

**Understanding Pelvic Organ Prolapse:
A Comprehensive, Biofidelic Computational Model of the Pelvic Floor**
(Technical Report)

The Struggle for Accessible Healthcare in the Rural United States
(STS Research Paper)

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Biomedical Engineering

by

Liza Harold

May 9, 2023

Preface

How can equitable access to medical care in the United States be improved? Some demographic groups face disproportionate barriers to healthcare and have been underrepresented as study subjects in clinical research.

How can computational models help researchers understand rectocele? Pelvic organ prolapse (POP) occurs when pelvic organs descend into the vagina, causing painful symptoms. In the US, POP afflicts 50 percent of women over the age of 50; over 20 million women will be affected by 2030. Pessaries provide mechanical support to non-surgically treat POP, but are inefficient in treating rectocele, or prolapse of the posterior vaginal wall. Computational modeling of the pathology of rectocele may reveal new treatment possibilities. Healthy female MRI data was used to develop a novel computational model. The research team used finite element analysis simulations to study differences in pressure, force, and wall thickness. FEBio software was used to quantify displacement of the posterior vaginal wall. Simulation output suggests rectocele can be attributed to weakened mechanical properties in the vagina. Researchers can apply these results to develop more effective pessaries.

In the U.S., how do rural health advocates seek better healthcare access in rural areas? Many rural Americans have insufficient access to healthcare. In much of the rural U.S., specialists and general practitioners are scarce. Many advocates of medical equity neglect the needs of underserved rural communities. Others, however, promote healthcare access in rural communities through public policy reforms that address their specific needs and by taking rural populations' distinct lived experiences into account. Insufficient funding, resources and technology in rural healthcare systems, and neglect of the barriers that some rural populations face, lead to deficient healthcare access and pervasive inequity in the United States.