend to cover day-to-day living expenses), sponsors are needed for each student. We are seeking individuals or companies to cover full or partial expenses of students. A full sponsorship is \$10,000.

For information about continuing the work of Rice students to find solutions to global health problems, please contact Liz McGuffee at lizmcguffee@rice.edu or (713) 348-4491.

Other angles: events of interest

Saturday and Sunday, March 21 and 22 Houston Global Health Collaborative Conference

Interdisciplinary health professionals in greater Houston and Gulf Coast areas gather to network, share information to increase collaboration and maximize efforts related to global health care. The conference is at Rice BioScience Research Collaborative (BRC), 6500 Main Street, Houston. For times, ticket prices and registration, visit <http://houstonglobalhealth.org/impact-conference-2015/>.

Thursday and Friday, March 26 and 27 Undergraduate Global Health Technologies Design Competition

March 26: Rice 360°'s Fifth Annual National Undergraduate Global Health Technologies Design Competition kicks off at 7 p.m. in the BRC Auditorium with a presentation by Stephen A. Brooke, Commercialization Advisor at PATH. March 27: Top entries in the competition will be on display at the BRC, 6500 Main Street, from 8 a.m. to 6:30 p.m. Visitors can see the innovative work of undergraduate students from universities throughout the U.S. Robert Miros, CEO and Founder of 3rd Stone Design, will offer a keynote address at 4:45 p.m. For information, contact Veronica Leautaud at vl2@rice.edu.

Thursday, April 16 Engineering Design Showcase

View the design projects and posters of students in all disciplines of Rice University's George R. Brown School of Engineering, including global health projects. The exhibition is from 4:30 to 7 p.m. in the Tudor Fieldhouse, Autry Court on campus. Awards will be announced at 6:30 p.m.

Friday, May 15 BTB Graduation Breakfast

Parents, students, friends and supporters are invited to join in a celebration of Beyond Traditional Borders (BTB) students and honor those who have completed the Global Health Technologies minor. The event will be in the Oshman Engineering Design Kitchen (OEDK) classroom from 9 to 11 a.m. RSVP to Liz McGuffee at lizmcguffee@rice.edu or (713) 348-4491.

Tuesday, May 5 Global Lens, Local Focus Health Symposium

On Tuesday, May 5, from 7:30 a.m. to 6 p.m., join us for **Global Lens, Local Focus: Applying the Lessons of Global Health to Reduce Health Disparities in the US**. The conference brings together researchers and practitioners from low-resource and underserved settings to identify opportunities that address high-priority gaps in care for medically underserved populations, particularly in Houston and the Texas/Mexico border region.

Sponsored by Rice 360°, Community Health Choice, Inc, the Kinder Institute for Urban Research, Baylor Global Initiatives and MD Anderson Cancer Center, all meetings will be at the BRC. For information, contact Rachna Khare at rk17@rice.edu or register at www.rice360.rice.edu/events.



Coming together: BTB Students demonstrate technologies at Peace Corps presentation

In September, students from Beyond Traditional Borders demonstrated technologies they designed to members of the World Affairs Council of Houston and met the Director of the Peace Corps, Carrie Hessler-Radelet. Shown above are Kamal Shah '15, Pablo Henning '15, Carrie Hessler-Radelet, Alexa Juarez '14, Erica Skerrett '15, and Chloe Nguyen '15.

Join the circle: here's how to get involved

This newsletter is one way you can learn about the innovative work of Rice 360°, Beyond Traditional Borders (BTB) and related programs. However, there are more ways to connect:

- Join us for dinner. We're planning alumni dinners in cities across the U.S.
- Come for a tour. Meet current students, see projects under way and visit with the staff.
- Tell us your global-health success story. We would like to hear about you and your career.

Find out more at www.rice360.edu. Follow us on facebook at www.facebook.com/BTB.Rice360 and on twitter (@Rice360atRiceU). Or contact Liz McGuffee at lizmcguffee@rice.edu or (713) 348.4491.



Full Circle: Lemelson Foundation \$875,000

Rice 360° has been awarded an \$875,000 grant by the Lemelson Foundation to implement a problem-based design program – similar to BTB – at The Polytechnic at The University of Malawi. This novel, international program will help develop a bioengineering curriculum at The Poly and lead to development of needed technologies to improve neonatal survival in low-resource settings and further the development of The Nursery of the Future.

"To make a sustained impact on the health of the poor in the developing world, we must work to train engineers who can identify practical new technological challenges, infuse engineering skills with entrepreneurial thinking and work across geographic and disciplinary boundaries with clinical, engineering and business partners," says Dr. Maria Oden, director of the Oshman Engineering Design Kitchen.



RICE 360°

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For the degree: 2015 senior design projects

"Sometimes we see huge challenges in the world, and we might think they are just insurmountable. And, then I think, 'Wow, we have this army of 18 to 22 year-old students who can solve these problems.'" Dr. Maria Oden, Director of the OEDK

Here's what our senior teams are cooking up:

- ☼ **Team Ventilation** addresses the problem of how to mechanize the bag ventilation of patients for whom on-going ventilation is not available due to lack of equipment or electricity.
- ☼ **Team First Hug** is challenged to design an optimized warming system to keep neonates at a healthy temperature from birth, to address neonatal hypothermia.
- ☼ **Team PulseFox** works to create a robust, portable, low-cost, reflectance-based pulse oximeter for neonates.
- ☼ **Team SteriVac** tackles the problem of reconstituting vaccines, a multi-step process

that requires precision and clean water, often unavailable in developing nations.

- ☼ **Team IncuBaby** is designing a low-cost, reliable neonatal incubator that will combat neonatal hypothermia.
- ☼ **Team SharpTank** is challenged to combat the unsafe practice of syringe reuse, by developing a cost-effective auto-engaged, auto-disposable syringe.

For more information on these projects visit <http://oedk.rice.edu/BTB-Teams> or attend the 2015 Engineering Design Showcase and Poster Session, Thursday, April 16, 4:30 to 7 p.m. at the Tudor Fieldhouse. Look for more global health projects in our next issue.