ECON 21300 Assignment 2 Yixin Hu

Question 1:

Theorize on a variety of possible causal channels via which marijuana legalization might lead to more or fewer driving fatalities. For each causal channel, guesstimate a plausible sign and magnitude of the impact of the channel. Obviously, you are just speculating here using common sense and back of the envelope calculations.

Response:

There are many possible causal channels which marijuana legalization might influence driving fatalities, I will outline some speculations and justify these ideas here without diving into data:

Direct influence on a 'latent' cohort:

Pathway: legalization of marijuana → readily available marijuana access → increased consumption in the population → more individuals with more frequent impaired coordination due to increased blood THC levels → increased traffic accidents

Here, I am assuming that there is a 'latent' group of individuals (such as teens) in the population who wish to try marijuana and are simply waiting for the legalization to consume marijuana. Without change of any other cohorts, this cohort will begin to consume marijuana at the earliest possible opportunity. According to the CDC report in 2017, marijuana has effects on the consumer. In particular, the drug can "impair coordination, distort perception, and lead to memory loss and difficult in problem solving" (CDC, https://www.cdc.gov/marijuana/pdf/marijuana-driving-508.pdf). This shows that marijuana does have a negative effect on one's ability to drive safely. If our pathway indicated above is valid, then that means that individuals form this 'latent' group will have impaired coordination more frequently, and thus increase traffic accidents. Furthermore, if we assume that this cohort is mainly concentrated around young adults and teens (as seen in this report: https://www.statista.com/statistics/737849/share-americans-age-group-smokes-marijuana/) at around 22% in 2019, then we would suspect the coefficient to be the following: **a positive sign on the coefficient by a magnitude bounded above by 22% from the year of effective access, assuming the effects are strong enough to cause an accident in most situations.** and of course, this will have severe overestimate results given the crude calculation

Interaction with other substances (subsitutes):

Pathway: legalization of marijuana → readily available marijuana access → increased marijuana consumption in the population and decreased alcohol consumption → individuals who make the switch are less impaired compared to consuming alchohol → decreased traffic accidents

According to a study by Sewell et al. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2722956/), while marijuana does have negative effects on cognitive ability, the effect of marijuana "vary more between individuals than they do with alcohol", and marijuana's effect is "more pronounced with highly automatic driving functions than with more complex tasks that require conscious control, whereas with alcohol produces an opposite pattern of impairment"(Sewell et al.). If we take driving as a task that "require conscious control", then marijuana might not have as strong of an effect compared to alcohol. Indeed, the study mentions that "[b]ecause of both [the aforementioned points] and an increased awareness that they are impaired, marijuana

smokers tend to compensate effectively while driving by utilizing a variety of behavioral strategies."(Sewell et al.). Therefore, if the portion of the population who used to consume alcohol switched over to marijuana, then the total amount of alcohol consumers may decrease. Combine this with findings by Sewell et al., it could be that decreasing driving under alcohol's influence with driving under THC's influence may decrease total traffic accident fatalities due to better control when consuming marijuana compared to alcohol.

Therefore, I suspect **a net decrease (negative sign) in total traffic fatalities by (according to the CDC report), a magnitude that is bounded above by the total population consuming alcohol on a regular basis**.

Interaction with other substances (compliments):

Pathway: legalization of marijuana → readily available marijuana access → individuals who currently consume alcohol also begin to smoke marijuana → more people become cognitively impaired when driving → increased traffic accidents

This works directly opposite to my previous speculation. As Sewell et al. notes: "Combining marijuana with alcohol eliminates the ability to use such strategies effectively, [and] results in impairment even at doses which would be insignificant were they of either drug alone.". Therefore, alcohol and marijuana could really be "a sum more than its parts" where even safe dosages of each could lead to decreased cognitive function when taken together.

Therefore, I estimate **a positive effect (positive sign) on the impact of the channel with a magnitude that (all else equal) is bounded upwards by the percent of the population that is already consuming alcohol regularly.**

Elimination of black markets, decreased dosage:

Pathway: legalization of marijuana → readily available marijuana access → decreased "black-market-type" marijuana → decreased average dosage of marijuana → individuals who make the switch are less impaired compared to high dosages → decreased traffic accidents

Since we are talking about a drug, we must then talk about the issue of dosage. as mentioned in Sewell et al., "detrimental effects of cannabis use vary in a dose-related fashion" and that "differences in smoking technique, and different absorption of [THC]" will lead to very different effects, similar to how alcohol concentration is more important than the simple presence of alcohol. Therefore, assuming that legal retail marijuana will have significantly safer dosages compared to current black market selections, I would reason that legalization and driving out the black market will decrease the average dosage of marijuana onto a safe level. This substitution between black market marijuana and retail marijuana may then decrease the overall negative effects of marijuana on individual's motor skills. Therefore, even if it is the case that legalization brings more people into smoking marijuana, the dosage levels may be low enough to decrease current traffic accident levels.

Of course, one may argue that consumers may desire higher and higher doses, which may increase the risk in the long run, but looking at the policy in the short term, I believe that the sign on the channel will be negative. Moreover, it is extremely difficult to estimate a magnitude on this line of reasoning, since we do not know how large is the black market consumer base or the actual effect of dosages other than lower is less intrusive. Therefore, I will abstain from concluding a magnitude, but at the same time reason that (all else equal) the point estimate **should be a magnitude bounded upwards by the percent population smoking marijuana from black market sources, and it should be a negative sign.**

Here, I have outlined a few causal pathways with various implications of the legalization process on traffic accidents.

Question 2:

Describe a "natural experiment" research design based on law changes that you will implement using available data that you will collect. (Some things to think about: (a) there have been various versions of legalization/medical marijuana/decriminalization across states. Provide a compelling logic as to which state law change have materially impacted the ability to obtain marijuana legally, (b) give some thought to timing... when do you think marijuana usage will increase relative to passage of relevant laws, and (c) justify your choice of a control group.

Response:

The 'natural experiment' when only considering traffic fatalities and law changes could be the following:

- A difference-in-differences analysis of 1-year lagged recreational legalization's effect on traffic fatalities by looking at the treatment of U.S. states which have made marijuana readily available (legalization) controlled by the U.S. states which have a no tolerance law on any marijuana consumption.

Now to detail my statement, note that by looking at the exact date of legalization will not tell us much, because it is not the case that states are handing out retail licenses prior to the legalization, and the legalization was like a call to start the race in selling weed. Therefore, I would take a look at a few years after the legislation has passed, because this will give time for individuals to act, receive retail licenses and allow businesses focusing on marijuana to be set up.

Regarding timing, we want to look at three identified states groups (full legalization vs. medical legalization vs. no laws at all) because marijuana legalization usually is passed in steps: first medical use, only then fully legal (recreation). Therefore, it would be helpful to look at the comparisons between three groups and see how each group differs from one another visually first.

Now addressing the treatment group, we will (as mentioned before) give a **1-year-lag** on the treatment of full legalization (i.e. the 'treatment' will start in 2014), this is to make sure that the public indeed have increased access to the substance, either from their caregiver or from retail. Indeed, the Denver Post reports that the first ever legal marijuana shop opened in Denver on January 1, 2014. (https://www.denverpost.com/2014/01/01/worlds-first-legal-recreational-marijuana-sales-begin-in-colorado/), and in Washington State, the first shop opened on July 8, 2014 (https://www.cbsnews.com/pictures/recreational-pot-dispensaries-open-in-washington/). Because we know for a fact that the shops have opened in these two most early states, we know that the law change have indeed materially impacted the ability to obtain marijuana legally assuming that these dispensaries do in fact indicate ease of access. Considering that the marijuana law was passed in December 2012 in both states (which is effectively 2013), I believe that a 1 year lag on the 'treatment' of legalization would be more comprehensive in measuring the true effects of the legalization process on traffic accidents, i.e. looking at 2014.

Finally to determining the control group, it would be most helpful if we are able to identify states with roughly similar fundamental characteristics in terms of demographics, urbanization etc. However, I will opt for a Difference-in-Difference approach to this problem. In doing so, the only main assumption that we are considering is parallel trends before the treatment, which can be examined visually. This approach is taken because we still want to limit the discrepancies between the two groups *even if* (in the next problem) we are explicitly told that we cannot use these variables as control variables in a DID setting. Of course, if we had access to more data, a finer analysis would be much more prefered.

To this find the control group, I have utilized a summarized table of information provided by an online source which summarizes information from the National Conference of State Legislatures, CNN, and congress.gov (found here: https://www.civilized.life/articles/timeline-history-of-marijuana-legalization-united-states/) to identify the legislative changes in the U.S. regarding marijuana.

For visualizations of the "medical' group, I have identified states which are not Washington nor Colorado which have also legalized medical marijuana before the 2012 legalization in Washington and Colorado **but have not fully legalized recreational marijuana yet**:

- Maine
- Hawaii
- Montana
- Vermont
- New Mexico
- Rhode Island
- Michigan
- New Jersey
- Arizona
- Delaware

Furthermore, I will also identify states in which marijuana is fully illegal, i.e. no legalization laws of any kind (even medical) has passed as of 2018. I will use a summarized table using data from ProCon.org to identify these states (https://www.fool.com/investing/2018/07/21/these-20-states-havent-legalized-medical-marijuana.aspx) These states are:

- Alabama
- Georgia
- Idaho
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Mississippi
- Missouri
- Nebraska
- North Carolina
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Virginia
- Wisconsin
- Wyoming

Therefore, I have identified two potential groups to make comparisons between them and our 'treated' group which fully legalized recreational marijuana. These two groups together will be used for visualization purposes.

Now to finally choosing our control group. I believe that the *fully illegal* group will serve this role. This is because the question asks the effect of marijuana consumption on traffic fatalities, and not necessarily the effect of marijuana *due to the recreational laws* on traffic fatalities. Therefore, I believe that in order to see this effect of marijuana most clearly, it would be most helpful to take the two extremes in laws. Of course, one could argue that the medical laws might compound the explanatory power of recreational laws, and I would fully agree. However, that does not harm my argument as **I am not solely looking at the effect of recreational laws, but increased marijuana access in general**. If I were to check the effect of marijuana *due to the recreational laws* on traffic fatalities, then this counterargument will surely be taken, but this is not the question at hand. In the end, if we are able to see a clear difference in the two groups, and say we saw that the treatment group has a significantly higher fatality rate, then we can argue that between no government licensed marijuana consumption has an adverse effect on traffic safety. **On the contrary, if we were to see that there is no significant difference, we can then make a strong case that even if states fully prohibit marijuana usage, there will be no benefit at least in terms of traffic**

safety. Nevertheless, the medical group will still be helpful in visualizing the data at hand, so I will keep it for visualization purposes in question 3.

In short, I will simply define two groups:

- **Treatment**: Colorado and Washington state, as they were the first ones to legalize recreational marijuana and did so very close in terms of timing.
- **Control**: States with no tolerance laws on marijuana.

Now I will turn to the data analysis portion of this exercise.

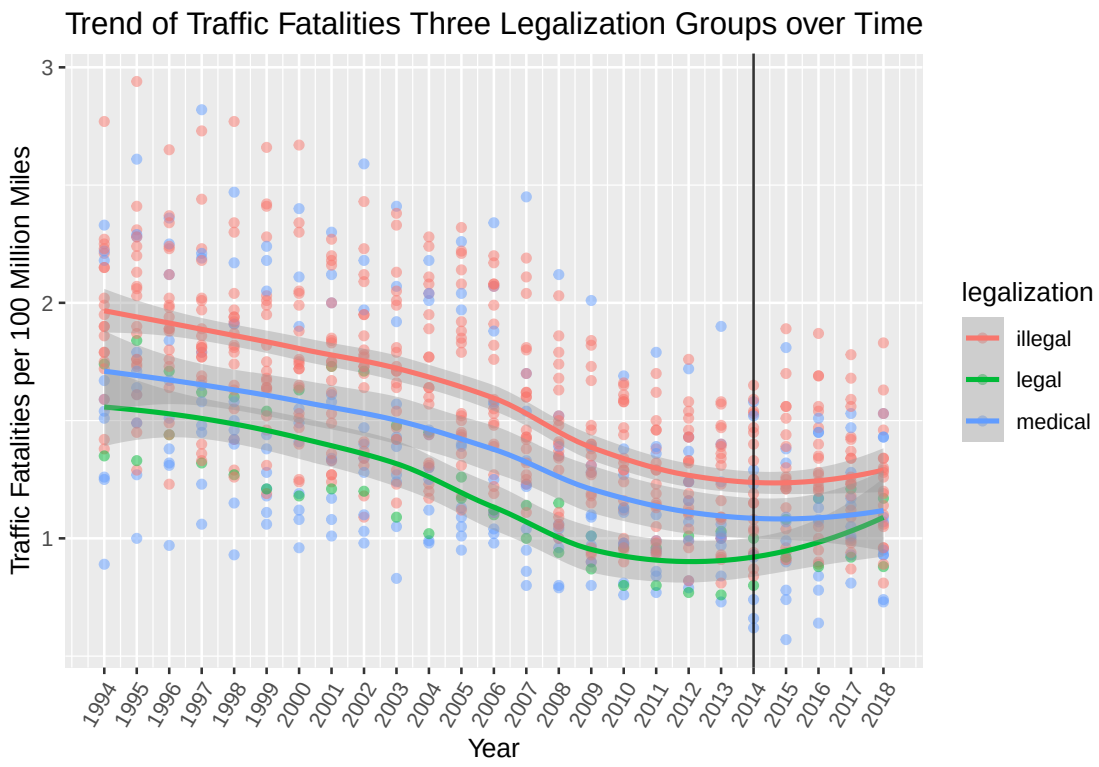
Additional considerations: Of course, one would usually need to control for other variables (such as demographics), but in our assignment here (where no other covariates are needed), we would only need to think about states with similar *general* characteristics, such as population and urbanization, which all are helpful in identifying traffic density, and thus control for traffic accidents. However, because we are using a DID approach, these extra factors are not necessarily needed so long as the common trends assumption is satisfied. In the end of this section, I will justify why I have chosen the no tolerance group as the control group.

Question 3:

Collect data at the state-year level on the legal status of marijuana and on traffic fatality death rates. NO OTHER CONTROL VARIABLES ARE NECESSARY. Make a summary statistics table, and also a graph showing how traffic deaths and the legal status of marijuana have evolved over time

Response:

Now turning to data cleaning, I will use date from the U.S. Department of Transportation (https://www-fars.nhtsa.dot.gov/States/StatesFatalitiesFatalityRates.aspx) to continue on with our analysis. Furthermore, using these pieces of information, I will then construct the visualizations and tables as required. The following graph shows the progression of traffic fatalities per 100 million vehicle miles over time, where the vertical line denotes our 'treatment' that coincides with the first dispensaries opening in the treatment group.



There are few things in this graph that is worth mentioning. First, it is worth noting that even among the three groups, there seems to be no significant difference in trends over time. Especially in the pre-period, we see that all the indicated states, regardless of legalization, share a common trend. This is a good sign for us to use the DID method of analysis. Furthermore, we do see a slight upward trend in legalization data, which warrants further investigation. Now I will present a summary statistic table of the data shown above.

In this summary table of the means and standard deviations of the three groups across time, we are able to numerically see the common trend of said three groups. where a gradual decrease in mean traffic fatalities per 100 million vehicle miles over time. However, we are also able to see gradually decreasing standard deviations across all groups throughout time. This might indicate some heteroskedastic element in the data which I will account for in the next section.

year	mean_illegal	mean_legal	mean_medical	sd_illegal	sd_legal	sd_medical
1994	1.9545	1.545	1.644	0.3235897	0.2757716	0.4706072
1995	1.9635	1.585	1.769	0.3855860	0.3606245	0.4948501
1996	1.9315	1.575	1.673	0.3415025	0.1909188	0.4589372
1997	1.8775	1.470	1.746	0.3420353	0.2121320	0.5270294
1998	1.8480	1.435	1.599	0.3559805	0.2333452	0.4632842
1999	1.8385	1.375	1.513	0.3825850	0.2333452	0.4606047
2000	1.7825	1.405	1.521	0.3674646	0.3181981	0.4780621
2001	1.7170	1.470	1.554	0.3308856	0.3676955	0.4526024
2002	1.7240	1.455	1.534	0.3572762	0.3606245	0.5370744
2003	1.7230	1.285	1.518	0.3471402	0.2757716	0.4853361
2004	1.6775	1.235	1.477	0.3601443	0.3040559	0.4461452
2005	1.7040	1.215	1.429	0.3670422	0.0636396	0.4844114
2006	1.6650	1.110	1.484	0.3542152	0.0141421	0.4842681
2007	1.5695	1.070	1.312	0.3011465	0.0989949	0.4926752
2008	1.4350	1.045	1.203	0.2912134	0.1484924	0.4052722
2009	1.3320	0.940	1.186	0.2849487	0.0989949	0.3447769
2010	1.3065	0.880	1.123	0.2600663	0.1131371	0.2754814
2011	1.2350	0.880	1.099	0.2317099	0.1131371	0.3200851
2012	1.2715	0.890	1.183	0.2391933	0.1697056	0.2843335
2013	1.2060	0.895	1.117	0.2377394	0.1909188	0.3323669
2014	1.2340	0.900	1.042	0.2519691	0.1414214	0.3447962
2015	1.2810	1.000	1.065	0.2700273	0.1131371	0.3628054
2016	1.3060	1.025	1.112	0.2742531	0.2050610	0.2982095
2017	1.2820	1.065	1.139	0.2490318	0.2050610	0.2307211
2018	1.2310	1.025	1.083	0.2539768	0.2050610	0.2882148

Question 4:

Using the research design in question 2 and the data collected in question 3, come up with an estimate of the causal impact of marijuana legalization on traffic fatalities. Please provide both a point estimate and a standard error. Explain whether you think the magnitude of your estimate is large or small.

Response:

Now to estimate the causal impact of marijuana legalization on traffic fatalities, I will do as I have outlined in question 2: conduct a difference-in-difference analysis on the effect of legalization of marijuana. Now having seen the visualizations in question 3, we have seen that:

- the legalization of marijuana lagged by one year (to account for the time it took to open dispensaries) may not lead to a sharp increase in the year-to-year traffic fatalities relative to other groups.
- the trends are relatively parallel throughout the 20+ year sample, and thus one key assumption for DID is *not* necessarily violated.
- however, we do see that there is some difference in the spread of data points throughout time. Specifically, it seems that from 2009 onward, the spread of all states' traffic fatalities seems to have decreased, which raises issues about so called 'heteroskedastic' error (essentially, I am assuming something about the uniform spread of data that I really shouldn't be assuming.)

With these points in mind, I will be running a DID regression using the fully illegal group and the fully legal group (justification is already presented in question 2), and also consider a quick test for heteroskedastic

data. My justification for this heteroskedastic check is that I have implicitly assumed that the variation within states is unrelated with time when choosing a DID. However, I can tell visually that the spread does in fact differ with time. Therefore, I will provide both a standard fixed effects model, and also (for the sake of completeness and as a sanity check), provide the heteroskedastic robust standard errors. This in effect deals with the heteroskedastic component of one state's traffic fatalities across time, and could yield us a 'better' result if the data is indeed heterskedastic with respect to time.

Furthermore, since we are interested in the law changes in recent years, I will be taking the years past 2000 onward to minimize the impact of years further out on the analysis.

In sum, the DID model will provide a 'causal model' for marijuana's effect on traffic accidents through legalization by identifying a 'natural' experiment with the different laws enacted in different states.

The models are given below:

```
##
## Call:
##    felm(formula = death_per_mil ~ get_treatment | is_post + is_treated,      data = working_df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7149 -0.2349 -0.0368  0.2065  1.1451
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## get_treatment1   0.1343     0.1299   1.034    0.302
##
## Residual standard error: 0.3361 on 414 degrees of freedom
## Multiple R-squared(full model): 0.1698   Adjusted R-squared: 0.1638
## Multiple R-squared(proj model): 0.002577   Adjusted R-squared: -0.004651
## F-statistic(full model):28.23 on 3 and 414 DF, p-value: < 2.2e-16
## F-statistic(proj model): 1.069 on 1 and 414 DF, p-value: 0.3017
```

```
##
##  studentized Breusch-Pagan test
##
## data:  model1
## BP = 3.9525, df = 1, p-value = 0.0468
```

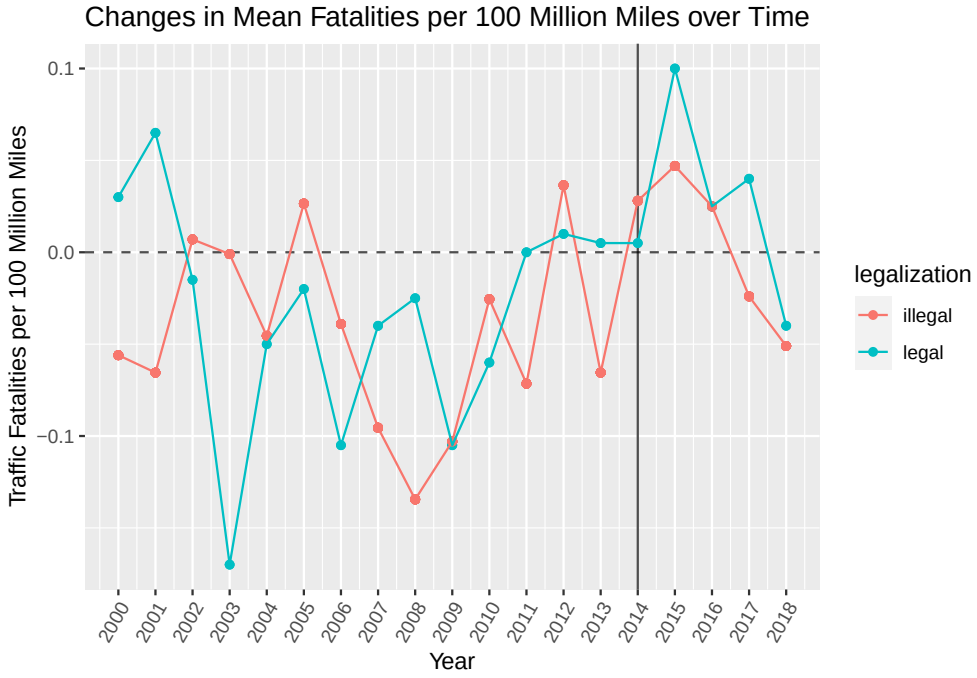
Notice that the treatment (recreational laws lagged 1 year) which may lead to a causal channel to increased traffic fatalities is neither statistically or economically significant. In particular, fully enacting the recreational marijuana law and considering dispensaries opening still do not increase the traffic fatality by a significant amount (one in ten people may be effected).

However, under the regression results, we can see above from the quick BP Test for heteroskadicity that the distributions of residuals do in fact vary with respect to time. This essentially tells us whether or not I am mis-assuming something. Therefore, this previous result will not be a sound result to take away. In response, I will use the model which considers the correlation within states across time which will deal with the heteroskedastic issue presented above.

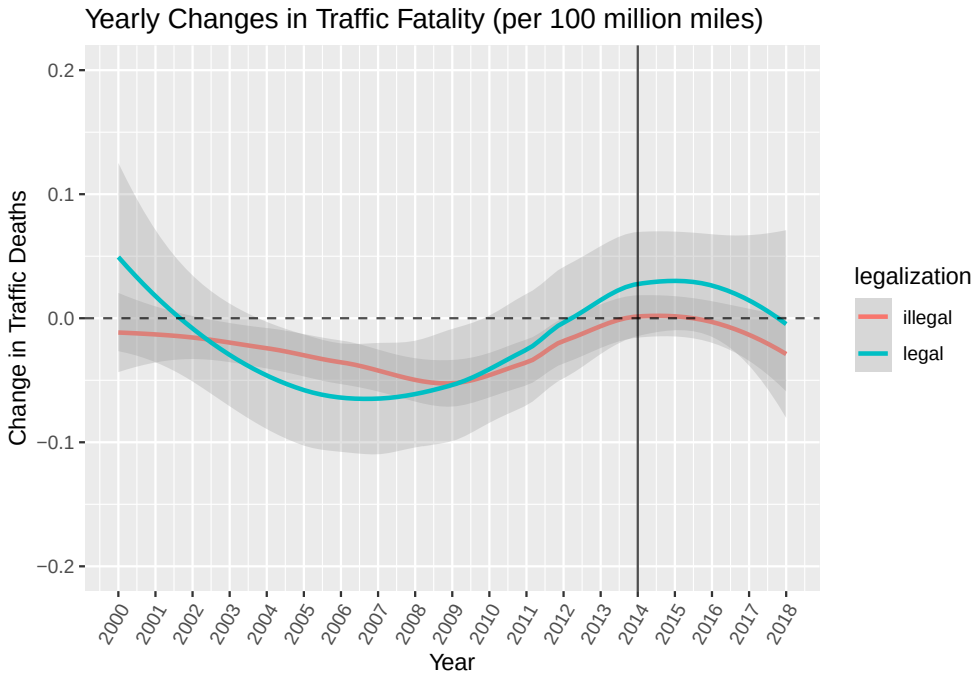
```
##
## Call:
##    felm(formula = death_per_mil ~ get_treatment | is_post + is_treated,      data = working_df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7149 -0.2349 -0.0368  0.2065  1.1451
##
## Coefficients:
##                Estimate Robust s.e t value Pr(>|t|)
## get_treatment1  0.13431    0.07442   1.805   0.0718 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3361 on 414 degrees of freedom
## Multiple R-squared(full model): 0.1698   Adjusted R-squared: 0.1638
## Multiple R-squared(proj model): 0.002577   Adjusted R-squared: -0.004651
## F-statistic(full model, *iid*):28.23 on 3 and 414 DF, p-value: < 2.2e-16
## F-statistic(proj model): 3.257 on 1 and 414 DF, p-value: 0.07183
```

Here, we have then estimated that the estimation has not changed, but the standard error has been decreased slightly. This increases the statistical significance by a slight amount, but it is still not a very compelling story. Of course, one could argue that this is already significant since people are losing their lives at all as seen in the difference tables below, where a 0.13431 almost entirely captures most of the mean YoY differences.

The graph below measures the change in the two groups' means throughout time, and it is presented to show that one could very likely argue that the point estimate could be economically significant. **In short, one could show the graph below, and argue that the magnitude of the point estimate is large because it is similar to the per-year changes of the two groups in previous years.** Furthermore, as indicated previously, the vertical line denotes our 'treatment' which coincides with the first dispensaries opening in the treatment group.



However, I argue that it is still a very small impact from what was perceived to be an extremely controversial law: While there is certainly an argument to be made about the percent change estimated by the model, the actual magnitude itself is not economically significant once we consider the gravity of this law in question. In the visualization below, a we have a different picture:



Here, the detrended time-series data for each group is shown, where the detrended method was to take YoY differences. Effectively, this is to show deviations from the general trend of each group. In particular, it shows the loess line, which helps visualize the departures from general trends of each group and the gray shadow indicates our statistical significance. It is worth noting that the trend from the legal group does not deviate significantly from the illegal group, nor is it statistically significant from zero. This shows that indeed the legal group is indeed different from the illegal group in terms of point estimates, but it would be very hard to argue that this is a economically or even statistically significant result, since it the legal group does not differ very much relative to the illegal group's trend, nor does it differ very much from zero.

In the following sections (specifically Question 6), I will further argue that even if we have this difference, the *actual* difference between the treatment and control series will not be economically nor statistically significant.

Nevertheless, the final robust causal model has a point estimate of **0.13431** and a robust standard error for **0.07442**, giving a p-value of **0.0718**.

Additional considerations: Since we are using a non-random subset of states to tell a causal story for every state, one could argue that a s.e. clustering would be needed (https://blogs.worldbank.org/impactevaluations/when-should-you-cluster-standard-errors-new-wisdom-econometrics-oracle). This also makes intuitive sense, since there is no reason to believe that somehow traffic fatalities in one state in year 1 has absolutely no explanatory power for traffic fatalities in year 2. However, serial correlation applies most effectively only in large macro panels with long time series, and thus for a short term analysis as we are doing here, a test seems uncalled for and may skew our straight-forward understanding of the data. (https://www.princeton.edu/~otorres/Panel101R.pdf)

Furthermore, this exercise would be much more concrete if we were allowed to utilize other forms of controls (demographic, differential traffic laws, urban density). However, as outlined by the question at hand, we are restricted to particular laws (marijuana legalization) and traffic fatalities.

Question 5:

Discuss the public policy implication of your finding, and what your results say about the theories in question 1.

Response:

In light of the ideas put forth in question 1, I believe that there could be a (like everything else in the world) a mix between factors which could (in the pathways I proposed) increase or decrease the traffic fatalities due to a change marijuana laws. In particular, it could very well be the fact that a full legalization of marijuana could increase the amount of people smoking (as proposed in pathway 1) but at the same time make the dosage much safer (as proposed in pathway 4), which this two-way effect 'effectively cancels out' the opposite signs.

With respect to policy implications and prescriptions, there is no conclusive evidence to support either full legalization or not. Simply put, although the results are somewhat statistically significant, the magnitude of the point estimate does not really tell a compelling story for either a full rejection or full acceptance of recreational marijuana laws for the sake of traffic fatalities. At best, we can only say that this is inconclusive evidence that marijuana **may** have some **small** correlations with an increase in traffic fatalities.

Of course, one could argue that the change in 0.13431 more traffic fatalities is a approximately a 10% increase from previous years (see the figure titled *"Changes in Mean Fatalities per 100 Million Miles over Time"*), but this is much more of a 'logarithmic thinking style' where somehow we subjectively view smaller changes more intensely than large changes, and does not really constitute a sound argument when considering the real potential effects of this law on traffic accidents.

Due to the inconclusive result, the target outcome of this policy implication is to increase the data surrounding this topic, especially in the two pathways surrounding interactions with other drugs (pathways 2 and 3). Based on medical studies (Sewell et al.), the interaction between alcohol and marijuana is quite clear in the sense that the two substances (biologically) has adverse effects on the human body. Therefore, by explicitly prohibiting marijuana consumption with alcohol when driving is the most medically sound policy so far. While this policy is in place, it would buy time for agencies and law enforcement to collect data on accidents caused explicitly by marijuana (as well as looking at whether or not alcohol was involved), which will give an extremely direct causal pathway to infer a new policy recommendation.

Question 6:

Make one single slide/table/graph that you would show to Secretary Buttigieg that best captures your empirical findings and communicates the results to him so that he understands your results.

Response:

Since we are using a DID for analysis, we would expect a level change between the control and treatment groups. Therefore, I believe the simplified bar chart shown below will give us the most direct interpretation of how the two groups evolved over time. In particular, we are interested in the variation spawned from the change in legislature. Therefore, we if we expect a economically significant increase in traffic fatalities, this should be highlighted by the legal group being drastically higher when compared to the illegal group in the period after 2014. However, we see in this graph that the states where recreational marijuana is legal does not significantly deviate from the states where marijuana usage is completely forbidden. Therefore, the co-movement between the two groups gives a direct visual indication that there is no significant difference.

Please note that **although using (closer to) raw data for the most convincing argument is ideal**, I realize that the level differences in trends would be much more constructive to our argument if are able to both provide an 'ideal' DID analysis graph that shows the difference post treatment **contrasted with** the lack of difference in our data. However, since we are only allowed one single graph, the pre and post means of the two groups provide the most direct visualization of what we found in our regression. (I acknowledge that I am very much sacrificing the important trend visualization by taking an average, but since we are concerned with changes in policy, I believe the following visual conveys the three points found in our regression quite well):

- If we suspected marijuana legalization to increase overall fatalities, we would expect the turquoise bar to be significantly higher than where it is now. Instead, it just follows the previous trend pre-2014.
- The two groups really do not differ at all through time relative to each other, which further emphasizes the inconclusive results of our DID analysis.
- In all, there is no concrete evidence to suggest that marijuana legalization may have induced increased traffic accidents.