

CLIMATE, WATER ECOLOGY & PUBLIC HEALTH
IN KAMPALA, UGANDA

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MOTIVATION

Of total global deaths in 2013, 2.3% were diarrhea related. Of total global deaths in children under 5, 9% were diarrhea related (IHME).

Climate-related outbreaks of waterborne disease

- Haiti, Bangladesh – Cholera outbreaks related to rise in sea temperature

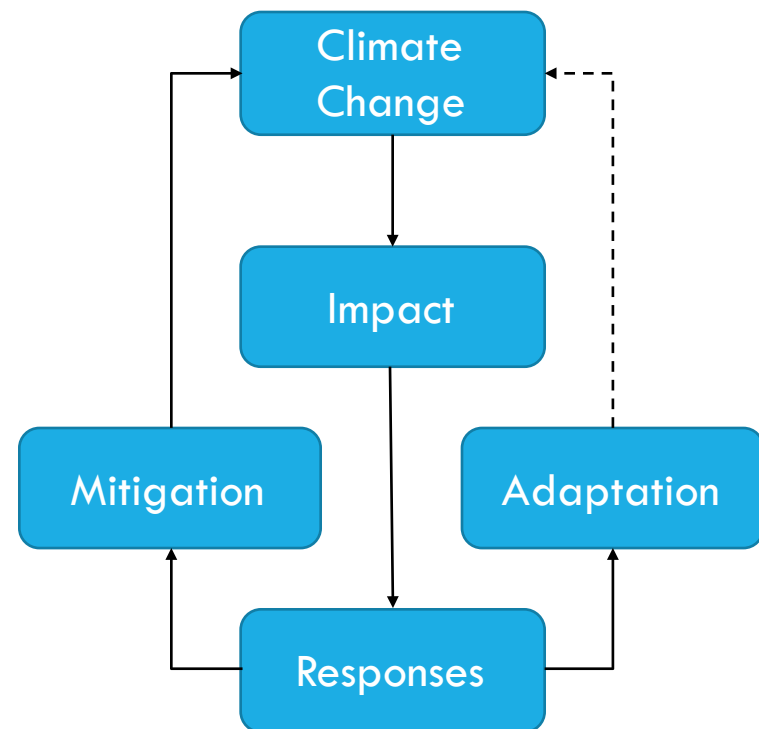
Climate change projected to have the greatest impact on developing countries

- Economic capacity, infrastructure resiliency, emergency response capacity

RESEARCH OBJECTIVES

It is widely accepted that heavy precipitation during the rainy season increases waterborne disease incidence. **How does this relationship manifest in a changing climate?**

1. Identify and quantify human enteric pathogens in environmental waters.
2. Use climate, water quality and disease incidence data to create a disease outbreak prediction model for Kampala.
3. Interpret how this model may help policymakers and designers develop climate change adaptation (CCA) strategies for Kampala.



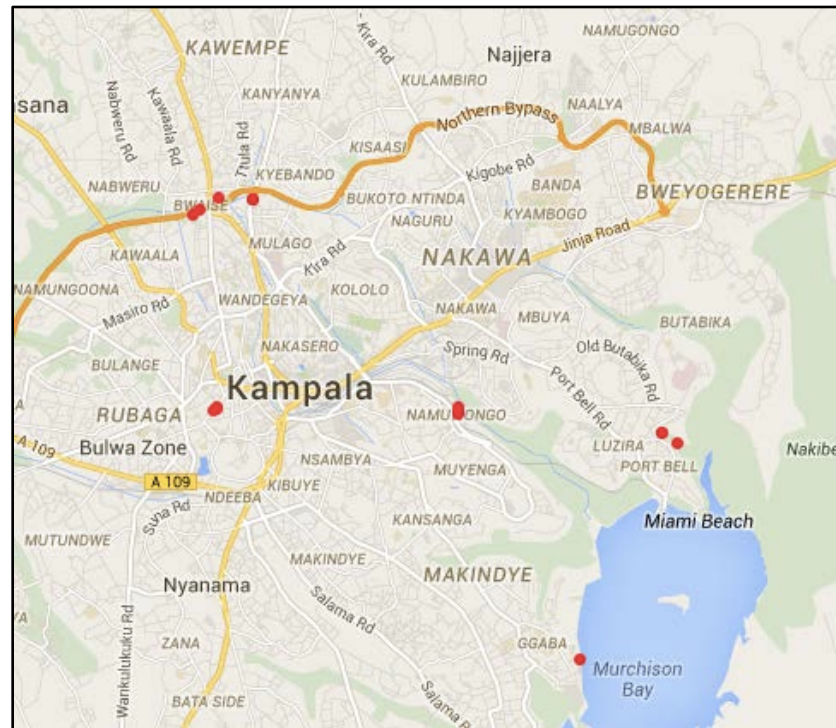
WATER SAMPLING— KAMPALA, UGANDA

DURING RAINY & DRY SEASONS

8 Protected Springs

1 Public Tap

7 Surface Waters



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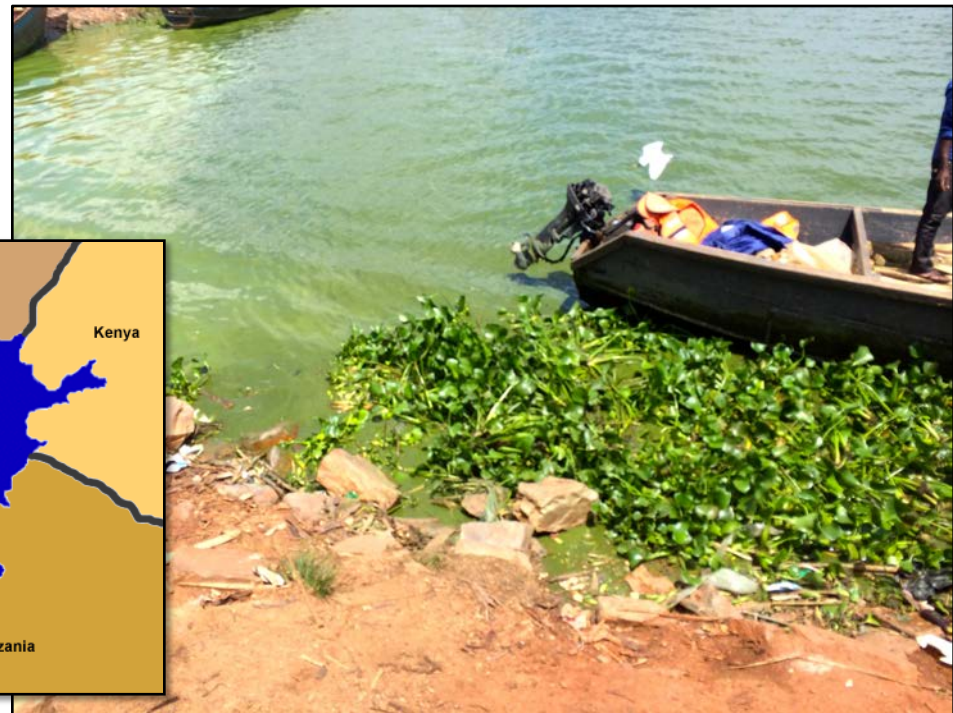
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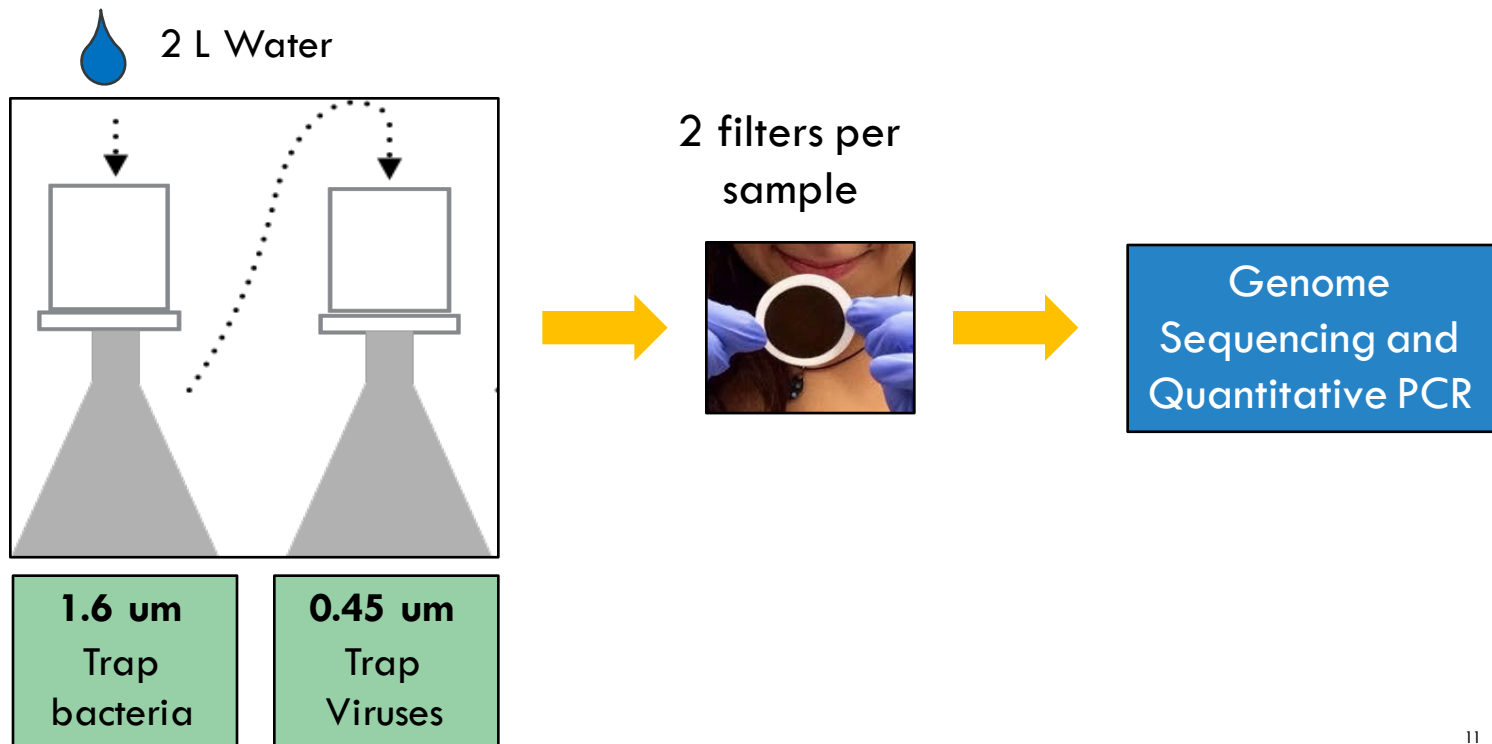
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WATER SAMPLE CONCENTRATION

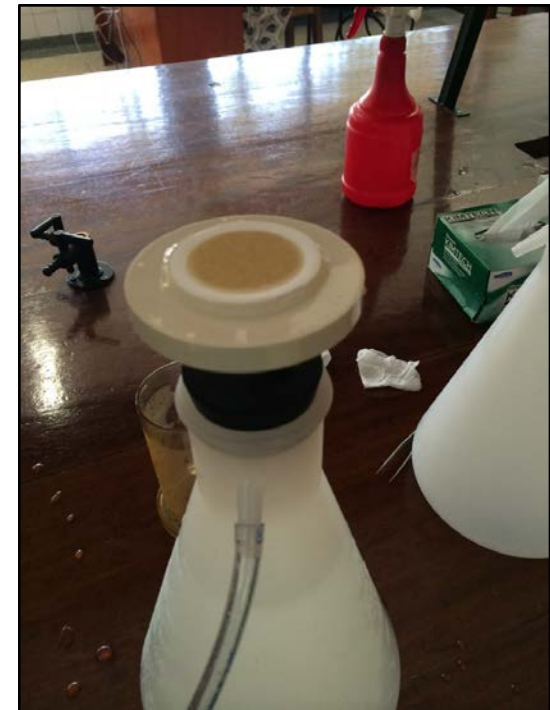
TRAPPING BACTERIA AND VIRUSES FOR ENUMERATION



WATER SAMPLE CONCENTRATION

TRAPPING BACTERIA AND VIRUSES FOR ENUMERATION

Uses a small vacuum pump and is solar powered.



Public Tap

WATER SAMPLE ANALYSIS

USING GENOME SEQUENCING AND QUANTITATIVE POLYMERASE CHAIN REACTION (QPCR)



Filter Extraction

- Extracts all the microorganisms stuck to the water filter

Genome Sequencing

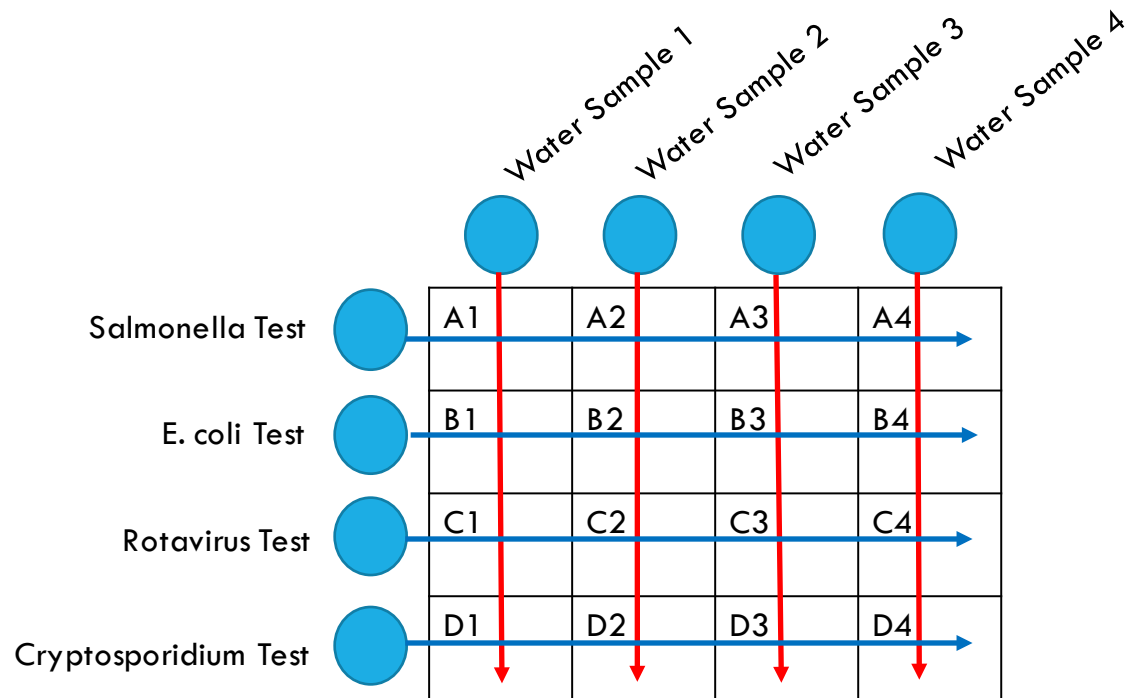
- Shows all the microorganisms present in a water sample, and allows us to compare microbial composition in the rainy seasons compared to the dry season.

Quantitative Polymerase Chain Reaction (qPCR)

- Shows the number of specific enteric pathogens in a water sample (*Salmonella Typhi*, Rotavirus, Cryptosporidium, etc).

CURRENT & FUTURE WORK

METHODS FOR MICROFLUIDIC QPCR

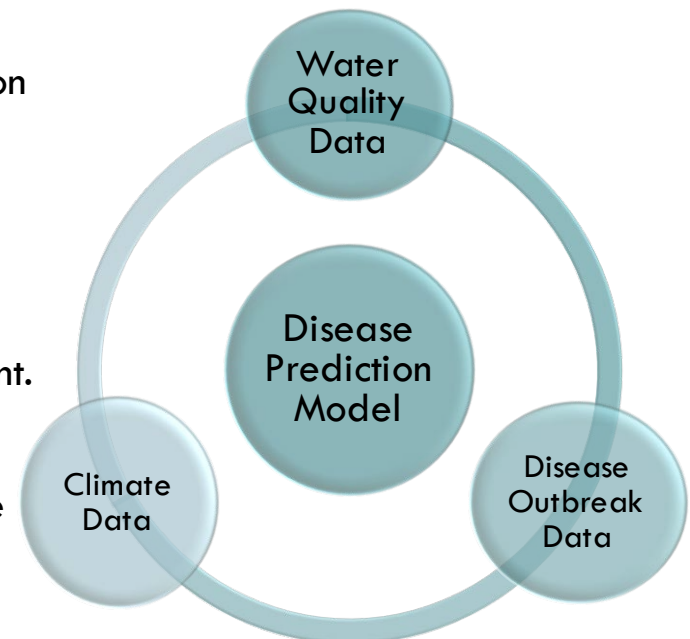


BROADER IMPACTS

We can use this data towards a disease outbreak prediction model that will consider inputs such as climate and water quality.

The mfqPCR system can be applied to a wide variety of environmental samples – water, soil, stool, surfaces – for rapid and precise detection of pathogens in the environment.

Long-term monitoring of climate, water quality and disease outbreak may reveal significant trends that lead to the redesign of water treatment systems and practices to promote climate resiliency.



ACKNOWLEDGEMENTS

Dr. Helen Nguyen and the Global Water and Food Safety Research Group

Dr. Noble Banadda and Makerere University

Fulbright Institute of International Education

Warren Lavey & Dr. Holly Rosencranz Award in Climate Change and Public Health

AWWA & CH2M Hill Holly A. Cornell Scholarship

Illinois Section AWWA Safe Water Scholarship

