

**Structural Racism as a Barrier to Inactivated Influenza Vaccination Coverage During
Pregnancy and Influenza Modeling in the Americas**
(Technical Report)

**Power Structures and Political Ideologies Reflected in C-sections Rates in Brazil:
*An Analysis Using Langdon Winner's Theory of Technological Politics***
(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the
School of Engineering and Applied Science
University of Virginia, Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Biomedical Engineering

By

Hunter Newland

May 1, 2021

STS Socio-technical Synthesis: Racial Disparities Related to Childbirth in Brazil

My technical project and STS research project both address the need to reduce health disparities based on systemic inequalities in Brazil. Firstly, influenza during pregnancy can result in harmful health outcomes for the mother and the baby. These adverse outcomes range from increased rate of maternal hospitalization and mortality during pregnancy to low birth weights, low APGAR scores, and preterm births (Buchy et al., 2020). Additionally, these adverse effects have a higher rate of incidence in minority, pregnant populations (Mertz et al., 2017). The technical portion of my project focuses on these adverse outcomes related to the lack of influenza uptake and race in the state of Ceará, Brazil. For my STS research project, I also focus on the process of childbirth in Brazil. Specifically, my research project addresses the overwhelmingly high percentage of women in Brazil who opt for a Cesarean section (C-section) procedure during labor. The project analyzes the uptake of C-sections in relation to socio-economic status, gender, and racial identity. In what follows, I will elaborate upon both the technical and the STS research project in order to elucidate the racial health disparities surrounding technologies and childbirth in Brazil.

My technical project is an optimization model for influenza vaccination scheduling for pregnant populations in the state of Ceará, Brazil. Previous models for influenza vaccination solely model the spread of influenza or the amount of vaccinated individuals in a particular catchment area. Our model is similar to an SIR model for disease tracking, but it incorporates the current vaccination schedule for the country of Brazil and future, possible vaccination schedules that we as a team decided to test as viable options. The goal of this project is to reduce the amount of adverse outcomes related to influenza during pregnancy by better predicting the best vaccination schedule for the state of Ceará.

The STS research project focuses on the sociopolitical factors that are embedded into the C-section technology that harms minority pregnant women during childbirth. The C-section has a history of dangerous, violent use against women of color. Additionally, according to Langdon Winner's framework of Technological Politics, the C-section contains the politics of the society it is used in (Winner, 1980). In the case of Brazil, the C-section contains the patriarchal, white masculine dominance and white, masculine political agenda. These politics are perpetuated by the population of Brazilian pregnant women that use the C-section most frequently: whiter ethnicities that fall under higher socioeconomic class levels. My argument is that the extraneous use of the C-section (more than 70% above the globally recommended number of procedures) is an example of class-based and racial discrimination in the country of Brazil. This paper is used to critique a procedure used during childbirth in Brazil, and to encourage conversation about the types of politics that are embedded into technologies related to childbirth and maternal health.

Exploring these projects simultaneously allowed me to better understand the social and political landscape of the country of Brazil. The racial, political, and socioeconomic forces in Brazil greatly impacted both my technical and STS research project. These factors allowed me to incorporate vulnerable populations into our vaccination model and better predict the proper scheduling timing for the state of Ceará. Understanding the political and social landscape of Brazil allowed me to realize the political agendas furthered by the C-section and how these agendas harm particular racial groups within the pregnant population. In summary, working on both of these projects simultaneously allowed me to have a greater depth of knowledge for the ways in which technologies extremify racial health disparities in Brazil.

Citations

- Buchy, P., Badur, S., Kassianos, G., Preiss, S., & Tam, J. S. (2020). Vaccinating pregnant women against influenza needs to be a priority for all countries: An expert commentary. *International Journal of Infectious Diseases*, 92, 1–12.
<https://doi.org/10.1016/j.ijid.2019.12.019>
- Mertz, D., Geraci, J., Winkup, J., Gessner, B. D., Ortiz, J. R., & Loeb, M. (2017). Pregnancy as a risk factor for severe outcomes from influenza virus infection: A systematic review and meta-analysis of observational studies. *Vaccine*, 35(4), 521–528.
<https://doi.org/10.1016/j.vaccine.2016.12.012>
- Winner, L. (1980). Do Artifacts Have Politics? *Daedalus*, 109(1), 121–136. JSTOR.

Table of Contents

Socio-technical Synthesis

Structural Racism as a Barrier to Inactivated Influenza Vaccination Coverage During Pregnancy and Influenza Modeling in the Americas

Power Structures and Political Ideologies Reflected in C-sections Rates in Brazil: An Analysis Using Langdon Winner's Theory of Technological Politics

Prospectus