

Thesis Project Portfolio

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

(Technical Report)

A SCOT Analysis of Home Cooking in American Culture

(STS Research Paper)

An Undergraduate Thesis

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

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Megan Everett

Spring, 2022

Department of Biomedical Engineering

Table of Contents

Sociotechnical Synthesis

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

A SCOT Analysis of Home Cooking in American Culture

Prospectus

Sociotechnical Synthesis

Strokes are a leading cause of death in the United States, and having adequate and prompt care when needed is critical to increasing a person's survival rate for strokes. Despite this importance, healthcare systems are designed in a suboptimal way and are often focused on fixed facilities that do not perform well under high-strain. The healthcare system could be reconfigured in such a way that it would allow for better stroke care and improve people's health, no matter the situation. Stroke treatment may occur at a hospital, but the management of its risk begins at home, with many modifiable risk factors for stroke being nutrition or diet related. A simple way to create a healthier diet is to cook at home, which often naturally decreases the amount of high-calorie, high-fat, and high-sugar foods consumed. By exploring the reasons behind why people choose to cook or not, an understanding of motivations is gained that can be leveraged to ultimately improve people's health, right in their own homes.

Fixed care facilities are typically the most prominent and common type of healthcare resource present in current healthcare delivery models. These facilities are immobile, and include buildings like hospitals and clinics. This kind of facility limits the flexibility of care and is not naturally resilient in high-strain scenarios, such as during a natural disaster or pandemic. During high-strain times, these healthcare delivery systems experience a time where they are unable to provide adequate healthcare to all groups of the population and bottlenecks are often created. The underserved communities who already face countless barriers to healthcare access over time are the most burdened by this decrease in accessibility to care. If healthcare resources were allocated in a different way, or if there was less of a focus on fixed facilities, there could be great benefits to these underserved communities and more adequate care could be provided throughout the duration of high-strain scenarios. Reallocating resources is especially important for common and chronic diseases, such as strokes. The time it takes to arrive at a hospital and to receive care after symptom onset is critical for strokes; these times are often suboptimal within current healthcare delivery systems. The continuum of care for strokes could be improved at every point, from preventative interventions to rehabilitative care, by reallocating healthcare resources

appropriately. This technical project used modeling to explore ways to reallocate healthcare resources with the goal of optimizing a healthcare system to provide improved care for strokes, even when facing high strain. This model is focused on Shelby County, Tennessee's current healthcare system. Agent-based modeling was utilized to recreate Shelby County's healthcare system, and the model was then altered to discover ways that the healthcare system could be improved through reallocating healthcare resources. By creating this model and developing recommendations that will lead to improved stroke care, the development of a resilient regional healthcare system with positive outcomes for those who are affected by strokes is made possible.

People affected by strokes can also benefit from altering the modifiable risk factors for strokes, which include eating a healthier diet; one of the easiest ways to eat healthier is to cook food at home. People in the United States are eating an increasing amount of food that is prepared outside the home and relying less on home cooking than ever before. Simultaneously, popular cooking television shows, viral food trends, and celebrity chefs' influence are on the rise. These and numerous other factors, such as dietary recommendations from medical professionals or simply the social benefits that come from cooking, have strong influences on home cooking in America. To investigate these factors and their effect on home cooking, this research seeks to answer the question, "How is home cooking influenced by American culture?" To support the analysis of this research, the STS framework of the Social Construction of Technology (SCOT) is utilized. The findings of this research will be manifold. Firstly, relevant social groups that are involved with home cooking will be identified and the most pertinent groups will be specifically analyzed to elucidate each group's understanding of home cooking's place within American culture. By doing so, home cooking can then be discussed in its wider context, resulting in a clear evaluation of the multiple influences American culture has on home cooking. This research is novel and will contribute to the field of STS, to people's understanding of home cooking, and to public health initiatives that seek to promote home cooking in America.

Having worked on the aforementioned technical project and STS research project simultaneously, unique insight was granted to both projects throughout the research process. The technical project focused on large-scale, systemic changes that could be made to improve people's health, specifically for stroke care; whereas, the STS research focused on a small-scale, individualized aspect of life that could be utilized to improve people's health. While these projects are different in their scale and focus, they both come together nicely to depict the importance of both system-wide and individual change to improve human health. The STS research informed the technical report by emphasizing the role that modifiable risk factors and demographics play in people's health – a point that the team took into consideration when designing the model of the healthcare system. These insights would not have been gained had the projects been done independently of one another.