

**Thesis Project Portfolio**

**Engineering a Resilient Regional Healthcare System: Improving Stroke Care in Shelby County, TN**

(Technical Report)

**Ethical Dilemmas Surrounding the Advancement in Cancer Therapies**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

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## **Sociotechnical Synthesis**

High strain scenarios, as seen in the COVID-19 pandemic, create bottlenecks for healthcare facilities limiting the distribution of patient care. In these scenarios, strokes, among other serious ailments, become difficult to treat leading to higher rates of stroke prevalence. To mitigate stroke prevalence, our team has developed a simulation model that can measure the effectiveness of healthcare delivery in the midst of high strain conditions. As a part of a broader project aimed at improving healthcare delivery at the national level, this project served as a means of getting the model started by using a smaller scale. For this model, the focus is on Shelby County, TN given its nationally high stroke prevalence and mortality. To consider the human and social dimensions of stroke care, our team also factored in disparities surrounding stroke care toward underserved populations that often have higher rates of stroke prevalence. This was accommodated by evaluating metrics such as distance to healthcare facilities. Along with other pertinent variables within the approach to stroke care, this plan ensured all necessary variables were involved when using the model to optimize stroke care for all portions of the population in Shelby County.

While acknowledging the importance of healthcare disparities in stroke care, the second portion of this project addresses the ethical dilemmas surrounding medical decision making (MDM) for cancer patients. Ethical dilemmas involve decisions that present two options both if taken, could be ethically wrong. These situations are commonplace in healthcare and even more so when discussing treatment options with cancer patients. When patients are at the end of their life, MDM becomes even more complex and approaching ethical dilemmas more difficult. Another phenomenon, moral distress, when one feels powerless in delivering sufficient patient care, is a potential outcome of ethical dilemmas that was also investigated. With the rise in prioritization of comfort care, treatment options such as palliative care are making the MDM process more

important. Interviews with palliative and hospice care physicians were conducted to learn more about the ethical dilemmas that arise in the hospital and the impact these have on MDM. To provide more background on this topic, a historical analysis of MDM models was also conducted. By using these methodologies, the aim was to better understand the intricacies of ethical dilemmas. In the same sense, this would better equip physicians to confront ethical dilemmas and promote a more effective approach to treating diseases like cancer.