

**Working Title:** A Statistical and Machine Learning Analysis of Opiate Prescription for Chronic Degenerative Disease and/or Other Pain Syndromes

**Project Purpose:** Using the National Ambulatory Medical Care Survey (NAMCS) (and potentially other data sets), I would like to identify patient demographics that are over prescribed opiates as compared with average overall trends.

**Project Importance:** With advances in machine learning and statistical models making it easier than ever to examine data in new and interesting ways, applying these methods to a field that has not taken full advantage of these tools could add additional insight. As the opioid epidemic grows in scope and we are more aware of it, resources are being spent on stopping the crisis. Examining why certain groups of people are receiving opiates, and if those opiates are being prescribed correctly, could make an impact in helping those efforts.

**Project Overview:** The NAMCS data set is a publicly-available data set published by the Center for Disease Control (CDC) that described outpatient doctor's visits across the United States. For our Senior Capstone, my group examined trends in the overall population of patients, and especially those who were prescribed opiates. While some trends were evident, largely we realized that more meaningful results would come from narrowing the scope of the project to get more details about a specific group of patients.

The purpose of this project, therefore, is to narrow the focus of examination to those patients who suffer from chronic degenerative diseases and other pain syndromes. It is not clear whether the patients receiving opiates are from demographics representative of the population at large, or whether prescription trends for patients suffering from these conditions has changed over time. I would like to identify trends over time that may exist in the prescription of opiates to these patients. I may also compare these trends to the prescription of other pain medications for similar conditions. I may also identify differences that exist between opiate prescriptions for other conditions versus the ones identified. In identifying trends over time, I would like to find out whether opiate prescription for these conditions has increased at the same dramatically increasing rate as the overall trend associated with the opioid crisis.

**Thesis Committee:**

Advisor: Dr Emily Evans

Reader: Dr Tyler Jarvis

Honors Coordinator: Dr Paul Jenkins

**Qualifications of Committee:** Dr Evans is an Assistant Professor in the Department of Mathematics. Her research focuses on networks. Specific to my project, she has interacted with the medical field as she has done research on collagen lattice networks. I have also worked with Dr Evans in my job as a Teaching Assistant for the Applied and Computational Mathematics Emphasis (ACME), and in her role as advisor to the Women in ACME club. In addition, she helped to review my senior capstone project. Her guidance will be valuable, as having a mentor

who has gone through the process of guiding masters students will enable her to help me develop my project while still keeping it relevant to the subject at hand.

Dr Jarvis is a professor in the Department of Mathematics. He taught the senior capstone class, and I plan on extending the project I did in that class for my Honors thesis. His insights will be valuable in noting how I extend the principles taught in his class, and making them mathematically relevant. I also did research with Dr Jarvis for about a year.

**Project Timeline:**

- Preparation, prior research, etc on the NAMCS database: Sep 2018-April 2019, as my Senior Capstone Project
- Identify other data sets available, attempt to gain access to them, and run analyses on patients diagnosed with chronic degenerative diseases completed by: September 2019
- First draft of thesis complete: October 2019
- Final draft of thesis complete and ready for defense: November 2019

**Culminating Experience:**

I hope to be able to present my findings at the MAA Undergraduate Student Poster Session at the Joint Math Meetings in 2020, the CPMS student research conference, and the NAPCRAG and FMEC meetings. I will also submit this paper for publication with the Journal of the American Board of Physicians and the Journal of Addiction Medicine.

*Awesome!*