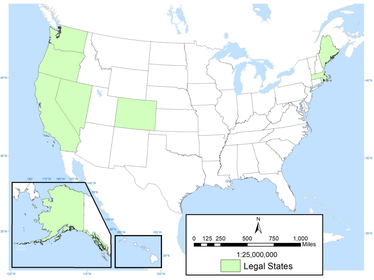
Cannabis in Colorado: A New Budding Industry



Introduction

Though having been used for thousands of years, cannabis, also known as marijuana, has been criminalized in the United States since the 1930's until recently. In November of 2012, the state of Colorado (along with Washington state) legalized cannabis for recreational purposes for adults age 21 and older. Though still illegal at the federal level, as of 2017 there are now eight states in the US with legal recreational cannabis allowed and more exploring it as an option. Additionally, many states now have some form of cannabis allowed for medicinal reasons (also illegal at the federal level) including Colorado. Medical cannabis, while a precursor to Colorado's recreational cannabis legalization, is not the focus of this project as the use of cannabis for recreational purposes has much more concern for the public over the medicinal aspect.

This project examined where licensed retail stores selling recreational cannabis are located in the state at the county level and if the number of stores per county has positive or negative connotations for Colorado. Examining a range of different factors at the county level, we can see how these retail cannabis stores have potentially influenced the state. Are there more cannabis-related emergency room visits in counties with more retail cannabis stores? Are housing values influenced by the rise of these stores? Are overdoses of drug use more prevalent in counties with a high number of cannabis stores? As prohibition states see what happens in legal states, Colorado serves as a prime example of what to expect with the experiment of legal recreational cannabis implementation in the United States.

Methodology

This project utilized data from the state of Colorado's online portal for several departments, including the department of revenue, department of public health and environment, and department of labor and employment. Data was also obtained from US Census data, Zillow.com housing data, and studies from health non-profits.

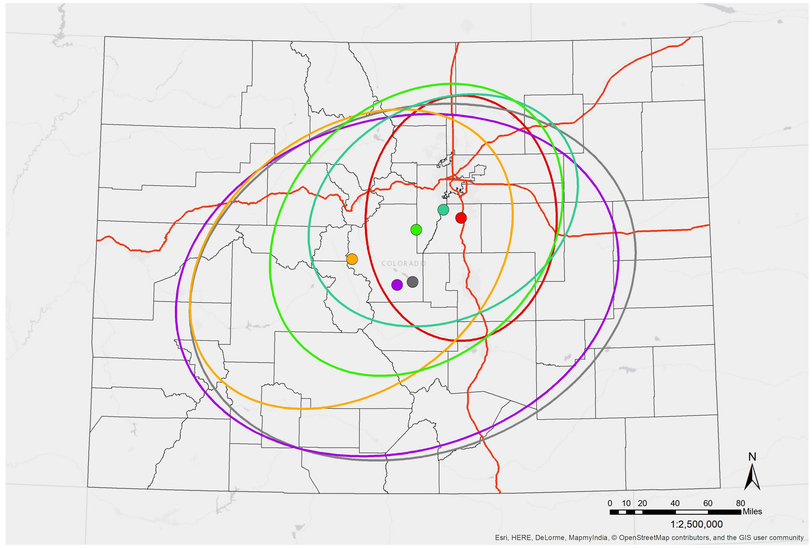
As part of the legal cannabis retail store licensing, the state has a list of addresses of where these stores are located (as of October 2017 there were 504 licensed retail stores in Colorado). Retail stores were used for this project because that is where the drug is obtained for adults age 21 and over and would most likely have effects nearby. At this time there are no licensed establishments to imbibe, like a bar for alcohol, other than on private property.

Data was obtained for unemployment rates (table, percentages as of October 2017, Colorado Department of Labor and Employment), overdose (table, death rate per 100,000 for 2014, Colorado Health Institute), housing values (table, median list price in thousands of US dollars for October 2017, Zillow.com), population (table, 2010, US Census, county level), and cannabis-related emergency room visits (table from report, 2014 to September 2015, Colorado Department of Public Health and Environment). Most of the data was on tables and joined to a Colorado county polygon layer from the state of Colorado, matching the county names.

For all the maps, there is a polygon layer of the Colorado counties (64 in total, outlined in black) and the major interstate highways in the state (red lines crossing the state horizontally and vertically in the middle). The capital Denver is shown near the middle where the major highways converge. A marker for the location of the capital was left out as Denver county was an important part of the project and having a point to represent it, while helpful as a landmark, would have put too much information on the maps and potentially taken away their purpose.

Analysis was done in two parts, finding the mean center and the directional distribution for each factor. The mean center located where in the state the geographic center was for the set of features. Using the specific features as a weighted field (so for recreational cannabis stores, the weighted field would be number of stores per county). This would show the mean center in Colorado for the all the figures in the counties. By comparing the mean centers of all these factors, we are able to see where they have similarities and differences spatially.

In order to see if there is a relationship with regards to direction, the directional distribution (standard deviation ellipse) helps summarize the spatial characteristics of the features. The direction distributions used the features attributes weighted with only the first standard deviation used so that a general overall understanding of the data could be seen, as there would have been too much information for visualizing. The colors used for the mean centroid and direction distribution were matched with those used in the more specific maps to help visualize the data.



Mean Center (Centroid) and Directional Distribution

- Cannabis Retail Direction
- Emergency Room Visits Direction
- Overdose Direction
- Housing Value Direction
- Population Direction
- Unemployment Direction
- Cannabis Retail Store Centroid
- Emergency Room Visits Centroid
- Overdose Centroid
- Housing Value Centroid
- Population Centroid
- Unemployment Centroid
- County Boundary
- Major Highways

Conclusion

Counties with greater population, had more recreational cannabis stores. There were also more emergency room visits related to cannabis in high cannabis store counties. Possibly due to the increased availability and greater population near the edge of the Rocky Mountains (along the north-south I-25 interstate highway corridor) and the cannabis tourism in the urban areas of the state (Kim et al, 2016). Another factor is that unlike a bar which can cutoff alcohol usage for intoxicated patrons, the current policy in Colorado for cannabis is private use only, giving a learning curve for the new legalized vice.

Counties with higher unemployment rates in Colorado also had a higher number of overdose deaths per 100,000 people. With less employment may cause more drug use. Colorado has the one of the lowest rates of unemployment in the country (Colorado: 2.7%, National: 4.1%, CDLE), some counties rates at 4%. Unemployment and overdose did see some interaction with high cannabis store locations in the south of the state.

Housing values are higher in counties of western Colorado where Rocky Mountain resort towns like Vail and Breckenridge are located. The directional trend is similar to the cannabis stores. Possibly meaning that there are stores in these higher housing value counties, but they do not have large number of retail stores. It is also possible that retail stores are more prevalent in counties with lower housing values looking for more businesses and have more customers.

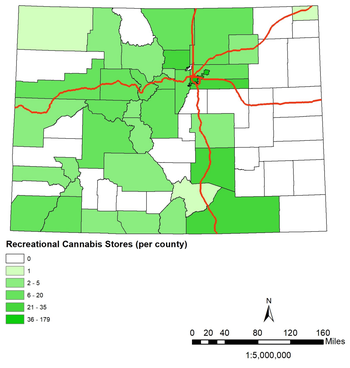
This project had several limitations in addition to the lack of data from the legalization of cannabis in the state. The datasets for several of the features had not been updated recently. The overdose information only went up to 2014, ending just as legal cannabis sales were beginning, though a new study has shown a decrease in the overdose rates in the state attributed to cannabis (Livingston et al, 2017). Future studies will be able to analyze this as more data become available.

References

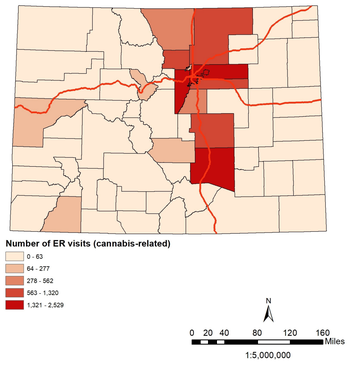
Sources: Colorado Department of Revenue Enforcement Division, Colorado Department of Labor and Employment, Colorado Department of Public Health and Environment, US Census, American Community Survey, Colorado Health Institute, Zillow.com
Class: UEP 232 (Fall 2017)
Projected Coordinate System:
NAD_1983_2011_StatePlane_Colorado_Central_FIPS_0502_Ft_US
Projection: Lambert_Conformal_Conic
Cartographer: Michael Flanary

Tufts University
SCHOOL OF ARTS AND SCIENCES
Urban and Environmental Policy and Planning
CDOR CO
COLORADO
Department of Revenue

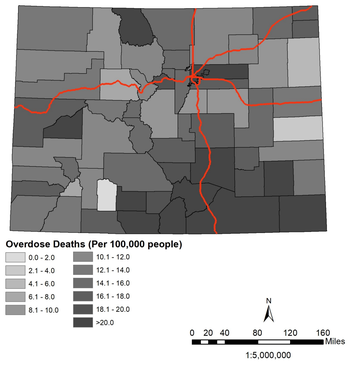
Recreational Cannabis Retail Stores



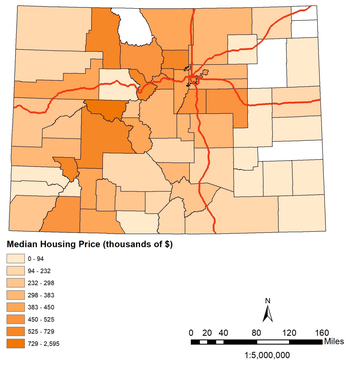
Emergency Room Visits



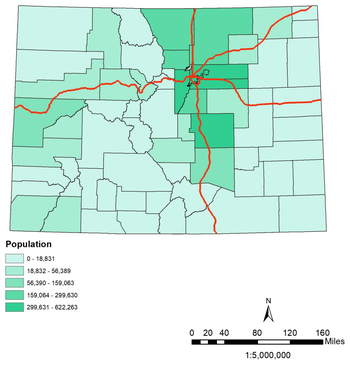
Overdoses



Housing Values



Population



Unemployment