Thesis Project Portfolio

The Mathematical Modeling of Muscle Cramps

(Technical Report)

Mobile Maternal Health Education in India: A Case Study on Kilkari

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Introduction

Both my STS research project and capstone project explored dimensions of maternal health. My STS research delved into a technological way maternal health is increased in a developing country where the rate of maternal and fetal deaths is high. I analyzed how this technology shapes the society in which it is implemented, as well as how societal influences such as culture shape the design and implementation of the technology. My technical research innovated a computational way in which a symptom of pregnancy can be further researched. This work will ultimately provide a framework to test the different ways in which muscle cramps can form. Overall, working on these projects together gave me a better understanding of both maternal health research and access to maternal health education.

STS Project

My STS project centered on one method of improving maternal health through education in India. Kilkari is the world's largest maternal health messaging service that reaches millions of subscribers every year and educates them about pregnancy and infant practices. I explored its history and factors that determine its scalability, improvement, and success. Specifically, I described the transition of the administrative institutions responsible for the service and examined the effects of this on its success. I then analyzed documents from the Government of India and secondary studies that critique and evaluate Kilkari's performance throughout the years. Through this, I conducted an analysis of both societal and technological factors through the framework of viewing artifacts to have politics. Finally, I concluded that more government

power is necessary to reach subscribers and properly train front line healthcare workers to result in less disparate maternal health outcomes across states.

Technical Report

My Capstone Project was inspired by an experience I had while shadowing in a maternal fetal medicine clinic at UVA Health. I witnessed how the prevalence of leg cramps during pregnancy was a problem that many women in the clinic faced, yet no physician could explain the underlying cause of such cramps. Upon further research, I discovered that the etiology of all muscle cramps is unknown, and there does not exist a model to recreate and study the stages of cramp formation, sustenance, and relaxation. To bridge this gap, we created a model that takes in all the sensory components of muscle to represent both the parts that cause a muscle contraction and the reflexes that modulate contractions. Ultimately, this project's innovation in creating a comprehensive model to explain muscle cramps is significant because it will provide a framework to test different ways a cramp is formed, sustained, and relaxed especially in the context of pregnancy.

Conclusion

Working on these projects concurrently has taught me a lot about dimensions of pregnancy, specifically by exploring the social and political aspects of maternal health initiatives through my STS research and understanding physiological difficulties relating to maternal health through my capstone project. My STS understanding influenced my approach to the technical report, prompting me to consider not only the etiology underlying pregnancy leg cramps but also the gaps in maternal health research that my project sought to bridge. The parallel work between my

projects underscored the interconnectedness of social, political, and biological factors in shaping

maternal health outcomes. Importantly, it reinforced the importance of tackling maternal health

challenges in different ways, from advanced science research in academic settings to basic

education access in less developed environments.