A Study of Addiction
The Opioid Epidemic: An Analysis at the State Level
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Abstract
Over the last two decades, there has been a significant increase in opioid prescriptions and addiction. The potential for addiction is related to factors that include genetics, prescriber behavior, user behavior and characteristics, in addition to environmental and systemic determinants. One measure for the gravity of the crisis is overdoses. In 2017, drug overdoses killed over seventy thousand Americans and overdose deaths are projected to increase in the future under current policies. Despite the risk of addiction and overdose, opioids are commonly prescribed to combat pain. This research uses mathematical modeling and cross-sectional time-series state level data to examine the socioeconomic, demographic, and community level factors that are important in explaining synthetic opioid overdose deaths.

Mathematical Models
Modelling was used to build a standard for comparison or reflect as a pattern or type. Mathematical models represent a process usually in the form of a set of equations that describe a number of variables (Drakes 2012). While there are several variations for the definition of math modelling, this paper will use the following: “A mathematical model is … “a description of a system using mathematical concepts and language to facilitate proper explanation of a system or to study the effects of different components and to make predictions on patterns of behavior” (Abramowitz and Stegun, 1964).

Table 1 contains an explanation of the variables and descriptive statistics.

Theory
As addiction is a chronic disease, it is related to theories in economics. The one of the most common theories of addiction and health relates is Gossman’s (1972) model of the demand for health. Gossman’s (1972) theoretical production function of health summarizes the relationship between health inputs and health outputs over a specified period of time. This model treats investment in health as a form of investment in human capital, health is a production and consumption. Health care is considered an input into the production of health stock. Similar to other investments, health can facilitate proper explanation of a system or to study the effects of different components and to make predictions on patterns of behavior (Abramowitz and Stegun, 1964). Applied mathematical models relating to economics fall into the econometrics field. This paper models the synthetic opioid overdose death rates for states.

State Level Analysis
This paper uses 2014-2015 panel state level data to examine the impact of prescriber behavior, user behavior and characteristics, and environmental factors opioid overdose deaths in the United States. The majority of the data used in this paper was extracted from the State’s Health Care Compare Web Tool. Data for prescription drug monitoring programs was extracted from Prescription Drug Monitoring Program Training and Technical Assistance Center (PDMP TAC). Data for cannabis laws was gathered from a historical timeline on ProCon.org.

Table 2 contains an explanation of the variables and descriptive statistics.

Heteroscedasticity is when the variance of the error terms varies with the variables. If the variance of the error terms is not constant, it violates a classical assumption. The White test indicated that heteroscedasticity was not present in equation (2) at the 5% level. Serial correlation occurs when current observations are dependent on previous observations. This can cause problems when using time-series or panel data. Durbin-Watson test is a more reliable test for serial correlation than a “Runs” test. I ran a Durbin-Watson test and found that test for serial correlation is inclusive. Thus, equation (2) remained unchanged.

Table 3 contains an explanation of the variables and descriptive statistics.

Conclusions
The final specification has two variables significant at α = 0.01 (ED and PSH), two variables significant at α = 10 (BD and MH), and three insignificant variables (SUI, PH, and F) with VIF above 5, however, none of the variables VIFs were above 5.5. Multicollinearity was thus deemed only a mild issue and the equation (2) remained unchanged.

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