STEM Fellowship Big Data Challenge 2019

Implications of Cannabis Prescribed on Opioid Overdose Rates

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May 23, 2019

Abstract

Cannabis is becoming a popular medication that is used to relieve pain. It started primarily as a recreational drug, cannabis has been legalized in various countries to help patients. Canada has become one of the countries that prescribes cannabis along with some parts of the USA. Since cannabis poses less serious side effects than most opioids, it was worth researching whether it will be replacing opioids in the future, and ultimately reduce the number of deaths due to opioid overdoes in North America. The number of deaths due to opioid overdoes and the number of cannabis patients were analyzed to see if there is a correlation. Through the analysis using graphical SAS software and data organization in Microsoft Excel, it was found that as the number of cannabis patients in many US states increased, the number of deaths due to overdose also increased. As a result. this hypothesizes that medical cannabis will not be fixing opioids crisis in North America in the near future. We can look at some data from States that have legalized cannabis for a longer amount of time, and compare between the rate of cannabis prescribed to patients and the rate of opioid

Keywords
Opioid Overdose, Cannabis, Analgesic Drugs

1 Introduction

According to the United Nations 2018 Drug report, 192.2 million or 3.9% of the world population consumed cannabis that year.[1] Cannabis is one of the most consumed drugs worldwide. Nowadays, many countries have legalized cannabis for medical purposes.

In 2018, cannabis was legalized in Canada. Cannabis is often used to relieve pain along with opioids.[2] However, when compared to other analgesic drugs like opioids, there is very limited information and data about cannabis on its ability to affect the current population of Canada. An important prospect of medical cannabis which has not been thoroughly researched is its potential to replace opioids that have more severe side effects.

In the past few years, both Canada and the United States have been struggling through an opioid crisis resulting into

a rapid increase in opioid overdose and deaths.[3,4] This report seeks to analyze the current health effects of cannabis in Canada, as a way to investigate whether it seems to be replacing opioids as an analgesic drug in the future.Such question can be accurately evaluated by comparing and analyzing data of cannabis consumed with the rates of opioid crisis from 2014 to 2018. By doing so, it will allow us to accurately predict whether cannabis can solve the opioid crisis over time in North America.

2 Materials & Methods

In order to analyze the correlation between the number of deaths due to drug overdose and the number of cannabis patients, SAS software was used to depict the relationship visually. The correlations were driven from statistical values along with graphs. Microsoft Excel and SAS were used to organize the data used. All the raw data were gathered from numerous sources. [3-12] SAS was also used to conduct a 2 sample t-test to determine whether there was significant difference in opioid overdose deaths between states where medical marijuana is legal and illegal.

3 Results

We first organized the drug overdose data using SAS by filtering the information that was needed (table 1), which left data for 8 states where medical marijuana is legal. Afterwards, the rates for each 2015 and 2017 opioid overdoses were calculated, as well as the difference between them (table 2). The data for the rates of medical marijuana patients between 2015 and 2017 was already available (table 3), so the difference in rates were calculated and plotted against the change in opioid deaths. By plotting the change in the rate of medical marijuana patients (per 1000) against the change in opioid overdose deaths (per 100000) from 2015-2017 (Plot 1), we found a positive relationship with a strong correlation (r=0.47376). Afterwards, a 2 sample t-test (2 sided) was conducted (table 4) between the change in opioid overdose rates in 8 states where medical marijuana is legal(mean=2.71) and 5 states where it's illegal (mean=2.92) between 2015-2017. This would help determine whether or not states where medical marijuana was available affected the number of opioid overdose deaths compared to states where it was not available. At the 0.05 level, there was no statistically significant difference found between the two groups. (p=0.53).

Table_1._Opioid_Overdose_Deaths Annually_in_the_United_States

Obs	State	Year	Month	Period	Indicator	Number_Of_Opioid_Deaths
1	CT	2015	December	12 month-ending	Opioids (T40.0-T	686
2	CT	2017	December	12 month-ending	Opioids (T40.0-T	967
3	ME	2015	December	12 month-ending	Opioids (T40.0-T	235
4	ME	2017	December	12 month-ending	Opioids (T40.0-T	348
5	NC	2015	December	12 month-ending	Opioids (T40.0-T	1159
6	NC	2017	December	12 month-ending	Opioids (T40.0-T	1921
7	NM	2015	December	12 month-ending	Opioids (T40.0-T	353
8	NM	2017	December	12 month-ending	Opioids (T40.0-T	336
9	NV	2015	December	12 month-ending	Opioids (T40.0-T	446
10	NV	2017	December	12 month-ending	Opioids (T40.0-T	438
11	OK	2015	December	12 month-ending	Opioids (T40.0-T	427
12	OK	2017	December	12 month-ending	Opioids (T40.0-T	387
13	OR	2015	December	12 month-ending	Opioids (T40.0-T	328
14	OR	2017	December	12 month-ending	Opioids (T40.0-T	344
15	RI	2015	December	12 month-ending	Opioids (T40.0-T	268
16	RI	2017	December	12 month-ending	Opioids (T40.0-T	284
17	SC	2015	December	12 month-ending	Opioids (T40.0-T	537
18	SC	2017	December	12 month-ending	Opioids (T40.0-T	748
19	UT	2015	December	12 month-ending	Opioids (T40.0-T	451
20	UT	2017	December	12 month-ending	Opioids (T40.0-T	456
21	VA	2015	December	12 month-ending	Opioids (T40.0-T	802
22	VA	2017	December	12 month-ending	Opioids (T40.0-T	1198
23	VT	2015	December	12 month-ending	Opioids (T40.0-T	77
24	VT	2017	December	12 month-ending	Opioids (T40.0-T	110
25	WA	2015	December	12 month-ending	Opioids (T40.0-T	702
26	WA	2017	December	12 month-ending	Opioids (T40.0-T	744

Table_2._Change_in_Opioid_Overdose Rates_from_2015-2017_in States_where_Medical_Marijuana_is Legal_and_Illegal

Obs	State	Rate_Change	Legality_Of_Medical_Marijuana
1	Connecticut	7.940	Legal
2	Maine	8.380	Legal
3	North Carolina	7.590	Illegal
4	New Mexico	-0.836	Legal
5	Nevada	-0.812	Legal
6	Oklahoma	-1.080	Illegal
7	Oregon	0.125	Legal
8	Rhode Island	1.510	Legal
9	South Carolina	3.920	Illegal
10	Utah	-0.428	Illegal
11	Vermont	5.290	Legal
12	Virginia	4.560	Illegal
13	Washington	0.220	Legal

Table_3._Rates_Of_Medical Marijuana_Patients_in_2015__2017

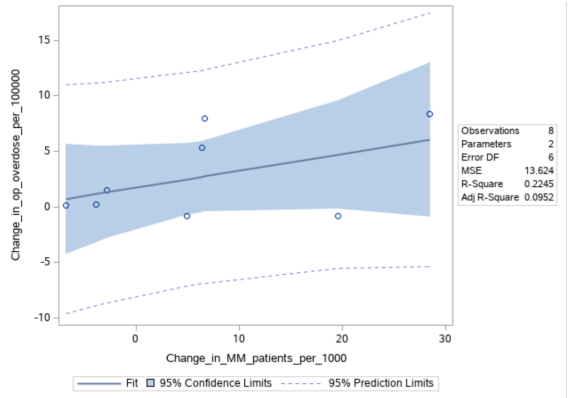
Obs	State	_2015_MM_Patients__per_100000_	_2017_MM_Patients__per_100000_
1	Connecticut	0.6	7.23
2	Maine	13	38.42
3	Nevada	2.3	7.2
4	New Mexico	5.5	25.03
5	Oregon	17.7	10.91
6	Rhode Island	8.8	5.96
7	Vermont	2.1	8.52
8	Washington	14.8	10.91

Table_4. T-Test results

State	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
Illegal		2.9124	-1.5948	7.4196	3.6300	2.1748	10.4310
Legal		2.7271	-0.5178	5.9721	3.8814	2.5663	7.8997
Diff (1-2)	Pooled	0.1853	-Infty	4.0675	3.7919	2.6862	6.4382
Diff (1-2)	Satterthwaite	0.1853	-Infty	4.0769			

Method	Variances	DF	t Value	Pr < t
Pooled	Equal	11	0.09	0.5334

Plot_1._Observed_by_Prediction_for Change_in_Opioid_Overdose_Per 100000_People



4 Discussion

We first thought that U.S States with increases in medical marijuana patients would result in decreases in opioid overdose deaths. However, our data instead shows that increases in medical marijuana patients led to increases in opioid-related deaths, with a strong correlation. This raises a concern with marijuana potentially being a gateway drug to opioids. It's important to note that we were only able to find opioid overdose data for 8 out of the 33 states where medical marijuana is legal. This small sample size likely made the results less resistant to any outliers. We also expected for states where medical marijuana is legal to have a lower increase in opioid deaths than states where it is illegal. However, there was no statistically significant difference between these two groups. Once again, there were not many data points available (8 states where it's legal vs. 5 states where it's illegal) to make any complete conclusions. It's also important to note that there is no evidence for the association between these marijuana and opioids. This study was to help determine whether or not marijuana could potentially replace opioids; however, this data suggests doctors are not prescribing marijuana over opioids and sheds some light on marijuana potentially being a gateway drug.

5 Conclusion

In conclusion, we have found a positive correlation relationship between the rate of cannabis prescribed to patients and the rate of opioid overdose deaths, as well as no significant difference in overdose deaths between states where medical marijuana is legal and illegal. However, this conclusion is not definite but could have been the result of lack of data points. Also, the correlation was not explicitly positive as it only seemed to favour the positive degree slightly. Overall, it is important that more data from longer periods of time are analyzed in the future in order to produce a better conclusion. For future purposes, the effects of cannabis should be closely monitored in order to prevent further related over-

dose deaths or recognize its potential to reduce opioids crisis by replacing standard opioids.

Acknowledgements

University of Waterloo,
Professor Gurpeet Singh Ranger
BDC Admins

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