Thesis Portfolio

Sewage Surveillance Tool for Tracking of SARS-CoV-2 in Urban Bangladesh
(Technical Report)

Factors Affecting Current SARS-CoV-2 Vaccine Reception
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

My technical work and STS research are connected by the topic of the coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. My technical work aids Bangladesh health officials in tracking COVID-19 cases in the city of Dhaka, while my STS research analyzes the network of actors that would disrupt COVID-19 vaccine distribution in America. Both of my projects are a response to the COVID-19 pandemic: tracking SARS-CoV-2 cases and effectively implementing SARS-CoV-2 vaccines. While my technical work and STS research differ in country and countermeasure presented, they are related by the common goal of trying to contain the coronavirus.

For my technical work, my capstone team created a dashboard using R Shiny to represent the spatiotemporal prevalence of SARS-CoV-2 in Dhaka, Bangladesh. Our dashboard displays a heat map of reported clinical case data for eight wards in Dhaka underneath sewage surveillance data. Our sewage surveillance is conducted at thirty-three different environmental sites within the eight monitored wards in Dhaka, and the wastewater is tested weekly for the viral load of the N1 region of the SARS-CoV-2 gene. Sewage surveillance is used because it is an unbiased and low-cost way to provide widespread testing of the large population in Dhaka and sewage surveillance can track disease progression before clinical cases are reported. Our dashboard also displays shapefiles of the study areas and time series plots of the clinical cases and sewage surveillance data. The dashboard is used by public health officials in Bangladesh to make actionable decisions and allocate resources to areas with a high prevalence of SARS-CoV-2.

My STS research assesses the network preventing widespread SARS-CoV-2 vaccine distribution in America. The SARS-CoV-2 vaccine is the most effective countermeasure to combat the COVID-19 pandemic and approximately 85% of the American population needs to get vaccinated to achieve herd immunity and stop the spread of the virus. There are many factors that impact effective administration of the COVID-19 vaccines, such as fear, distrust, cost, availability, and vaccine myths. The anti-vaccination movement, political ideology, low-income status, and racial minorities also represent four populations that are less likely to receive the vaccine. Actor-Network Theory (ANT) was used to analyze the network of actors preventing effective vaccine distribution, in order to understand the relationships within the network and recommend steps public health officials and community members should take to increase vaccine uptake and increase probability of reaching herd immunity.

Working on both my STS research and technical capstone work simultaneously gave me a greater breadth of knowledge for the necessity of tracking COVID-19 and the importance of a vaccine in containing COVID-19. These projects were very timely, as I was working on them throughout the COVID-19 pandemic. Understanding the burden SARS-CoV-2 was placing on the medical infrastructure in Dhaka, further enabled me to understand the importance of containing COVID-19 and achieving herd immunity through SARS-CoV-2 vaccination. It was impactful to contribute to COVID-19 tracking and control in the overpopulated city of Dhaka, and I learned the difficulty of tracking a disease and implementing a vaccine. Working on my technical project and STS research paper this past year has allowed me to explore COVID-19 control from two different angles and has improved the quality of both of my works by giving me a deeper understanding of the work it takes for a government to combat a pandemic.