



**Name:** *JACQUELINE KNEE*

PhD student Georgia Institute of Technology, Dept. of Civil and Environmental Engineering

E-mail: [jknee3@gatech.edu](mailto:jknee3@gatech.edu)

### ***Area of Research/Teaching***

Each year, a lack of adequate water, sanitation, and hygiene (WASH) results in the deaths of over 842,000 people in low and middle income countries (LMIC) worldwide; of this number, 361,000 are children less than 5 years old. These estimates equate to the preventable deaths of over 2000 people per day. While these figures represent improvement over past estimates, it is plainly obvious that there is still significant progress to be made. I have spent the majority of my short academic and professional career focusing on issues related to WASH. Past projects have included evaluating household water treatment technologies, developing and/or evaluating detection methods for water quality indicator organisms, and assessing microbial water quality in various settings worldwide. Presently, my research is focused on better understanding the role of sanitation in modulating disease transmission and human health risk in peri-urban communities of LMICs.

The World Health Organization and Joint Monitoring Programme estimate that of the 2.5 billion people who lack access to basic improved sanitation, 756 million reside in urban areas, and this proportion is expected to increase as migration to cities continues. Health risks associated with unsafe excreta disposal can be more pronounced in densely populated urban areas due to the amount of excreta produced and probability of exposure. In fact, populations living in informal, peri-urban settlements experience persistently elevated disease risk related to inadequate sanitation. Therefore, sanitation interventions targeting urban slums may yield increased public health gains given the high baseline risk associated with living in these areas.

The MapSan trial, the focus of my current research efforts, is a USAID-funded, collaborative study led by the Georgia Institute of Technology and the London School of Hygiene and Tropical Medicine which seeks to understand whether and how improved shared sanitation impacts disease risk in peri-urban informal neighborhoods of Maputo, Mozambique. The study is designed as a controlled before-and-after (CBA) trial to assess the effect of implementing a sanitation intervention on child health and how that effect may be modified by localized population density. The intervention consists of the construction of private, on-site, pour-flush latrines shared by multiple households. To determine the effect on health risk, we will measure objective health outcomes in 760 children <5 years old living in intervention and control communities at two time-points - prior receiving the intervention and 12 months following latrine handover. We will also investigate the potential impact of the invention on enteric pathogen transmission and exposure through fecal source tracking, exposure assessment, and microbial transmission modeling. This is the first controlled sanitation intervention trial to measure the effect of on-site sanitation, shared sanitation,

and localized population density on child health and the results should help inform ongoing policy discussions and decisions in the WASH sector.

In addition to the MapSan trial, our research laboratory at Georgia Tech is involved in several other research projects including an evaluation of field-deployable, low-cost *E. coli* tests for water quality monitoring and surveillance in low-resource settings and the development of a quantitative microbial risk assessment framework to predict health risks associated with use of intermittent or poorly performing water supplies.

### **Biography**

I first became interested in public health and environmental engineering while studying at UNC-Chapel Hill where I received both my Bachelor's and Master's of Science of Public Health (2008 BSPH, 2010 MSPH) from the Department of Environmental Science and Engineering (ESE) in the Gillings School of Global Public Health. As a student in the ESE department, I completed an interdisciplinary curriculum comprised of courses in environmental science, microbiology, immunology, biostatistics, epidemiology, health behavior and education, and laboratory training. I completed my undergraduate and graduate research under direction of Dr. Mark Sobsey, who is responsible for introducing me to the field of water, sanitation, and hygiene. While my research at UNC consisted of laboratory-based evaluation of point-of-use water treatment options and optimization and adaptation of water quality methods for use on marine water, I wanted to apply the skills and knowledge acquired in school to field research. In pursuit of this goal, I applied for and was awarded a Fulbright Fellowship to perform research in Thailand.

As a Fulbright Fellow (2010 – 2011), I collaborated on a project investigating the potential relationships among stored rainwater quality, diarrheal disease, and dengue fever in rural Thailand. While abroad, I learned how to design and implement a laboratory research project in a resource poor area of a foreign country, troubleshoot issues that arise during field research, and work with a team of scientists of varying academic backgrounds to achieve a common goal.

Upon returning to the US, I accepted a job in the Waterborne Disease Prevention Branch (WDPB) at the Centers for Disease Control and Prevention (CDC). While at the CDC (2011 – 2013), I worked on variety of research projects including the optimization of an ultrafiltration technique for the detection of bio-threat agents in water, evaluation of the microbiologic quality of composted latrine waste in Haiti, and development of a method for detecting hepatitis E virus in foodstuffs. This diversity of my research experience has reinforced my interest in WASH research as it pertains to developing and resource poor regions, allowed me to develop and expand my technical skills as a scientist, and provided me a unique perspective on the utility and importance of scientific research outside of the world of academia.

Presently, I am completing my first year as Ph.D. student in Dr. Joe Brown's research group in the Civil and Environmental Engineering Department at the Georgia Institute of Technology. After considering more traditional public health programmes for my doctoral degree, I settled on Georgia Tech for two reasons: (1) I believed the academic environment of a technical engineering school would provide me with a new perspective on WASH issues and (2) I was afforded the opportunity to work with Dr. Joe Brown on the MapSan trial. Data collection for MapSan should end in August 2016, and I plan to complete my Ph.D. by May 2018.

Looking forward, I hope to return to the CDC and help establish a global WASH laboratory within the WDPB that focuses on the needs of disadvantaged or resource poor communities abroad.

WASH represents an important field of research full of dedicated, intelligent scientists and policymakers who have the capacity to affect positive change on the health and well-being of populations worldwide. Oftentimes, however, this change is slow and is marred by issues of sustainability. Through increased collaborative research with other sectors such as water resources, I believe we have the potential to make meaningful, lasting progress towards increasing access to safe water and sanitation and improving the health of some of the world's most disadvantaged populations. For this reason, I truly look forward to the opportunity to learn about the state of science in other research sectors and to foster collaborative relationships with scientists across academic fields.