



# CUGH Faculty Development Webinar Series

## Teaching Global Health Through an Interprofessional Lens

Moderated by: Jessica Evert, MD

Executive Director, Child Family Health International (CFHI)

Assistant Clinical Professor, UCSF Department of Family and Community Medicine

Affiliate Faculty, UCSF Global Health Sciences

Chair, CUGH

Competency Sub-Committee

Child Family Health International



Consortium of  
Universities  
for Global Health





## Faculty Development Webinar Series

### Teaching Global Health Through an Interprofessional Lens

*Global Health is fundamentally an interprofessional pursuit, yet educators are often more familiar with their own discipline and can be challenged to teach global health through an interprofessional lens. This CUGH webinar series aims to equip educators with a basic understanding of the need-to-know aspects of different disciplines approaches and contributions to global health. Webinars will include key learning objects, vocabulary, and resources to bring multiple professional approaches to your global health course. This is especially useful for educators who do not have content area experts in other disciplines available to co-teach. Please join us for this important faculty development offering- attend one , several or all webinars in the series. Series runs October 2016-May 2017.*

#### **Global Health & Law**

Featuring Virginia Rowthorn JD, University of Maryland  
Thursday, October 20, 2016  
10am PST/1pm EST

#### **Global Health & Anthropology**

Featuring Peter Brown PhD, Emory University  
Wednesday, December 7, 2016  
10am PST/1pm EST

#### **Global Health & Engineering**

Featuring Shannon Marquez PhD MEng, Drexel University  
Tuesday, January 31, 2017  
10am PST/1pm EST

Global Health & Economics, Global Health & Public Health,  
Global Health & One Health/Veterinary Medicine  
Dates/Times To Be Announced

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Learn more about webinars and membership: [www.cugh.org](http://www.cugh.org)

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## Minority Serving Institutions (MSIs) and Global Health

CUGH is joining the Centers for Disease Control and Prevention (CDC) and the Centers for Global Health and Global Health Institute's Global Health Fellows Program and the Centers for Disease Control and Prevention (CDC) to host a groundbreaking webinar on Minority Serving Institutions (MSI) and global health. This webinar will provide an opportunity for the academic community, MSIs, global health centers, faculty, and practitioners with important insights into how MSIs bring to global health and that global health brings to MSIs.

Tuesday, January 24, 2017 -

1:00pm to 2:00pm

[Read more](#)

## CUGH Webinar: Global Health and Anthropology

The image shows a promotional graphic for a webinar series. The main title is "Webinar - Faculty Development Series - GLOBAL HEALTH & ANTHROPOLOGY". Below the title, there are several boxes representing different regions and their focus areas:

- from CUGH**: Amazon Community & Indigenous Health
- LA PAZ**: Pediatric Health & Adolescent Medicine
- SOUTH AFRICA DURBAN**: HIV/AIDS & Healthcare
- INDIA New Delhi**: Public Health & Community Medicine, Sight for All - Ophthalmology Rotation

Other topics mentioned include: Access & Inequities, Women's Reproductive Health, Maternal & Child Health, Rural Urban Himalayan Region, and Focus on Traditional Medicine.

**MEXICO**  
OAXACA

- Realities of Health Access & Inequities

**MEXICO**  
PUERTO ESCONDIDO

- Tropical Medicine & Community-Based Care
- Women's Reproductive Health

**INDIA**  
MUMBAI/PUNE

- Confronting Tropical Disease Challenges
- Maternal & Child Health

**INDIA**  
RURAL HIMALAYAS

- Rural/Urban Himalayan Rotation
- Intro to Traditional Medicine

**ECUADOR**  
QUITO/PUYO/CHONE

- Amazon Community & Indigenous Health
- Andean Health
- Implementing Universal Healthcare
- Reproductive Health
- Urban & Rural Comparative Health
- Infectious Disease Eradication
- Sonrie Ecuador-Dental Program

**BOLIVIA**  
LA PAZ

- Pediatric Health & Adolescent Medicine

**SOUTH AFRICA**  
DURBAN

- HIV/AIDS & Healthcare

**INDIA**  
NEW DELHI

- Public Health & Community Medicine
- Sight for All-Ophthalmology Rotation

**BOLIVIA**  
TARIJA

- Healthcare in Remote Southern Bolivia

**SOUTH AFRICA**  
CAPE TOWN

- Healthcare Challenges

**cfhi.org**

let the world  
**CHANGE you**

ORIGINAL RESEARCH

## Identifying Interprofessional Global Health Competencies for 21st-Century Health Professionals

Kristen Jogerst, BS, Brian Callender, MD, Virginia Adams, RN, PhD, Jessica Evert, MD, Elise Fields, PharmD, Thomas Hall, MD, DrPH, Jody Olsen, PhD, MSW, Virginia Rowthorn, JD, Sharon Rudy, PhD, Jiabin Shen, M.Ed, Lisa Simon, DMD, Herica Torres, MSN, Anvar Velji, MD, Lynda L. Wilson, MSN, PhD

*Hanover, NH; Chicago, IL; Washington, DC; San Francisco, Martinez, and Elk Grove, CA; Baltimore, MD; Birmingham, AL; Cambridge, MA; Albuquerque, NM*

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### Abstract

**BACKGROUND** At the 2008 inaugural meeting of the Consortium of Universities for Global Health (CUGH), participants discussed the rapid expansion of global health programs and the lack of standardized competencies and curricula to guide these programs. In 2013, CUGH appointed a Global Health Competency Subcommittee and charged this subcommittee with identifying broad global health core competencies applicable across disciplines.

**OBJECTIVES** The purpose of this paper is to describe the Subcommittee's work and proposed list of interprofessional global health competencies.

**METHODS** After agreeing on a definition of global health to guide the Subcommittee's work, members conducted an extensive literature review to identify existing competencies in all fields relevant to global



# Teaching Global Health Through an Interprofessional Lens

## Global Health & Engineering



### **Shannon P. Márquez, PhD, Meng**

Dr. Shannon Márquez is the Associate Vice Provost for Global Health and International Development at Drexel University. In addition, she serves as the Director of the Global Health Program at the Dornsife School of Public Health. As Associate Vice Provost, she oversees Drexel's Dornsife Global Development Scholars Program, which leverages an exciting capacity-building partnership between Drexel and World Vision International to provide training in WASH, global health, and international development and funding for faculty/student research and student field experiences in 24 countries across Sub-Saharan Africa. As a "public health engineer," she has garnered local, national and international recognition for research and practice in the field of global environmental health, safe water systems, and sustainable solutions to address the environmental burden of disease and health disparities in developing countries of Africa. She holds a BS in mechanical engineering, a masters in civil engineering, and a PhD in environmental sciences and engineering from The UNC-Chapel Hill Gillings School of Global Public Health, and has held distinguished international faculty appointments in global health at The University of the The Gambia; the Université Gaston- Berger de Saint-Louis in Senegal; and as a Erasmus Mundus Scholar at the Ecole des Hautes Etudes en Santé Publique (or EHESP, The French School of Public Health), and the University of Sheffield (UK) School of Health and Health Related Research (SchARR). She teaches graduate courses in WASH, global health ethics, public health in developing countries and maternal and child health, and helps support a number of global health research and training activities in Europe, Asia, Latin America, and Africa on behalf of Drexel. Dr. Márquez serves on numerous boards and committees including, the Board of Directors of the Consortium of Universities in Global Health (CUGH).

# Global Health and Engineering: An Overview

Tuesday, January 31, 2017

**Shannon P. Márquez, PhD, MEng**

**Associate Vice Provost, Global Health and International Development**

**Director, Dornsife SPH Global Health Initiatives**

**Associate Professor-Environmental & Occupational Health**

**[marquez@drexel.edu](mailto:marquez@drexel.edu)**



# Outline

- Introduction
- Key terms for understanding intersection of global health and engineering
- Examples of engineering and global health
- Conclusions



# Objectives

1. Define engineering as it relates to global health.
2. Give examples of engineering applied/within the context of a global health interventions.
3. Describe the inter-professional and workforce development needs.

# What is engineering?

- “engineering is the application of scientific knowledge to solving problems, designing and building things in the real world...”
- “the ability to solve complex problems and implement solutions and designs and translate them into reality in cost effective and practical ways...”
- “engineers are problem solvers, organizers, communicators, calculators, and designers...it’s about using science and math to solve problems..”
- There are many branches and fields within the various engineering disciplines; however, all engineering degrees are based on one (or a combination) of the four major disciplines: mechanical, electrical, chemical and civil engineering.



# Engineering Education in the US

- ABET is the engineering professional body dedicated to the education, accreditation, regulation and professional development of engineering professionals and students.
- 35 member societies provide experts and set the standards for the ABET accreditation process.
- Educational standards have served as the basis of quality against which professional engineers are held for licensure. Engineering programs align their curricula with ABET standards (and prepare students for licensure).
- ABET accredits approximately 3,700 programs at over 750 colleges and universities in 30 countries.
- The professional engineer license (PE) is the engineering profession's highest standard of competence, a symbol of achievement and assurance of quality.
- "...just as the CPA defines the accountant, and a law license defines the lawyer, the PE license tells the public that an engineer has mastered the critical elements of the profession...." (NSPE; NCEES)
- Receiving the engineer-in-training (EIT) designation is one step along the path toward PE licensure.

# Intersection of global health and engineering

- There is a need for professionals who can provide sustainable solutions and resilient infrastructure to help alleviate poverty and address global health challenges.
- Engineers are needed to work in a global context and with the skills and understanding to address global health challenges and international development.
- Engineers can help with the understanding of infrastructure design and delivery processes in resource-limited settings, and can assist with the mobilization of technical expertise to implement global health interventions addressing natural and environmental disasters, food security, WASH, energy, housing, disease outbreaks, etc



# PASSIVE VACCINE STORAGE DEVICES

“A revolutionary cooler that could save millions of lives”

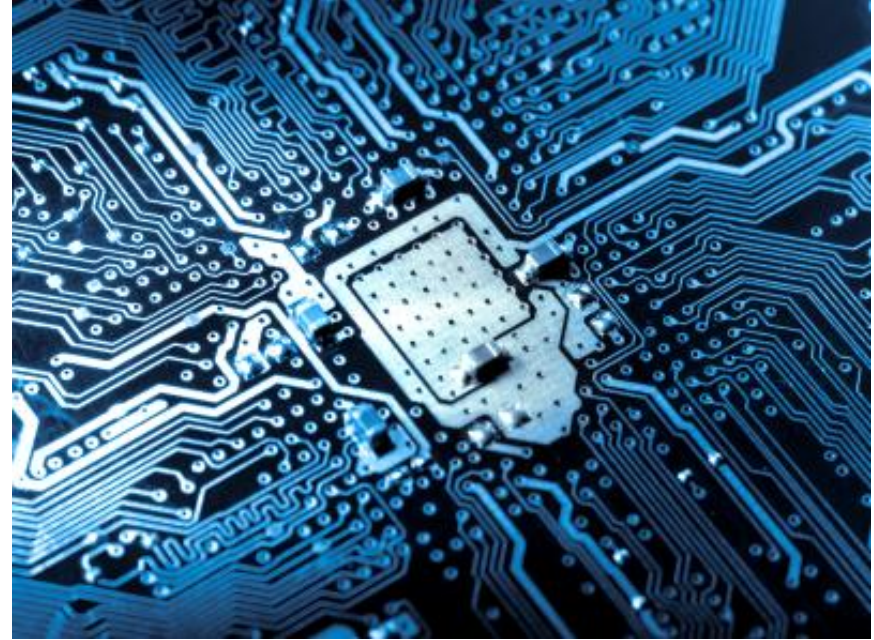
“an insulated container to strengthen and extend vaccination services in developing countries...its designed to keep vaccines at the appropriate temperature for a month or more with repeat vaccine retrievals and no need for electricity...”





# Electrical engineering

- Designs and develops new electrical equipment, solves problems and tests equipment; it deals with electricity, electromagnetism and electronics.
- Works with all kinds of electronic devices, from the smallest pocket devices to large supercomputers and telecommunications





# New horizons for global health through mobile technologies (mHealth)



## TECHNICAL BRIEF

### USE OF TECHNOLOGY IN THE EBOLA RESPONSE IN WEST AFRICA

#### KEY MESSAGES

- 1** The severity of the Ebola epidemic and limited information on new cases and geographic spread calls for the rapid deployment of information and communication technology (ICT) tools, including eHealth and mHealth, to **optimize the response**.
- 2** A number of technology tools have **already been used** in the response and others are in development. Open-source platforms such as DHIS2, Open Data Kit, Enketo, RapidPro, iHRIS, and the DCP form the technology suite known as mHero. In Liberia, this suite is emerging as a set of tools endorsed by many actors in the response and **builds on existing government ehealth systems**. Numerous other platforms are in use by nongovernmental organizations (NGOs) and other mhealth practitioners.
- 3** **Integration, harmonization, and accessibility of ICT infrastructure** by public, private, and civil society actors is critical to the response to the Ebola humanitarian crisis, as well as the long-term economic development and security of the region.
- 4** **Better coordination** is needed in the deployment of technologies to avoid duplication of efforts and data fragmentation. Coordinating the tech component of the response should be integrated in the overall National Ebola Outbreak Response Plan of the affected countries and in the preparedness plans of non-affected countries.
- 5** Whenever possible, governments and partners should seek to **use and endorse proven platforms** and tools before developing new ones to ensure interoperability. New tools are unproven and will lead to further lack of coordination and data fragmentation.

The United States Agency for International Development's (USAID) Africa Bureau and their project, African Strategies for Health (ASH), in collaboration with colleagues from USAID's Global Health Bureau and Global Development Lab, prepared this Technical Brief in November 2014 in the midst of the West Africa Ebola Outbreak. At the time, Ebola transmission rates remained intense or increasing in Guinea, Liberia, and Sierra Leone, while other countries, including Nigeria and Senegal, had successfully halted the epidemic. The situation has since changed, with caseloads declining or eliminated in all countries. This brief provides a summary of information and communication technology (ICT) tools, including eHealth and mHealth, which have or will be used to optimize the Ebola response. It also provides recommendations for policymakers and program managers seeking to deploy ICT tools in outbreak settings that are applicable beyond the 2014 Ebola crisis.

#### OVERVIEW: THE EBOLA OUTBREAK

The 2014 epidemic of Ebola Virus Disease (EVD) in West Africa is the largest in history. Of the more than 13,500 cases, 4,900 have resulted in deaths.<sup>1</sup> The overwhelming size and nature of the epidemic has led to the collapse of already fragile health care systems in Liberia, Guinea, and Sierra Leone. The Ebola epidemic has been hampered by misinformation and a lack of information about critical aspects of the response, including EVD transmission, case notification, infection control options, geographic spread, and health service availability. In addition, health workers were neither trained nor equipped for EVD outbreaks and government-imposed travel restrictions make reaching them (for training, communication, and equipment) difficult. With up to \$33 billion in economic losses, the severity of the epidemic calls for the rapid deployment of technology, including ehealth and mhealth, to accelerate and optimize the response.<sup>2</sup>

#### TECHNOLOGY USE IN THE EBOLA RESPONSE

ICT tools are critical to the Ebola response. As the epidemic continues to rise at an exponential rate in Liberia, the strategy of expanding containment through a limited number of treatment facilities will soon be outstripped by the number of new cases. The number of available beds in the Ebola Treatment Units (ETUs) as currently planned will meet only a small portion of isolation and treatment needs. Mobile network platforms provide a vital set of tools to support these hard-to-reach populations of infected individuals and affected households with life-saving information, essential commodities and financial support, and monitoring of vital epi-surveillance information.

Technology is currently being used to **map and geolocate Ebola outbreaks** and to collect and share **data in near real-time**. Other types of technological innovations—including **tools for point-of-care diagnostics, case management, logistics management, community mobilization, payment and financial support distribution, and big data analytics solutions** for Ebola responders and affected communities—have and can be used in the response.

The World Health Organization (WHO) and other agencies are **adapting existing ehealth tools** to Ebola and **building capacity** to use them. Moreover, some tech firms are deploying short-term communication infrastructure solutions to **boost broadband connectivity**.

#### CURRENTLY USED TECH TOOLS

The communication system **mHero** is the recognized and most proven system in the field by the donor and practitioner communities, sponsored by the US Agency for International Development (USAID), UN Children's Agency (UNICEF), IntraHealth, ThoughtWorks, Jembi Health Systems and WHO. mHero is a suite of open-source mobile phone-based communication systems for contacting, informing, surveying, and polling facility-based and community health workers on information, such as training materials, Ebola lab test results, and equipment/supplies. The system builds on and interacts with existing government/partner systems, including DHIS 2.0, RapidPro, Data Coordination Platform (DCP), and iHRIS.

In **Nigeria**, an emergency presidential decree enabled officials to access mobile phone records and use law enforcement agencies where necessary to track down people at risk. Contact tracers used mobile data platforms on their phones to administer their questionnaires and report contact responses. Mobile data platforms were used to track temperatures with real-time data transmission to a dashboard (normal temperatures indicated in green and elevated temperatures in red). Geographic information system (GIS) technology was used for follow-up and outreach visits. Mobile technology meant live updates could be made to the contact list. The Government of Nigeria and UNICEF also used the SMS-based community dialogue platform called U-report. (Partners: Government of Nigeria,

Emergency Operations Center, WHO, UNICEF, eHealth Africa)

In **Uganda**, UNICEF supported Uganda's National Task Force on Ebola to operationalize an mhealth platform, mTrac, into their response to the 2012 Uganda Ebola outbreak. mTrac enables real time alerts and surveillance and uses mobile phones via SMS from communities and health workers. It is viewed and managed through an online dashboard by District Health Teams (DHTs) and the Ministry of Health (MoH). mTrac's role in the fight against Ebola included: 1) engaging the community via a free SMS hotline to report suspected Ebola cases; 2) receiving suspected Ebola case alerts from DHTs and health facility workers free of charge; and 3) sending targeted MoH-approved messages to DHTs, health facility workers,

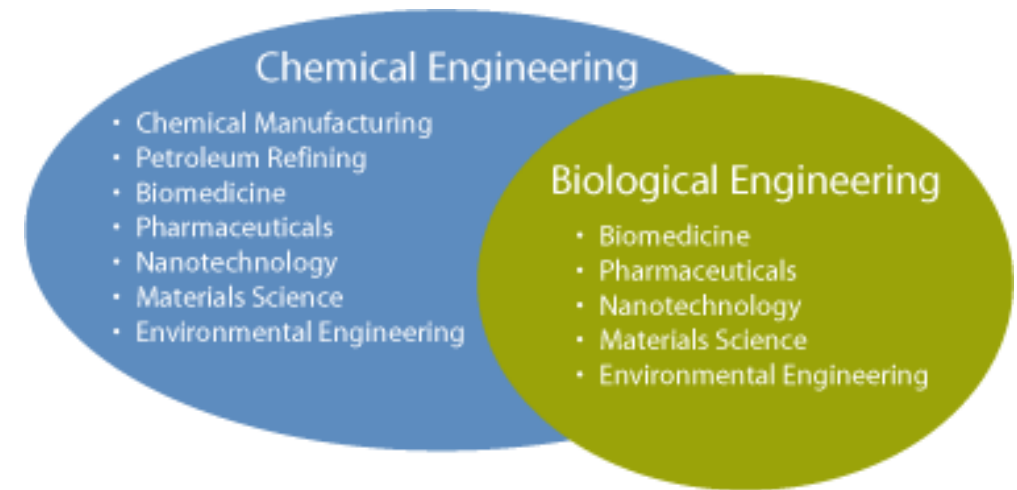


and village health teams (VHTs) in the affected districts. The messages reached 2,000 DHTs and health facility workers in these districts every two days and also in tandem with the spread to new districts.<sup>3</sup>

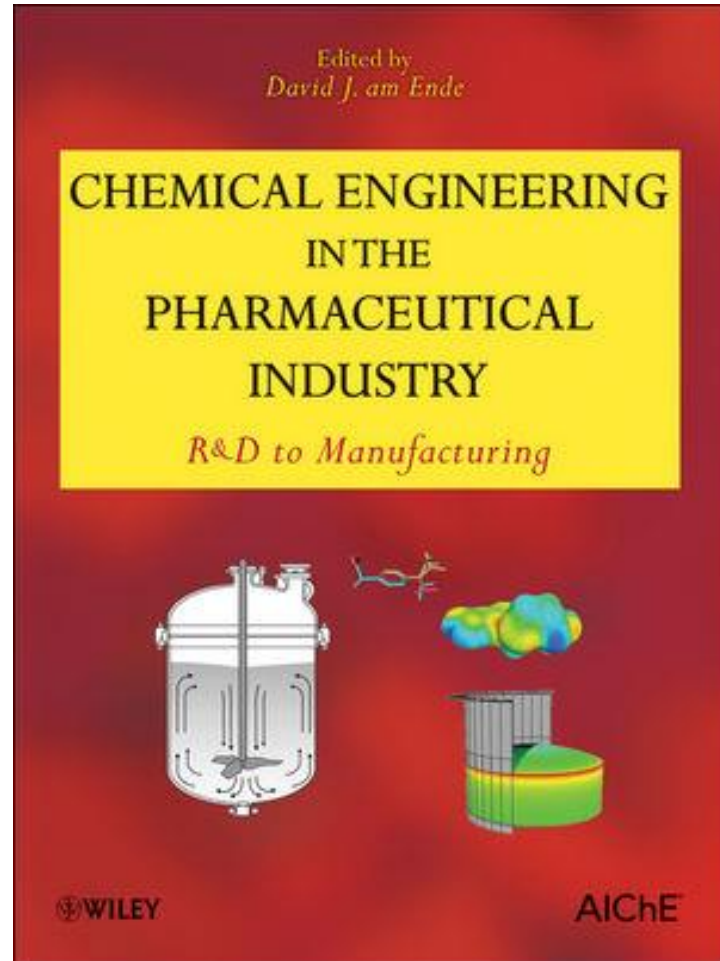
In partnership with major mobile phone operators, **Senegal's** MoH sent four million SMSs to the general public warning of the dangers of Ebola and how to prevent it—encouraging individuals to alert health authorities of anyone showing signs of a fever and bleeding by calling a toll-free number. Sent in response to Senegal's first EVD case, the SMSs were delivered using the mDiabetes platform, which was developed with support from WHO, the International Telecommunications Union, and Alcatel-Lucent.

# Chemical engineering

- Deals with the chemical production and manufacture of products through chemical (and biological) processes.
- Chemical engineers apply the principles of chemistry, biology, physics and math to solve problems that involve the production or use of chemicals, fuel, drugs, food and many other products.







## Getting Vaccines Faster with Chemical Engineering

Posted on November 19, 2015 by ECS



When viruses emerge—spreading in a rapid and extensive way—researchers must scramble to create life-saving vaccines. At Brigham Young University, researchers are working to speed up that process.

A team of chemical engineers has devised a way to create machinery for vaccine production en masse, freeze drying the produced vaccines and stockpiling them for future use. This development could aid in relief efforts when new viruses hit populations, allowing researchers to rapidly produce vaccines.

“You could just pull it off the shelf and make it,” says [Brad Bundy](#), senior author of [the study](#). “We could make the vaccine and be ready for distribution in a day.”



A team lead by Brad Bundy, chemical engineering associate professor, is paving the way for new life-saving vaccine technology.  
Image: Mark A. Philbrick

This from Brigham Young University:

Bundy’s idea is a new angle on the emerging method of ‘cell-free protein synthesis,’ a process that combines DNA to make proteins needed for drugs (instead of growing protein in a cell). His lab is creating a system where the majority of the work is done beforehand so vaccine kits can be ready to go and be activated at the drop of a dime.

[Read the full article.](#)

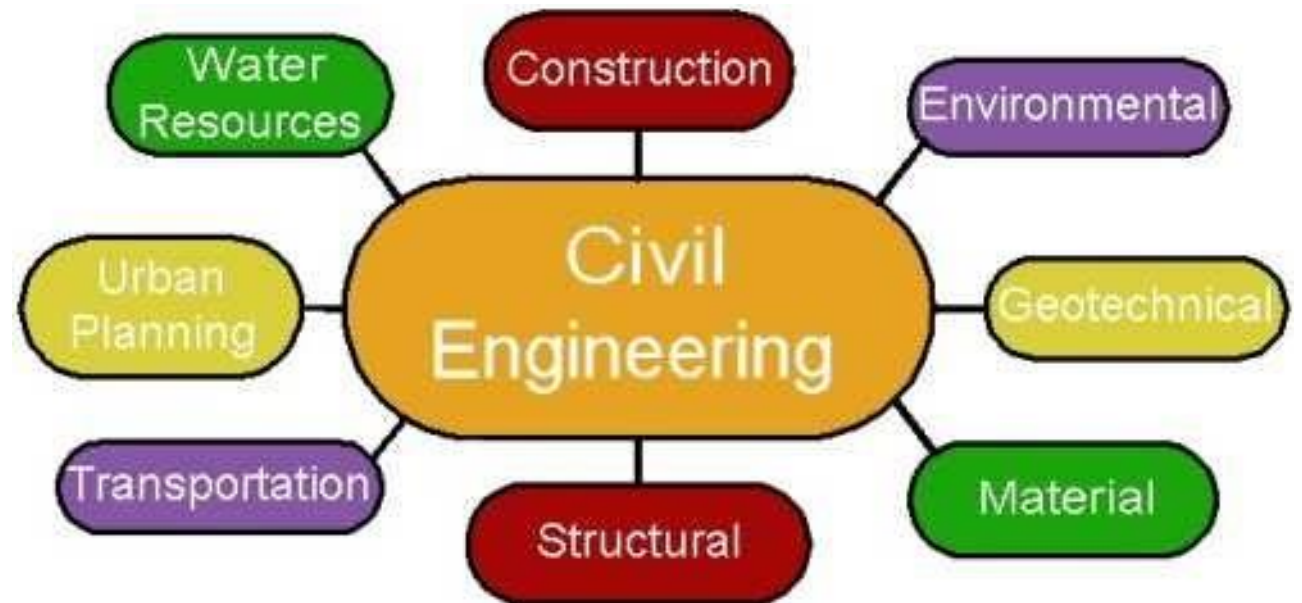
“It will not only provide a quicker response to pandemics, but it will also make protein-based drugs more available to third-world countries where production and refrigerated storage can be problematic,” says [William Pitt](#), co-author of [the study](#).

The researchers hope that through this development, life-saving treatments will be more readily available and patient expense will drop.

“The drugs today are changing,” says [Bundy](#). “The lifesaving cancer drugs we have now, the drugs for arthritis, the drugs with the greatest impact, are made out of proteins, not small chemical molecules. This method takes full advantage of that to provide a quicker, more personal response.”

# Civil engineering

- One of the oldest engineering disciplines
- Deals with the built environment including the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams and buildings; as well as engineering for air pollution, water resource management, water and wastewater treatment (e.g. public health engineering).



# Global water, sanitation and hygiene promotion (WASH)

## Changing lives with clean water :: HOW WE WORK



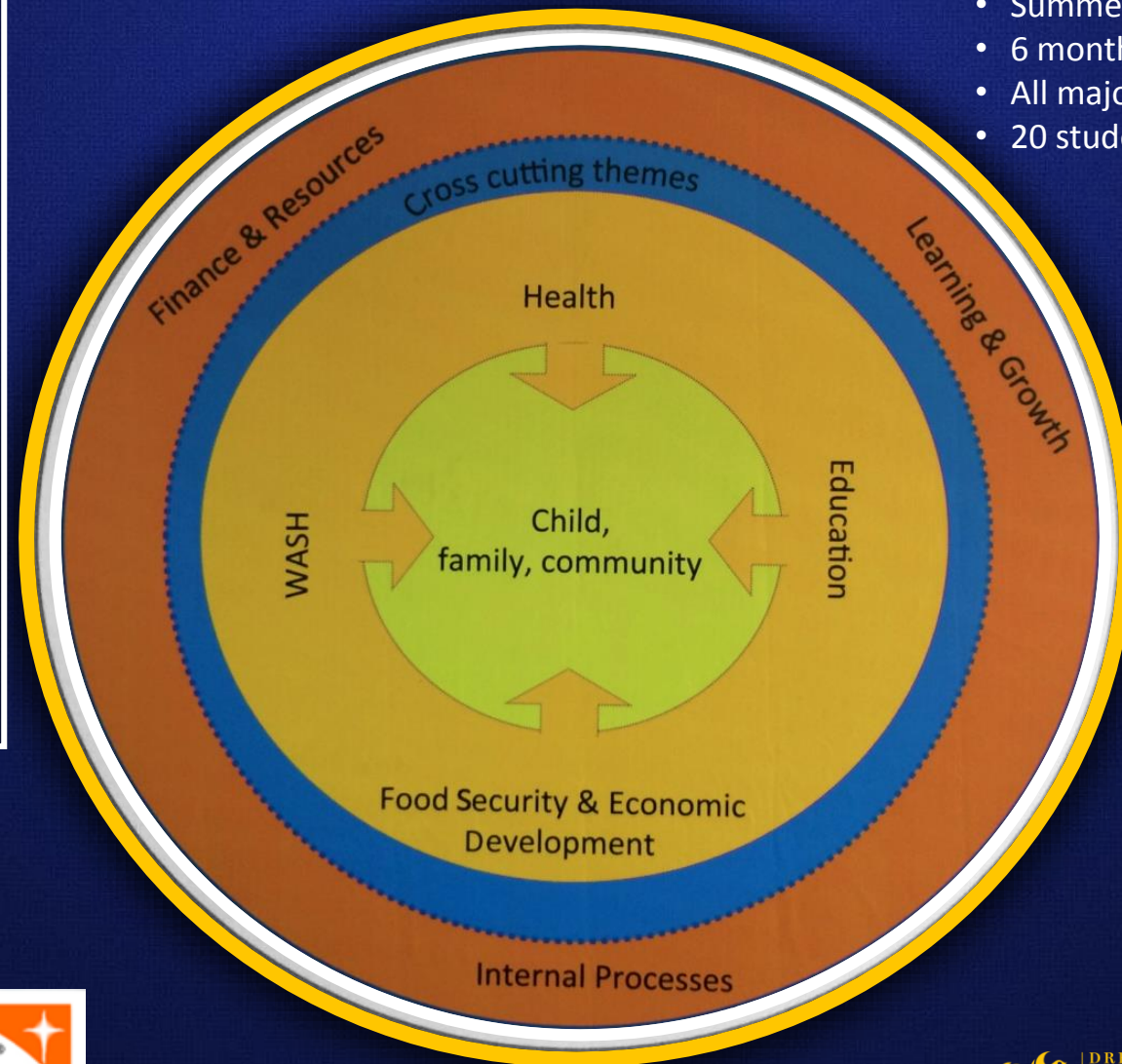


# DORNSIFE GLOBAL DEVELOPMENT SCHOLAR FRAMEWORK

“teaches global health through an interprofessional lens...”

- ANGOLA
- **ETHIOPIA (Center)**
- **GHANA (Center)**
- KENYA
- LESOTHO
- MALAWI
- MALI
- NIGER
- MOZAMBIQUE
- NIGER
- **RWANDA**
- **SENEGAL**
- SIERRA LEONE
- SOUTH AFRICA
- SWAZILAND
- TANZANIA
- UGANDA
- **ZAMBIA (Center)**
- ZIMBABWE

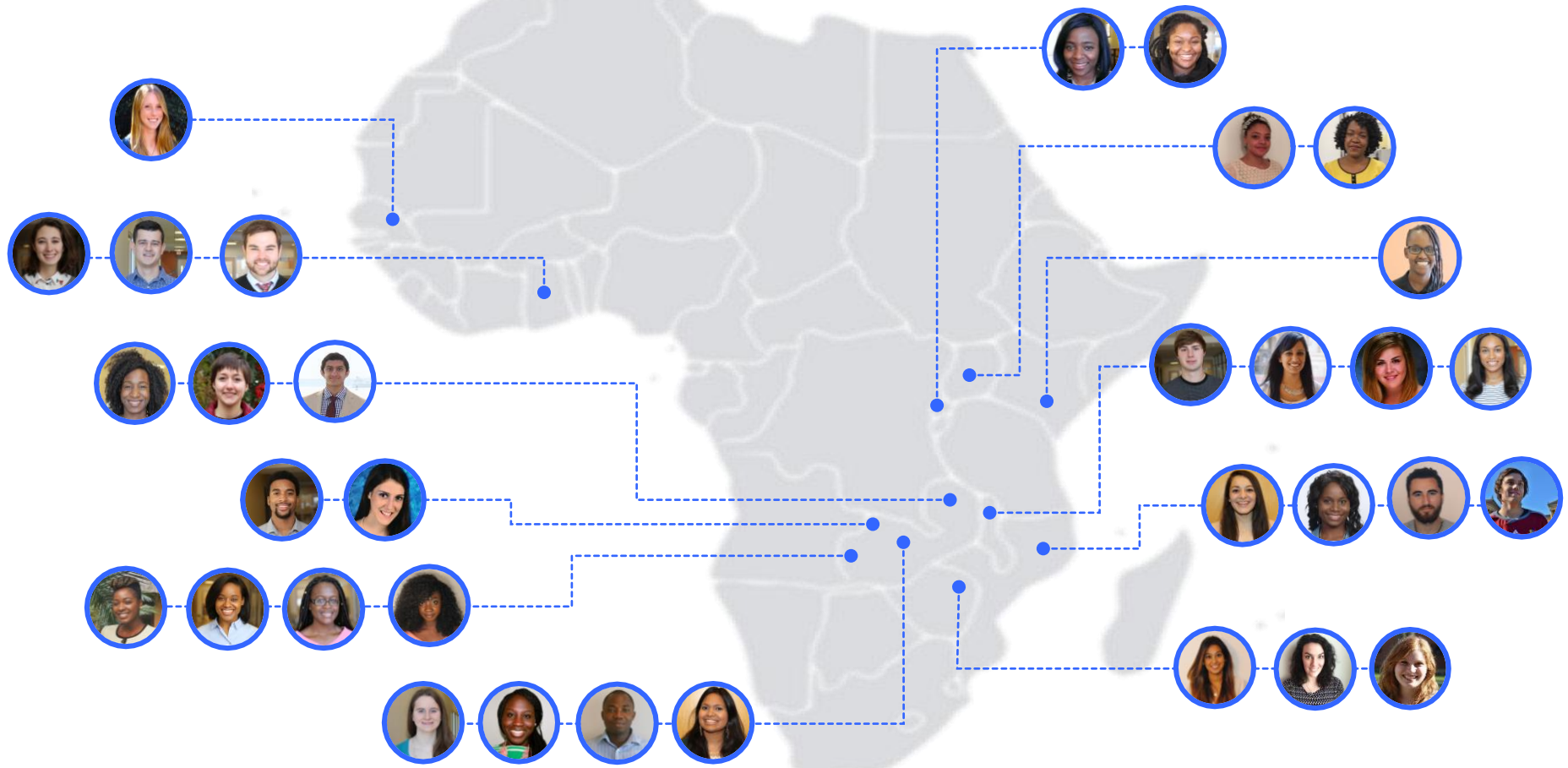
- Summer international experiences
- 6 month Co-ops or research
- All majors, graduate/undergrad
- 20 students per year funded



Students from the following eight (8) colleges and schools have participated:



- School of Public Health
- College of Medicine
- Honors College
- Nursing & Health Professions
- Arts & Sciences
- College of Business
- **College of Engineering**
- School of Biomedical Engineering Science & Health Systems







Global Water Crisis: Multidimensional





Are we  
being  
equitable?



Do we have  
enough  
data?

Is it hurting  
other  
species?



# A Critical Health Issue

“Every 20 seconds someone  
in the world will die from a  
water-related problem” –  
United Nations





# The Problem: Sanitation and Drinking Water



## *Problem*

- Inadequate drinking water, sanitation, and hygiene

# Lack of Adequate Sanitation

**2.4 billion people** worldwide do not have access to improved sanitation

[approx. 28.7% of the world's population]

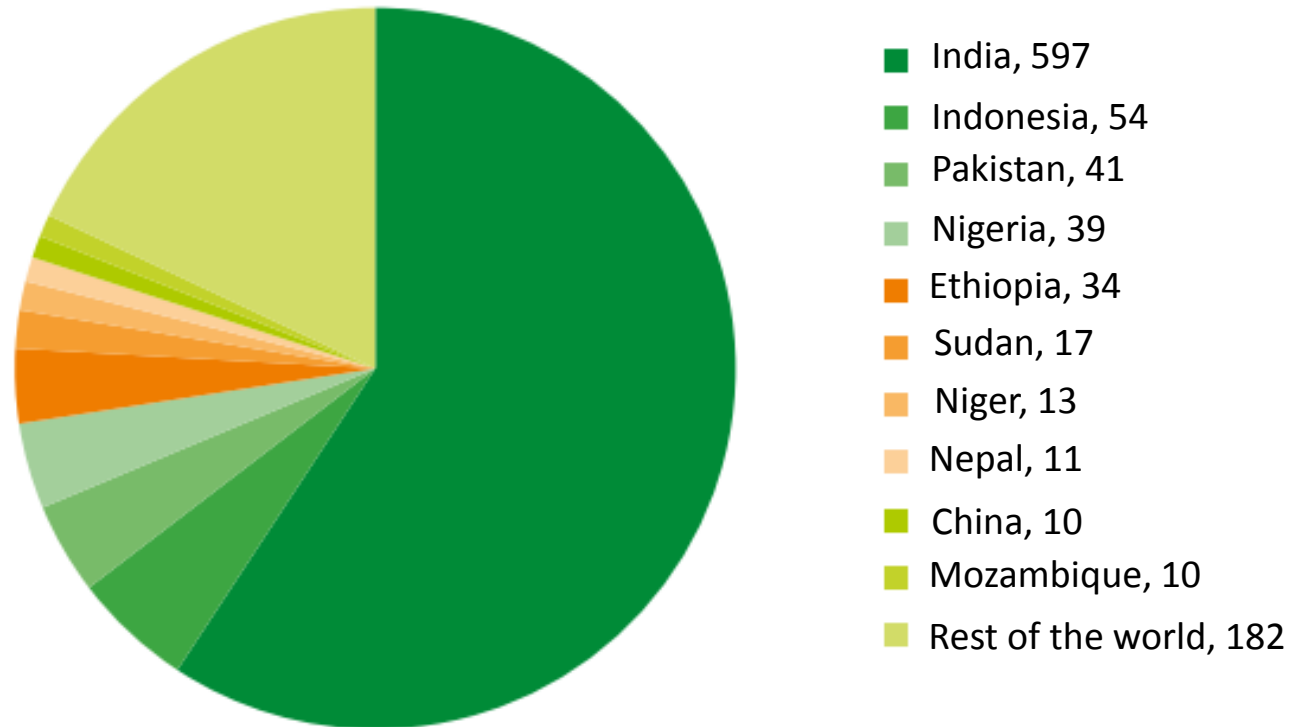


**1 billion people** practice open defecation



# WASH and Global Health

82% of the 1 billion people practicing open defecation in the world live in 10 countries



Top 10 countries with the highest number of people (millions) practicing open defecation

# The Sanitation Ladder



## Improved Sanitation Facility

Toilet/Latrine to piped sewer system

Septic Tank

Pit Latrine



## Shared Sanitation Facility

Two or more households share

Public Toilets

# The Sanitation Ladder –Global Statistics



## **Unimproved Sanitation Facilities**

Pit latrines without platform

Bucket latrines



## **Open Defecation [1 billion people]**

In fields, forest areas, bodies of water



# How WASH contributes (engineering approaches)

Health and Nutrition	Literacy	Self-reported well-being
88% of diarrheal disease is caused by unsafe WASH*	Reduced school absenteeism by half or more among girl students	Provided the entry point to gain community support and ownership of projects
Reduced chronic malnutrition rates by 40%	Dramatically improved teacher deployment and retention rates	Removed the heavy burden and threats on women and children from walking long distances
Increased food security allowing communities to grow nutritious vegetables and reduce hunger	Increased student test scores by one full letter grade	Enabled parents to better care for their children with the time saved fetching water

*\*Source: World Health Organization; World Vision Water*



# Changing lives with clean water :: HOW WE WORK



\*Source: World Vision Water

# Beyond Access: Promising Potential Solutions



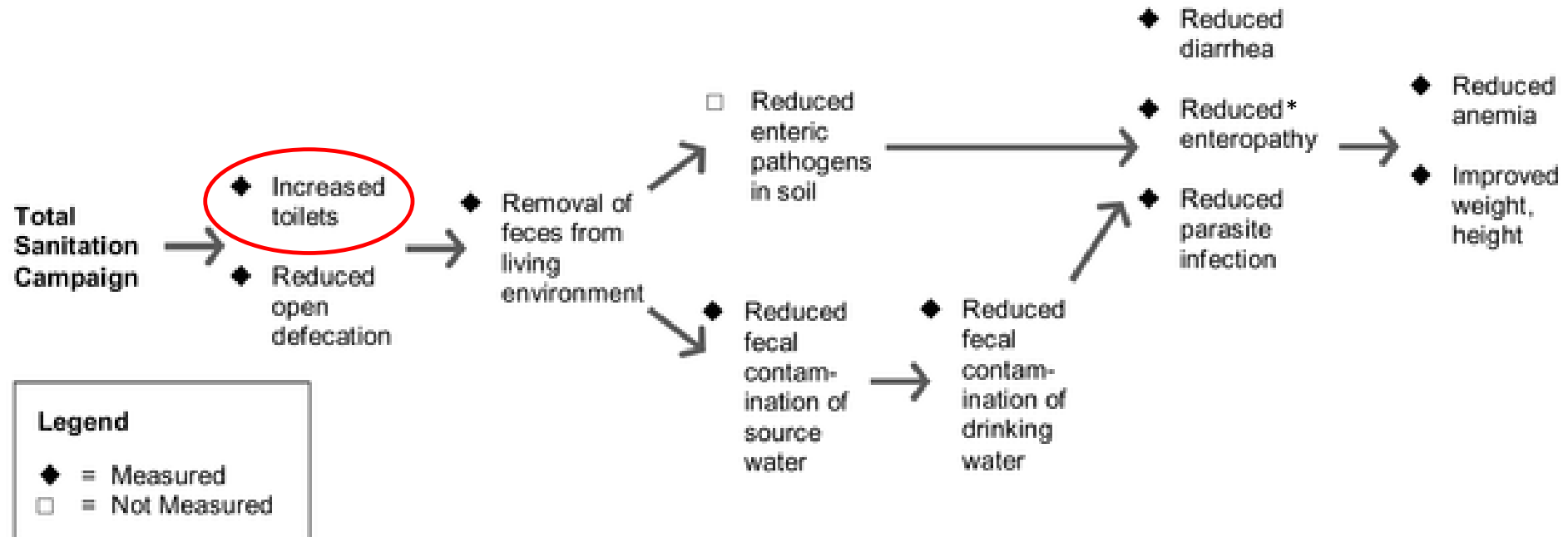
Community-based,  
“bottoms-up”  
approaches:  
**CLTS**

**Hardware Focus/  
Engineering Approaches:**  
household level,  
point-of-use [POU] solutions;  
well/pump & latrine design

Health Impact Focus:  
**Designing for Behavior Change (DBC)**

Sustainability focus:  
Institutions, policies, cost recovery,  
private-sector involvement,  
**training and capacity building**

# Hypothesized causal pathways for WASH intervention impact and measurements.



\*Environmental *enteropathy* affects the small intestine and is the result of chronic childhood exposure to fecal microbes due to poor sanitation. It also reduces a child's ability to absorb nutrients.

Patil SR, Arnold BF, Salvatore AL, Briceno B, et al. (2014) The Effect of India's Total Sanitation Campaign on Defecation Behaviors and Child Health in Rural Madhya Pradesh: A Cluster Randomized Controlled Trial. PLoS Med 11(8): e1001709. doi:10.1371/journal.pmed.1001709

<http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.1001709>

# Conclusion: Emerging Issues

(the intersection of global health and engineering)



Inequality (gender and income) of services



Nexus between water, food, and energy crises



Urban Issues



Connecting public health, medical, engineering  
and water professionals



Impacts of climate change

# Questions and Discussion