Global Health Teaching Workshop

DePauw & Wabash
May 2017

GLCA-sponsored
Brief Introductions (30 s/person)
INVESTIGATION
SERVICE
EDUCATION

Eric Wetzel, PhD
Department of Biology
Director, Wabash Global Health Initiative
Wabash Global Health Initiative

“To TRANSFORM the lives of students through global public health education, investigation and service and in so doing to effect positive change in underserved communities globally”
DISEASE

- Biology, climate, etc.
- Economics
- Impact of government
- Education
- History
- Social/culture
“Global health issues are infinitely more complex than just sickness. Education, stronger structures, cheaper drugs, and sanitation will always be the answers. Poverty is very close to us. This experience has shrunk my view of the world. It has distorted and altered my view of what health is. Global health includes business, logistics and analytics, political science, and so much more. I have a new perspective on what it means to be a health care provider.”

–Bilal Jawed ’17, Global Health Fellow
GLOBAL HEALTH MINOR

Mission: To educate Wabash students in global health from a liberal arts perspective

- understand the burden of disease in society
- examine the history of public health
- acquire the basic tools to evaluate health in communities
- consider health in the context of human rights
- assess the influence of culture on human health

Minor is interdivisional program
- designed to engage students interested in medicine, policy, economics and other social sciences, humanities, and culture
GLOBAL HEALTH MINOR

Students are required to take the following 3 credits:

- Global Health
- Sociology & Politics of Health
- Introduction to Epidemiology (DPU-Wabash collaboration?)

Also:

- 3 elective credits (chosen from courses across college)
- Senior Capstone Portfolio
Wabash Global Health Initiative

The “Local Global”
Global Health Initiative Internship Opportunities – “Campus” jobs, Spring 2017

• Montgomery County Public Health Department – Environmental Health Specialist Fellow
• Montgomery County Free Clinic – Medical Scribe; Spanish Translator
• Assistant to the Montgomery County Medical Care Trust
• Half Way Home
• Youth Service Bureau
<table>
<thead>
<tr>
<th>Institution and Location</th>
<th>Contact Person</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>IU Fairbanks School of Public Health, Indianapolis</td>
<td>Sylvia Bigatti, PhD</td>
<td><a href="mailto:sbigatti@iu.edu">sbigatti@iu.edu</a></td>
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<td>Amber Reed</td>
<td><a href="mailto:amber.reed@montgomerycounty.in.gov">amber.reed@montgomerycounty.in.gov</a></td>
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</tr>
</tbody>
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**Global Health Initiative Summer Internship Opportunities**

Other possible connections for projects, e.g., CDC, Child Family Health International, Frontier Nursing Services, and with research partners in Peru.
“Other” ongoing GHI work
(possible DPU-Wabash collaboration?)

• WGHI / WDPD collaboration with IN Public Health Association
• Student/Staff Mental Health Concerns Committee
• Looking for ways to interact with colleagues in…
  - developments of professional skills
  - new courses / course modules
  - “global health” is NOT just for pre-health / science
    - theater
    - business
Global Health Program

DePauw
The Global Health Program
A Cross-Disciplinary Major

- Intro
- Epidemiology/Statistics
- Thematic Tracks
- Practicum
- Capstone
GLH 101 - Introduction to Global Health

Programmatic Areas

- Communicable Disease
- Noncommunicable Disease
- Violence and Injury
- Special Populations
- Nutrition
- Environment & Human Health
Thematic Track 1
- 3 courses
- Two distinct disciplines
- One at 300-400 level

Thematic Track 2
- 4 courses
- Two distinct disciplines
- One at 300-400 level

Track Options
- Health in Resource-Poor Regions
- Ethics of Global Health Interventions
- Noncommunicable Diseases and Behavioral Determinants of Health
- Biosocial Determinants of Health
- Environment and Human Health
- Population and Family Health
- Global Health Biostatistics
The Practicum Requirement ~ GLH 301

What is the Practicum?

- A practicum is a unique opportunity for undergraduate students to integrate and apply skills and knowledge gained through coursework and experiences in a public health work environment.
- Public health work environments include not-for-profit organizations, hospitals, local health departments, and for-profit firms among others.
- This expectation mirrors expectations set by the Council on Education for Public Health.
The Practicum Requirement ~ GLH 301

Writing in the Major

- Public health writing is unique. In no other field do authors often deal with a complex range of factors that include age, gender, education, economics, race, sex, culture, medicine, genetics, individual behavior, family, community, and social justice.
- One of the conditions necessary for improving public health is communication among an array of stakeholders, facility with global health research and a range of health science writing.
Internship Opportunity Examples

Indiana Healthy Communities Initiative
(Putnam Co Hospital)

Regional Collaboration for Quality Improvement In Long Term Care
(Putnam Co Hospital)
Other aspects of the GLH program

Study Abroad

Capstone ~ Senior Seminar (GLH 401) - Infections and Inequalities (Proposed)

- This seminar explores how the interdisciplinary practice and discipline of Global Health can both explain and help to ameliorate health inequities.

- Health and human rights are often considered as kinds of taken-for-granted realities, particularly in current socio-political climates that ask us to become globally aware and responsible citizens.

- For social scientists, these presumed realities provide opportunities to explore and debate cross cultural and universal notions of rights and responsibilities, and to carefully consider how people make sense of infringement upon their beliefs, practices and rights. For natural scientists, the implications of access to these rights are often examined in concert with epidemiological outcomes as paths to infection are often traced across terrains of inequities and inequalities in access to care.
Introduction to Disciplinary Perspectives in Global Health

Read short article

Gender disparities in water, sanitation, and global health

Celebrating World Water Day, The Lancet Editors' highlighted the gains made towards Millennium Development Goal (MDG) 7c, “to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation”, and noted UN-Water’s call for sustainable water management in view of future increases in demand and shortfalls in supply. As the primary water collectors worldwide, women are disproportionately affected by the scarcity of adequate resources; however, global estimates of improvements in water access do not reflect gender-disaggregated benefits and burdens.

While water fetching, women have increased risks of infection from faecally transmitted diseases, such as ascariasis, trichuriasis, diarrhoea, and trachoma.² Chronic or persistent
Figure 2.0.F01: Key Determinants of Health
10 Minute Break
Sanitation

Focused Perspectives
The Neglected Tropical Diseases (NTDs)

**Worm (helminth) infections**

- Soil-transmitted helminths (STH)
  - Ascariasis (roundworm infection)
  - Hookworm infection
  - Trichuriasis (whipworm infection)
- Other helminth infections
  - Schistosomiasis ("snail fever")
  - Lymphatic filariasis (elephantiasis)
  - Onchocerciasis (river blindness)
  - Food-borne trematode infections
    - (liver fluke, lung fluke, intestinal fluke)
  - Cysticercosis (tapeworm)
  - Human echinococcosis (tapeworm)
  - Dracunculiasis (guinea worm infection)

**Protozoan infections**

- Leishmaniasis
- Chagas disease
- Human African Trypanosomiasis
  - (sleeping sickness)

**Bacterial infections**

- Trachoma
- Buruli ulcer
- Leprosy
- Yaws and endemic treponematoses

**Viral infections**

- Dengue
- Rabies
# Neglected Tropical Diseases (NTD)

## Major NTDs

### “Rapid Impact”

<table>
<thead>
<tr>
<th>Disease</th>
<th>Global # infections</th>
<th>Population at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascariasis*</td>
<td>807 million</td>
<td>4.2 billion</td>
</tr>
<tr>
<td>Trichuriasis*</td>
<td>604 million</td>
<td>3.2 billion</td>
</tr>
<tr>
<td>Hookworm* (2)</td>
<td>576 million</td>
<td>3.2 billion</td>
</tr>
<tr>
<td>Schistosomiasis</td>
<td>207 million</td>
<td>779 million</td>
</tr>
<tr>
<td>Lymphatic filariasis</td>
<td>100 million</td>
<td>1.4 billion</td>
</tr>
<tr>
<td>Trachoma</td>
<td>21 million</td>
<td>590 million</td>
</tr>
<tr>
<td>Onchocerciasis</td>
<td>25 million</td>
<td>90 million</td>
</tr>
</tbody>
</table>

* “The Unholy Trinity”

Common Features of NTDs

1. The NTDs have *high prevalence*.
2. The NTDs are *linked to rural poverty*.
3. The NTDs are *ancient* conditions.
4. The NTDs are *chronic* conditions.
5. The NTDs cause *disability and disfigurement*.
6. The NTDs have a *high disease burden but low mortality*.
7. The NTDs are *stigmatizing*.
8. The NTDs have *poverty-promoting* features and other socioeconomic consequences.
Soil-transmitted helminths (STH)

Figure 1: Adult male and female soil-transmitted helminths
Reproduced with permission

Figure 2: Soil-transmitted helminth eggs
Reproduced with permission
Civilian Public Service workers built and installed 2065 privies for hookworm eradication in Mississippi and Florida from 1943 to 1947.

Zoonotic infections
(Pamplona Alta, Lima)
Intestinal parasites

Huanuco (n=100)
“One Health” Concept

https://parasiteecology.wordpress.com/2015/03/04/the-disease-triangle-and-the-one-health-concept/
Common Features of NTDs

1. The NTDs have high prevalence.
2. The NTDs are linked to rural poverty.
3. The NTDs are ancient conditions.
4. The NTDs are chronic conditions.
5. The NTDs cause disability and disfigurement.
6. The NTDs have a high disease burden but low mortality.
7. The NTDs are stigmatizing.
8. The NTDs have poverty-promoting features and other socioeconomic consequences.
Using Evidence

and sharing knowledge
Finding Existing Data
Improved sanitation facilities, rural (% of rural population with access)

WHO / World Bank

http://data.worldbank.org/indicator/SH.STA.ACSN.RU
Improved Sanitation

Access to improved sanitation facilities refers to the percentage of the population using improved sanitation facilities. Improved sanitation facilities are likely to ensure hygienic separation of human excreta from human contact. They include flush/pour flush (to piped sewer system, septic tank, pit latrine), ventilated improved pit (VIP) latrine, pit latrine with slab, and composting toilet.
UN Statistics

Institute for Health Metrics and Evaluation

http://www.healthdata.org/
GBD Compare at IHME

https://vizhub.healthdata.org/gbd-compare/
Hans Rosling

Ted Talks

https://www.ted.com/playlists/474/the_best_hans_rosling_talks_yo
Child mortality rate, deaths under age 5 per 1000 births

Improved sanitation, overall, %

www.gapminder.org
Dollar Street

Creating Data
The 2010 Cholera Outbreak in Haiti: How Science Solved a Controversy

Fabini D. Orata¹, Paul S. Keim², Yan Boucher¹*

¹Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada, ²Center for Microbial Genetics and Genomics, Northern Arizona University, Flagstaff, Arizona, United States of America, ³Pathogen Genomics Division, Translational Genomics Research Institute, Flagstaff, Arizona, United States of America

The 2010 Earthquake and Cholera Outbreak in Haiti

On January 12, 2010, a catastrophic 7.0 magnitude earthquake struck Haiti, affecting 3,500,000 people [1,2]. This severely damaged an already marginal public sanitation system, creating ideal conditions for outbreaks of major infectious diseases. In October 2010, nine months after the earthquake, an outbreak of cholera started, which quickly spread all across the country [3]. As of January 7, 2014, 8,534 deaths and 697,256 cholera cases have been reported by the Haitian Ministry of Public Health and Population [4]. Prior to 2010, there was no reported history of cholera in Haiti, despite devastating outbreaks in the Caribbean region in the 19th century [5]. Many wondered where the cholera in Haiti came from. Two hypotheses as to its origin were presented. The climatic

Initial Studies Support the Human Transmission Hypothesis

Rumors spread on October 27, 2010, pointing blame for the outbreak at the United Nations Stabilization Mission in Haiti (MINUSTAH) troops from Nepal who had recently set up camp in Meille, a small village 2 km south of Mirebalais (Figure 2A). This followed revelations by news reporters showing improper sewage waste disposal in the camp [12,13].

The stool samples collected by the Haiti National Public Health Laboratory from cholera patients at the start of the outbreak were sent to the Centers for Disease Control and Prevention (CDC) for analysis. On November 13, the CDC reported that V. cholerae El Tor O1 was isolated from the samples and independent isolates were indistinguishable by multiple rapid phenotypic and molecular characterization methods, suggesting that a single strain
Evaluating Interventions

https://www.ted.com/talks/esther_duflo_social_experiments_to_fight_poverty
Targeting health subsidies through a nonprice mechanism: A randomized controlled trial in Kenya

Pascaline Dupas,1,2,3* Vivian Hoffmann,4* Michael Kremer,2,3,5* Alix Peterson Zwanepol6*

Free provision of preventive health products can markedly increase access in low-income countries. A cost concern about free provision is that some recipients may not use the product, wasting resources (overinclusion). Yet, charging a priceto screen out nonusers may screen out poor people who need and would use the product (overexclusion). We report on a randomized controlled trial of a screening mechanism that combines the free provision of chlorine solution for water treatment with a small nonmonetary cost (household vouchers that need to be redeemed monthly in order). Relative to a nonvoucher free distribution program, this mechanism reduces the quantity of chlorine procured by 60 percentage points, but reduces the share of households whose stored water tests positive for chlorine residual by only one percentage point, substantially improving the trade-off between overinclusion and overexclusion.

Policy-makers have long debated whether developing countries should charge for health products such as deworming medication, malaria medication, mosquito nets, water treatment solution, and latrines. Multiple studies have found that demand for preventive health goods is highly sensitive to price (1–4). For mosquito nets, usage appears as high among recipients who get them only when they are free or nearly free as among those able to pay a price of USD 1 or more (2, 5–8). However, in the case of water treatment solution, Ashraf, Berry, and Shapiro (9) argue that households with lower willingness to pay for those willing to expend a small effort (redemption of a month-specific voucher at a local shop) to obtain it. By testing households’ stored water for chlorine residual, we assess actual use of the product and thus compare the extent to which each mechanism generates errors of exclusion (by providing the product to households that will not use it to treat water) or of exclusion (by preventing households that would use the product to treat water from obtaining the product). We then examine how the optimal choice of mechanism for a policy-maker depends on these error rates, the cost of each mechanism, and policymakers’ valuation of households’ use.

Setting and background

Diarrhea is a major cause of child mortality (ages 1 to 59 months) globally and in Kenya (10). Water is a major channel for the transmission of diarrheal disease. Dilute chlorine solution kills many of the pathogens that cause diarrhea. Arnold and Colford (11) review 21 randomized controlled trials on the impact of point-of-use water treatment with dilute chlorine solution and find that access to point-of-use chlorination reduces reported child diarrhea by an average of 29% overall (13). Dilute chlorine solution is socially marketed in many countries by the nongovernmental organization (NGO) Population Services International (PSI), which receives donor support.

The study took place from November 2007 to September 2008 in western Kenya, a region with the second highest prevalence of child diarrhea in Kenya (14). In addition to free government provision during epidemics, the primary approach to distribution of water treatment solution in this area had been social marketing and sales to households through retail shops. PSI began marketing 150-ml bottles of dilute chlorine solution branded as “WaterGuard” in Kenya in May 2003. These bottles, expected to last a household 30 to 50 days (15–17), were sold at a price of 20 Kenyan shillings (Ksh) at the onset of this study, around USD 0.30 at the exchange rate at that time (16, 19). Although brand recognition for WaterGuard is high, as is reported understanding of the potential benefits of the technology, take-up of water chlorination in rural western Kenya is low. Kremer et al. (20) report that only 7% of rural households in this part of Kenya were using chlorine to treat their drinking water, a rate typical of many other rural African settings. Point-of-use water treatment services reported positive behavior
Reducing Sexual Violence by Increasing the Supply of Toilets in Khayelitsha, South Africa: A Mathematical Model

Gregg S. Gonsalves, Edward H. Kaplan, A. David Paltiel

Published: April 29, 2015 • https://doi.org/10.1371/journal.pone.0122244

Background

Sexual violence is a major public health issue, affecting 35% of women worldwide. Major risk factors for sexual assault include inadequate indoor sanitation and the need to travel to outdoor toilet facilities. We estimated how increasing the number of toilets in an urban township (Khayelitsha, South Africa) might reduce both economic costs and the incidence and social burden of sexual assault.

Methods

We developed a mathematical model that links risk of sexual assault to the number of sanitation facilities and the time a woman must spend walking to a toilet. We defined a composite societal cost function, comprising both the burden of sexual assault and the costs of installing and maintaining public chemical toilets. By expressing total social costs as a function of the number of available toilets, we were able to identify an optimal (i.e., cost-minimizing) social investment in toilet facilities.
The graph illustrates the cost of toilets, cost of assaults, and total cost as a function of the number of toilets. The current and optimal positions are marked on the graph, with the cost-neutral position shown as well. The red line represents the cost of toilets, the green line represents the cost of assaults, and the purple line represents the total cost. The graph shows that as the number of toilets increases, the cost of toilets and the total cost decrease, while the cost of assaults increases.
The potential of positive deviance approach for the sustainable control of neglected tropical diseases

Ken Ing Cherng Ong¹, Hitomi Araki¹, Shigeyuki Kano² and Masamine Jimba¹*

Abstract
Neglected tropical diseases (NTDs) have gained much attention in recent years due to the support from various agencies. However, the main approach to combat NTDs has been to cure rather than to prevent. As many NTD infections are closely linked with human behaviors such as hygienic practices and tradition, behavior change is also very crucial to prevent relapse or reinfection. Therefore, we would like to suggest a potential new approach—the positive deviance approach—to tackle NTDs by focusing on the preventive phase. What makes this approach unique is that the solution comes from the affected population themselves and not from the expert outsiders. Preventive chemotherapy that relies on outside aid has serious sustainability issues as reinfection is also high after the aid program has ended. Learning from the success story in Vietnam on preventing childhood malnutrition, the positive deviance approach could end the spread of NTDs once and for all by making full use of the available local solutions.

Keywords: Neglected tropical disease, Positive deviance
Sharing Data
WATER, SANITATION, and HYGIENE

Every 21 seconds, a child dies of a waterborne disease. In sub-Saharan Africa, women and children spend 20 million hours a day fetching water.

768 million people do not have access to clean water. Waterborne diseases are among the leading killers of children under 5.

Americans spend about $65 billion on soft drinks every year, enough to provide access to improved water and sanitation for everyone in the world for more than 2 years.

http://richstearns.org/graphics
Reinventing the toilet for 2.5 billion in need

High-tech toilets for tackling the growing public health problem of human waste are gaining increasing attention. But, as Gary Humphreys reports, low-tech solutions may be more practical in poor countries.

Professor Karl Linden of the University of Colorado, Boulder, in the United States, is understandably proud of his team’s toilet. It looks like a missile tracking system and makes human feces and urine disappear; or, to be more precise, turns solid waste into biological charcoal, a material known as bio-char that can be safely used as a fuel or fertilizer, while urine-infused bio-char can be used as a nitrogen-rich fertilizer. “Nothing harmful is left over,” says Linden. “There are no by-products, no germs, nothing.”

The Sol-Char toilet is one of the winners of the Bill & Melinda Gates Foundation’s Reinvent The Toilet Challenge, a competition launched in 2011 to encourage the development of technological solutions that will bring safe, affordable sanitation to the 2.5 billion people worldwide estimated to be without it.

In the first three years of the competition, 15 grants were disbursed. One, for example, went to a University of Bristol team, to develop a device that transforms human waste into electricity. Another went to Swiss aquatic institute EAWAG for a toilet that stores urine and feces for energy recovery, and another to RTI International in the USA for a model that disinfects urine, dries and buries waste and converts this into stored electricity.

Recently the Gates Foundation joined forces with Indian Biotechnology Industry Research Assistance Council to pick six teams of researchers from India, who are developing several models, including a solar-powered toilet with an in-built waste processing capability and a toilet that uses ultrasound to reduce water wastage.

“The idea of the challenge isn’t simply to come up with better toilets, but to invent new ideas and new approaches to dealing with human waste,” explains Gates Foundation sanitation expert Jan-Willem Rosenboom, who has 10 years’ experience of working on sanitation solutions in the field. Prior to joining Gates, Rosenboom worked for Oxfam and the United Nations Children’s Fund (UNICEF).

The Gates Foundation initiative is laudable and addresses a serious problem. According to Bruce Gordon, acting co-director of the Water, Sanitation, Hygiene and Health Unit at the World Health Organization (WHO) in Geneva, the lack of access to clean sanitation currently puts an estimated 2.5 billion people at risk of many diseases including dysentery, cholera, typhoid, schistosomiasis, trachoma and intestinal worms. An estimated 645,000 children under five die every year from diarrhoea—a preventable, sanitation-related disease.

“Progress on the issue has been disappointing,” Gordon says, noting that the Millennium Development Goal (MDG) sanitation target to halve the proportion of the global population without access from around 58% in 1990 to 23% in 2015 is unlikely to be met, while the number of people practising open defecation—usually because they have no other option—has fallen by only 21% over the past two decades to around one billion in 2012. “Achieving universal access to basic drinking water sources appears to be in reach, but we will not achieve universal access to basic sanitation without some fundamental change,” Gordon says.

The idea is to invent new ideas and new approaches to dealing with human waste
Jan-Willem Rosenboom

Is reinventing the toilet the way to achieve that change? Rosenboom thinks so, but has no illusions about the ease of the challenge faced, a challenge reflected in the stringent selection criteria of the Reinvent The Toilet Challenge competition.

The winning toilets are supposed to remove germs from waste, recover valuable resources such as energy, clean water and nutrients, without being connected to water, sewer or electrical mains. They should be cheap—less than 1 cent per user per day ($0.005) — and suitable for promoting sustainable and profitable sanitation services and businesses that can operate in poor, urban settings. “It is admittedly a very tall order,” Rosenboom says.

It is so tall, in fact, that none of the winners of the Reinvent The Toilet Challenge competition, so far, have managed to tick all of the boxes, though some have come close. Several new toilet models will be field tested this year in Bangladesh, Kenya, India, Senegal and South Africa.
Art

https://www.youtube.com/watch?v=lo1cRLdqKq4
Using Evidence

Looking at Context and Implications

What good does it do to treat people’s illnesses...

...only to send them back to the conditions that made them sick?
Social Determinants of Health & Sanitation

“Until everyone has access to adequate sanitation facilities, the quality of water supplies will be undermined and too many people will continue to die from waterborne and water-related diseases,” ~ Dr Maria Neira, Director of the WHO Department of Public Health, Environmental and Social Determinants of Health.
Global Public Health ~ SDGs and Human Rights

Public Good or a Private Commodity?
Global Public Health ~ SDGs and Human Rights

Who is most at risk?
Who benefits from existing or modified conditions?

- Gender
Refocusing Upstream ~ sometimes literally

- Flint, MI crisis
- Henderson Island
- Agbogbloshie, Accra
Implications for Teaching Global Health

WASH Programs

- Strengths & limitations to infographics and ‘education only’ outreach

Socio-Ecological Models must include:

- Focus on Structural inequalities
- Power
- Diversity of contexts
- Multi-disciplinary approaches
What’s next?
After Lunch:

1. In small groups (assigned): brainstorm ideas
2. Individually: learn, develop assignments, think...
3. In small groups: share progress, get feedback

Sharon, Rebecca, Eric are all available for discussion.
Wednesday

Share with workshop
Now: lunch