

Year in Review

Rice 360° Institute for Global Health 2019 Year In Review



RICE 360°
Institute for Global Health



We transform students
into innovators and ideas
into sustainable *solutions*.

We invest in collaboration
for global *impact*.



To learn more about Rice 360°
internship opportunities visit
WWW.RICE360.RICE.EDU/INTERNSHIPS

A Letter From The Directors

Dear Friends,

What a year it has been! Thirteen years ago when we founded Rice 360° we could not have imagined where we are today.

On our first trip to Africa, we met nurses and doctors who were committed to caring for newborns in their wards but lacked the right equipment to help the most vulnerable. After years of working together with partners at universities and healthcare facilities to develop technologies for low-resource settings, this year we launched NEST360°, a comprehensive plan to reduce preventable newborn deaths in Africa. We are deeply grateful to the many partners and funders that are making NEST possible. It is our great privilege to be part of a global team that is dedicated to solving this problem together.

Meanwhile, students and engineers at Rice and at our partner institutions around the world continue to develop technologies for other pressing global health challenges in low resource settings, ranging from solutions for maternity to oncology to surgery. You'll read about some of their exciting projects in the subsequent pages. We can't wait to see what ideas they come up with next!

Thank you for being on this journey with us.

Wishing you a happy and healthy new year!

Rebecca and Maria



Rebecca Richards-Kortum
Malcolm Gillis University Professor
Professor of Bioengineering
Director, Rice 360° Institute for
Global Health

Maria Oden
Director of OEDK
Professor of Engineering
Co-Director, Rice 360° Institute
for Global Health

From The Co-Chairs

Dear Friends,

On behalf of the Rice 360° Advisory Board, we wish to thank the Institute's many supporters, partners and the University's leadership for making this year the most successful in Rice 360°'s history. As you will read in the following pages, this year Rice 360° and its partners launched NEST360°, an initiative to reduce newborn mortality in Africa, with \$68 million in funding from foundations, corporations and individuals. We echo Rebecca and Maria's thanks for this very generous support.

As parents of a former Rice 360° student who is now a surgical resident, we have seen firsthand the impact of the program on an undergraduate and now alumna like our daughter, Tara Barry '10. It is deeply rewarding to meet Rice 360° students today and see how the program has shaped their outlook on the world. The sky is the limit for these talented young minds!

We are proud to support Rice 360° and invite you to join us in supporting innovative education and technologies for global health. As you will see in the next pages, our support makes a difference.

Best wishes for the new year!

Subha and Jim Barry



Subha and Jim Barry
Co-Chairs, Rice 360° Institute
for Global Health Advisory Board

This comprehensive approach will serve as a proven model for providing sustainable newborn care in Africa, catalyzing change across the continent.



To learn more about the NEST360° initiative visit WWW.NEST360.ORG

NEST360°: A Global Partnership

An international collaboration committed to reducing preventable newborn deaths in sub-Saharan African hospitals by 50 percent.



KEY MOMENTS

- **DECEMBER 11, 2017**
NEST is a finalist in the MacArthur Foundation's 100&Change competition.
- **JUNE 10, 2019**
Dar es Salaam Institute of Technology and NEST360° open the DIT Design Studio.
- **OCTOBER 4, 2019**
Public launch in London with coverage from BBC.
- **OCTOBER 21, 2019**
NEST360° and Malawi Ministry of Health lead first clinician and technician trainings on NEST bundle.
- **NOVEMBER 22, 2019**
NEST bundles handed over to the Ministry of Health in Lilongwe, Malawi in an official ceremony.

Newborn Essential Solutions and Technologies (NEST360°) is committed to reducing 50% of preventable newborn deaths in health facilities by the year 2030 through the development and distribution of a bundle of high-quality products and services for newborns at scale across Africa. Phase One will focus on reaching national scale in all 36 district hospitals in Malawi, testing and refining implementation in 12 health facilities in Kenya, and supporting uptake at national teaching hospitals in Tanzania and Nigeria by 2022.

The NEST bundle consists of affordable, effective medical devices and diagnostic tools that address the needs of neonates for temperature stability, respiratory support, hydration and nutrition, infection prevention, and neonatal jaundice treatment. Grouping these products together at a greater volume, allows for health systems to provide more effective care at a lower cost, and for developers and distributors to sell or service at lower prices.

In addition to developing innovative technologies, NEST is educating clinicians and technicians on how to use and maintain the NEST tools which are creating employment opportunities, and building an ecosystem of innovators to create the next generation of technologies.

NEST360° is comprised of a multi-institutional and international consortium of engineers, clinical and public health experts that bring together a diversity of expertise to the complexities of reducing neonatal mortality. This team of collaborating institutions are 3rd Stone Design; Center for Public Health and Development; Dar es Salaam Institute of Technology; Ifakara Health Institute; London School of Hygiene & Tropical Medicine; Malawi University of Science & Technology; Northwestern University; Oxford KEMRI-Wellcome Trust; Rice 360° Institute for Global Health; University of Lagos; University of Ibadan; University of Malawi, College of Medicine; and University of Malawi, The Malawi Polytechnic.



Pictured right (from left to right): A group of head nurses attend the NEST ceremony at Ministry of Health in Lilongwe, Malawi.

Two nurses monitor a newborn patient in a radiant warmer provided as part of the first NEST bundle at Queen Elizabeth Central Hospital in Blantyre, Malawi.

NEST360° is made possible through the collaborative funding efforts of: the John D. and Catherine T. MacArthur Foundation, Bill & Melinda Gates Foundation, The ELMA Foundation, Children's Investment Fund Foundation, The Lemelson Foundation, Ting Tsung and Wei Fong Chao Foundation, and individual donors.

Stories of Innovation

Rice 360° internships give undergraduate students the opportunity to work with international teams to tackle global health design challenges in real-world settings. Students develop prototypes throughout the year in Global Health Technologies (GLHT) minor classes and take them to the field as interns. This year 35 students from three countries participated in internships in Houston, Malawi, Tanzania, and Brazil.



DESIGN STUDIO, DAR ES SALAAM INSTITUTE OF TECHNOLOGY (DIT), TANZANIA

Aarohi Mehendale is a Junior Bioengineering Major with Minors in Global Health Technologies and Mathematics. Her project this summer was to help establish the first engineering design studio at DIT, bringing our total number of partner design studios in Africa to three! Visit Aarohi's blog to read more about her internship experience: <http://tanzania.blogs.rice.edu/author/amm28/>



DESIGN STUDIO, MALAWI POLYTECHNIC, MALAWI

Hannah Anderson is a Senior Bioengineering Major with a minor in Global Health Technologies and Engineering Design. Her project was to develop a training model for nurses to practice neonatal airway suction. Visit Hannah's blog to read more about her internship at Malawi Polytechnic: <http://malawi.blogs.rice.edu/author/hca2/>



NEONATAL TEMPERATURE MONITOR (NTM) GLHT 360/400

STUDENT TEAM Nimisha Krishnaswamy, Mackenzie Flanagan, Krithika Kumar, and Aarohi Mehendale

NTM is a temperature probe that will be used to measure the temperature of newborns who are receiving Kangaroo Mother Care using an arm band to measure temperature of the mother, and a shoulder strap to measure temperature of the baby. The device is still in the prototype stage. The next steps are to refine the testing and accuracy of the temperature probe to ensure that the recorded temperature is an accurate reflection of the newborn's temperature.



THE FUNGUYS GLHT 400

STUDENT TEAM Whitney Gartenberg, Brenda Venegas, Kiujoy Kokko, Miriam Wolter, and Jeel Mehta

The Funguys team is developing a prototype of a portable air quality sensor for low-resource settings. Its purpose is to help determine if air quality within neonatal wards is detrimental to the recovery of neonates; especially since units are typically held at high temperatures to prevent hypothermia. Increased temperatures and humidity increase risks of air pollutants that can be inhaled and cause respiratory distress in newborns.

Technology Highlights

Rice 360° Global Health Fellows continue to develop, refine, and evaluate prototypes that teams of undergraduates created during the Global Health Technologies minor and/or internship. By further developing student designs along the path to commercialization, their work has the potential to directly impact lives.

OPTOCO



STUDENT TEAM 2018–2019

Millie Antwi-Nsiah '18, Patricia DaSilva '18, Shannon Fei '18, Catherine Schult '18, Leah Sherman '18, and Aniket Tolpadi '18

ISSUE

Worldwide, over 1 million infants die annually from complications during labor. Proper monitoring during labor and delivery is essential for identifying and managing obstetric emergencies. In high resource settings, tocodynamometers are used to monitor uterine contractions and track the progress of labor. In low resource settings, tocodynamometers are often not available, and nurses track the progress of labor by manually palpating contractions and recording data on a paper partograph. Nursing staffing levels in low resource settings are generally not sufficient to meet the standard of care set by WHO.

SOLUTION

Optoco: a low cost tocodynamometer to automatically monitor uterine contractions and display information that is normally recorded by hand on a partograph. Preliminary pilot data show good agreement between contractions detected by Optoco and contractions detected by a conventional tocodynamometer. Global Health Fellow Theresa Sonka (Spring '19) is currently optimizing the system in preparation for a pilot study in Malawi.

COLOSTOMATES: MAKING OSTO-ME, OSTO-WE

ISSUE

The surgical creation of a stoma can save or dramatically improve the lives of patients around the world, but for patients in low-resource settings the long-term management of the stoma after the operation often gives rise to serious complications. While ostomy pouches are readily available and widely used in high-resource countries, patients in low-resource settings do not have access to an affordable ostomy system designed to meet their needs.

SOLUTION

Students developed a low-cost, reusable prototype for low-resource settings. Their design improves access to ostomy care, decreases the use of potentially dangerous ostomy care options, lowers social stigma, and reduces the overall cost to patients. Their solution is an affordable, leakproof, durable, easy-to-use, comfortable, and sustainable reusable ostomy bag that can be readily available and suitable for the needs of low-resource settings both in the U.S. and internationally. As a Global Health Fellow this spring, Shravya Kakulamarrri (Fall '19) will further test and refine the prototype, moving this technology closer to commercialization and the patients who need it.

STUDENT TEAM 2018–2019

Caroline Lee Spring '19, Rachita Pandya Spring '19, and currently including Liseth Perez-Sanchez Spring '19, and Shravya Kakulamarrri Fall '19



Spotlight: Student, Alumnus, Staff



PAULA AYALA '21

Bioengineering Major, Global Health Technologies Minor

Rice 360° intern at Barretos Cancer Hospital in Brazil (2019). Among Paula's leadership roles, she is Chair, Internal Affairs of the Society of Women Engineers at Rice and Public Affairs Chair of the Society of Hispanic Professional Engineers at Rice.



CHRISTINE BOHNE '11 (Ph.D., HARVARD)

Regional Program Director, East Africa, Rice 360°

Graduated from Rice with a BA in Cultural Anthropology and minors in Global Health Technologies and Ecology & Evolutionary Biology. Ph.D. in Global Health, Public Health from Harvard University. Christine recently came back to Rice to work at Rice 360° on the NEST360° initiative in sub-Saharan Africa.



CHRISTINA SAMUEL

Global Health Fellow, Rice 360°

Bachelor's in Telecommunications & Electronics Engineering, Honors from University of Malawi, The Polytechnic. Christina is responsible for the development of Kasupe (meaning "spring" in Chichewa), a low-power, affordable, and easy-to-use syringe pump.

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Executive Director, Johns Hopkins Center for Bioengineering Innovation & Design (CBID), Assistant Professor, Johns Hopkins School of Medicine

Thank You!

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Thank you for your support.

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