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Opioid Crisis in America

Section 0: Abstract

In this paper we will be analyzing how factors such as manufacturing states, the 2008 recession, and labor force participation rate impact overdoses and the total cost of Medicare and Medicaid. Manufacturing states are disproportionally impacted and have higher average costs than other states. The growth rate of overdoses also is higher in manufacturing states since 2011. It is for those reasons these states need additional support in the opioid crisis.

Section 1: introduction

For the past twenty years America has been struggling with a quiet and lingering battle with opiate addiction. Prescription opiates like Vicodin, Oxycontin, and morphine are some of the main opioids that many people have been constantly abusing. These drugs are highly addictive and easily accessible. By the end of the 1990s 86 percent of the people who were prescribed opiates were using them for non-cancer pain[1]. Typically, these medications are supposed to be used for cancer patients to manage pain, but this fell out of the norm by the 2000s.

Accessibility however is not the only issue that is factoring into the reason of why America is dealing with a national wide substance abuse problem, there are economic factors that contribute to opioid related addiction and death. It was agreed by researchers that factors such as economic opportunity, poor working conditions, and eroded social capital Dasgupta et al, are just a few factors that drive people to abuse opioids. These two factors lead to an alarming rate of abuse, so alarming that the CDC noted in 2017 that there were 1,000 emergency room visits a day for patients who needed medical attention in relation to opioid prescription abuse (CDC2017a). These thousand visits a day may have a tremendous social cost and effect government spending. In 2007 it was reported that opioid abuse had a societal cost of $55.7 billion dollars[2]. This study however is over ten years old and a lot of data can change in ten years. This paper's more present state of data can provide more insight on how Prescription Drug Monitoring Programs are helping reduce the financial and productivity costs in the United States. We can examine this through a simulation after running our data analysis.

This paper looks to specifically examine how certain economic variables effect the number of overdoses in a given state in a given time. To do this we will be using panel data on all fifty states and the District of Columbia from 2000 to 2018 to figure out how specific factors

[1] Scavette, "Adam Exploring the Economic Effects of the Opioid Epidemic" Federal Reserve Bank of Philadelphia Research Department, 2019 Q2.

[2] Brill, Alex. Gnaz, Scott "The Geographic Variation in the Cost of the Opioid Crisis" AEI 2018 and referencing Birnbaum et al. 2011

in a given state relate to overdose death rates. Once this information is found and evaluated next the paper would like to address how these deaths effect Medicare and Medicaid spending and what the cost to society is in monetary and productivity terms. The variables that will be specifically assessed are labor force participation rate, states who are heavily dependent on manufacturing in their job markets, and lastly states after the recession of 2008. This hopefully can give insight on how economic variables and factors can affect overdosing on opioids and what that cost to the country is. Ideally this paper will be able to give the public an idea on how to reduce both overdoses as well as Medicare and Medicaid costs.

The economic variable labor force participation rate typically is an indicator of the health of an economy. The next variable are states that have manufacturing jobs that make up a large percentage of their job market. This variable is included because economic success is beneficial for these states, but economic troubles hit these states harder than other states. Also, opioid abuse is used more within these states therefore we would like to quantify how much harder they are hit than other states to see if these states may need special attention in aid and or policy. Both variables above have been reported to impact opioid abuse and overdose death and with the use of panel data we will be able to quantify this impact as accurately as we can which has yet been done in this topic. The last variable of the recession from 2008 we want to see how life after the recession, a major economic event that effected every state and millions of people, is impacting opioid overdoses. There will be more socioeconomic variables that will be included in the regression equation but will be described more in section 4 and will primarily be used as controls in the equations.

Section 2: Previous Research

Curtis Florence, PhD, discusses in “The Economic Burden of Prescription Opioid Overdose, Abuse and Dependence in the United States, 2013” how the opioid crisis in the US is affecting the country. In this study Florence uses data from various sources such as the National Vital Statistical System and the National Survey of Drug Use and Health, along with data on fatal and non-fatal opioid cases on the US population. Florence used a logistic regression model to account for all patients and the regression included many variables such as age, sex, residence of patient, health care plan, race and others over a 12-month observation period. The results found were over 2 million people met the qualification of abuse and dependence on opioids and there were over 16,000 deaths. Medicare costs of dependence and abuse were more than $17,000 and Medicaid above $13,700. Lastly Florence found that abuse of opiates ended up costing over $28 billion, while overdose, abuse, and dependence had cost the country more than $78.5 billion. Florence’s work had shown the country how detrimental the opiate crisis in the country is and in addition shows how immense the burden on all levels of government (local, state, and federal) has in accounting for the cost of opioid related abuse, dependence, and overdose. Florence also notes that about 25 percent of the economic burden is funded by public resources. The study puts the issue of the crisis in a monetary value which helps emphasize how big the issue of the opioid abuse is in the US.

Alex Brill and Scott Ganz take a look at the opioid abuse and how it effects each state in “The Geographic Variation in the Cost of the Opioid Crisis”. They view the total opioid cost per capita in terms of health care, criminal justice, and productivity costs in 2015, and on the chart it is seen that areas in the north eastern part of the country are hit the hardest with some states having their per capita cost being within the range of $1827 to $2530 which is the second highest range of cost in this chart. There are three to four states in the north eastern part of the nation that are being hit the hardest where the per capita costs in these states ranges between $2530 to $4378. Again a similar chart is produced but this time at the county level and this is where we see a national issue because across the nation a majority of the states have counties that are in the second and first highest range of costs per capita when excluding mortality. When including mortality, the results slightly change geographically and is more concentrated in the Midwest, parts of the south and north east but nonetheless a majority of the states are experiencing high levels of per capita costs. This study shows how a lot of the states that rely on manufacturing as their primary job market are hit the hardest. States like Kentucky, Alabama, Ohio, West Virginia, and Connecticut are just some of the states that have very high per capita costs at both state and county levels and rely on manufacturing jobs in the states job market.

Lastly a highlight comes from Adam Scavettte where he is discussing the idea of economic effects on the opioid epidemic, and in this paper he mentions another paper by Alan Krueger where Kreuger finds how labor force participation in the 2000s is at a lower level in states where opioid medication is prescribed per capita. Krueger however fails to distinguish this patter from state level to county level. This is notable because labor force participation is one of the variables we will be examining in this paper and we would like to see in this variable's behavior follows suit with Kreuger's study.

Section 3: Data Resources

A majority of the data found on the variables in this paper heavily relies on data from the US census for variables for each state from 2000 to 2018. Variables' whose data relied on information from the census are population, median household income, percent of state population insured, and percentage of state population that is a high school graduate. For Medicaid and Medicare spending the information was found through Kaiser's medical records as well the number of overdose deaths. Deciding whether or not a state is a manufacturing state was through constructconnect where they rank each state by industrial subsector jobs by manufacturing. Unemployment rate data is found through the Bureau of Labor Statistics' website. Lastly this paper got its data through the RI Department of Labor and Training Labor Market information. Since the paper is including the Recession of 2008, we had created a dummy variable to mark the years in which the recession occurred and the years after.

The socioeconomic variables of state GDP, population, median household income, percent of state population insure, percentage of state population that graduated from high school, Medicare spending, Medicaid spending, and unemployment are served to be controls in the regression equation. The main variables we will be assessing are labor force participation, manufacturing states[3], and the Recession of 2008.

Section 4: Economic Model

One thing to mention before we break down the models we will be using in this paper, it is worth mentioning that when discussing an addictive good—in this case opioids—their demand curves are very inelastic and steep. This is because once someone is addicted to opioids it isn't something that can stop being consumed instantly, it takes time to quit. This model is to illustrate factors that impact the number of overdoses per state at a given time and how much these overdose deaths cost. We will go into more depths about how the addictive nature of opioids can impact our results later in this paper.

[3] States that are labeled as "manufacturing states" in this paper are states that have more than 50 manufacturing jobs per million residents. There are twelve states that meet this criteria and they are Wisconsin (83.4 per million), Indiana (79.8 per million), Iowa (71.5), Michigan (62.1), Ohio (59.7), Minnesota (57.7), Kansas (56.7), Kentucky (56), Alabama (55), Arkansas (52.9), Nebraska (52.7), and New Hampshire (52.6).

The model we will be using to determine the impact of the variables of manufacturing, recession and labor force participation rate is:

$$Overdose = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots \ldots \ldots \ldots . u \qquad (1)$$

β_n = slope parameters of overdose function that will be estimated from the data.

x_1 = recession dummy variable[4]

x_2 = recession dummy $*$ manufacturing dummy variable[5]

x_3 = labor force participation rate

As for the rest of the variables in our panel data set, the socioeconomic variables, these will be $x_4 \ldots x_n$ and will primarily serve as controls in the equation. Lastly u represents the error term for things we can't quite account for. In this equation we will also include 19 dummy variables for each year (from 2000-2018) to account for unobserved year specific effects. This model will be ran under a standard OLS regression.

The next model we will analyze is the Total Cost function which is:

$$Total\ Cost = \gamma_0 + \gamma_1 overdose + \gamma_2 z_2 + \cdots \ldots \ldots \ldots . u \qquad (2)$$

γ_n = slope parameters of overdose function that will be estimated from the data.

$overdose$ = the number of overdose deaths in a given year in a given state

z_2 = recession dummy $*$ manufacturing dummy variable

[4] In stata we will be marking a 0 for the years 2000-2007 and a 1 for the years 2008-2018 to signify the pre and post-recession periods for each state in the 19 year period we are observing.
[5] Recession times manufacturing variable is to address how manufacturing states are impacted by the recession and how both these variables together interact with overdoses instead of both variables independent effects on overdoses.

z_3 = labor force participation rate

Total cost will be equal to the aggregate of Medicare and Medicaid in a given year. The same socioeconomic variables will be used as controls again but this time from $z_4 \ldots z_n$. The error term remains the same as well. In this model however we, created 51 dummy variables, one for each state and the District of Columbia, to account for the unobserved specific effect of each state. This model will also be ran through a standard OLS regression but it will also be ran through a Fixed Effects regression which will drop all the variables that do not change over time like manufacturing.

Section 5: Empirical Analysis

5.1 Overdose Model (overdose model) Analysis

The first regression we ran was a standard OLS regression of logoverdoses on the recession variable dummy, recmanu[6], labor force participation rate, all our socioeconomic variables, and year dummy variables. The output shows that the recession results in 36%[7] rise/fall on overdoses. The recession manufacturing variable shows something quite interesting; it shows that manufacturing states have an additional 45% rise of overdoses along with the recession percentage (36% + 45%) which illustrates how much harder manufacturing states are impacted by the opioid crisis. Our last key variable shows if there is a 1 percentage point increase in labor force participation overdoses decrease by 11%.

5.2 Endogeneity Test for Total Cost Model

[6] Variable that accounts for manufacturing states in a recession as well.
[7] Due to the unexplained output of the recession variable in my own regression, we will be borrowing Dr. Chattopadhyay's recession output in his model which is very similar to my own in terms of data and values used in the data.

As our next step in our analysis we take logoverdoses and put it into the Total Cost equation. Doing this we risk the chance of the model suffering from endogeneity. To make sure our output is reliable and there are no endogeneity in the variable logoverdoses we ran the Wu-Hausman test on the residuals of the equation. If the residuals are ran through an OLS regression with the rest of the variables in the equation and if the residuals are statistically significant at a 5% level then there is endogeneity in the equation variables. Our residuals had a p-value of 0.832 which confirms that there is no endogeneity in this model, and we can proceed with our analysis.

5.3 Total Cost Model Analysis

Again, in the cost model we will be focusing on our key variables, manufacturing states, the recession, and in addition overdoses and how they interact with total cost. Manufacturing states surprisingly have 78% lower costs on average, compared to other states—in terms of total Medicare plus total Medicaid. When discussing the recession variable, we found total costs increased by 24% after the recession (2008-2018) compared to before (200-2007). For everyone overdose death total cost goes up by about 13%. An interesting observation in this model is how percentage of population insured and percentage of population who graduated high school had hardly an effect on total costs, they're impact was 1.3% and 2.6%, respectively, increase in total costs if they both increased by one percent.

In the analysis above we analyzed an OLS regression with 50 state dummy variables (omitted state1) which is essentially the same as a fixed effect regression. The only major difference that running a fixed effect regression does is it would drop our manufacturing variable but all the other variables in the regression would have the same values.

Section 6: Simulation Analysis

With the results we got from our Stata output we were able to apply these findings to some simulations.

Section 6.1 Growth Rate of overdoses, Manufacturing states versus other states

The first simulation we ran is how manufacturing states growth rate of opioid overdoses compared to the other states, this is assuming that other states growth rates are fixed. We first ran a regression in the overdose model of manufacturing and tmanufacturing on overdoses to see what the rate of growth was for manufacturing, hence tmanufacturing variable. Next, we used this growth rate and multiplied it to the growth rate of other states plus the difference of manufacturing states and then multiplied this by each year. What we find, as you can see in Figure 1, is in 2000 manufacturing states growth rate in overdoses is lower than the growth rate in non-manufacturing states but by 2011 the growth rate of manufacturing states begins to exceed the growth rate of non-manufacturing states. By 2018 manufacturing states growth rates were higher than non-manufacturing states by .87. This simulation illustrates the disproportional rate at which manufacturing states are subject to in this opioid crisis.

Section 6.2: Trend in Total and Trend in Average Costs in Manufacturing States Versus Other States

Again, in our second simulation we are still comparing the disproportional effects manufacturing states face in this opioid crisis. This second simulation we summed the total cost of each opioid overdose death and summed each opioid overdose for each year for both manufacturing states and non-manufacturing states. The monetary impact of the total cost from 2000 to 2018 came to be $37,648,373 in manufacturing states and $49,173,254 in non-manufacturing states. Although non-manufacturing has a higher total cost for this can be attributed to there being 39 states to gather data on versus the 12 manufacturing states. The average cost is a more telling statistic of the data. To get the average cost we took overdose deaths for each year and divided it by each year's total costs. The average of the average costs in manufacturing states is $7,232,364 for a given year versus non-manufacturing states having an average average cost of $6,004,255. This gives us a more accurate representation of how manufacturing states are being hit by this crisis more than other states.

Section 6.3: Average Annual Cost Per Opioid Death in 2018 Dollar

Next, we look at a simulation where we observe how a 1 percent increase on labor force participation would affect overdoses. As you may recall our stata output when running the overdose model gave our variable labor force participation rate a value of 0.113999 we then multiply this value on the number of overdoses each year and this gives us how many lives would not be lost if labor force participation rate was 1 percent higher. In Figure 2 we can see in 2000 we see a 1 percent increase would have saved about 18 lives but as time goes on and the opioid crisis got worse, we can see that the 1 percent increase in labor force participation would save more people. In 2018 the amount of lives a 1 percent increase would have saved is 104 people. The labor force participation rate also impacts the total cost model and we also observe cost avoided by an increase of labor force participation rate by 1 percent. On average the 1 percent increase would reduce total cost by $278,766,662.7. To help the government be more cost efficient it is shown that finding ways to keep the labor force participation at a high level can be extremely beneficial in helping the government reduce spending.

Section 6.4: State Ranking With Respect To Average Cost and Total Cost of Overdose Deaths

Finally, we look at each state's total overdoses, total cost, average cost, from years 2000-2018. Next, we ranked each state to see who had the highest total and average cost. Again to get a more accurate representation of our data and the costs of this crisis we will look at the average costs for each state. The top five states who had the highest averages costs were: Mississippi ($14,727,369), Nebraska ($14,378,609), North Dakota ($10,784,010), Louisiana ($10,628,353), and South Dakota ($10,191,171). Of these five, Nebraska is a manufacturing state, the other manufacturing states Alabama, Iowa, and Minnesota were ranked in the top 10. Their rankings and average cost can be seen in Table1.

Section 7: Discussion and Policy

Through the use of our overdose model and our total cost model we are able to create these simulations to analyze overdose deaths and their costs on states in numerous ways. Through each simulation one thing remained frequent which was the 12 manufacturing states being hit harder in this opioid crisis harder than the other 38 states (and District of Columbia). This has caused manufacturing states to be strong contributors to the Medicare and Medicaid spending because on average the cost is over a million dollars higher than that of a non-manufacturing state.

Now that we know the severity of the issue, we must provide some sort of ideas on how to address this issue. Many people seek opioids to treat chronic pain and working in the industrial job, a worker is likely to be subjected to chronic pain than others. A potential way to help with chronic pain may be to implement a policy that could be preventative of chronic pain is to offer workers paid leave for a period of time to meet with physical therapists to address the pain in a health way and to give their bodies a break, maybe three times a year. This could help workers gain knowledge on how to deal with pain, so it doesn't compound overtime and become chronic pain.

Perhaps another solution could be for industrial workers to get a yearly or biyearly mandatory physicals to evaluate the health of workers and monitor their pain if they have any. The government could help companies subsidize this mandatory assessment through company insurance policies. This with the programs that oversee the prescription of opioid prescriptions could not only reduce overdose deaths but the monetary burden it puts on Medicare and Medicaid.

Because opioids are an addictive good the demand is not very elastic because it is not easy to quit. So with any policy implemented we would have to wait for a couple years to start seeing the changes and effectiveness of policies.

Section 8: Conclusion

By using our overdose and total cost models we were able to monetize the effect manufacturing state are subject to during this crisis and what events, such as labor force participation rate, impact overdoses and the cost of those overdoses. As a country were facing a crisis with opioids that has been extremely costly but for those states that are being hit harder than other, they need help and special attention.

Section 9: Bibliography

Brill, Alex. Gnaz, Scott "The Geographic Variation in the Cost of the Opioid Crisis" AEI 2018.

Carrick, Alex. "Series (1 of 7): Rankings of States by Industrial Subsector Jobs – Manufacturing." *ConstructConnect, Construction Project Management Software*, 14 Jan. 2019, www.constructconnect.com/blog/economy/series-1-7-rankings-states-industrial-sub-sector-jobs-weight-concentration-maps-manufacturing.

"Civilian Noninstitutional Population and Associated Rate and Ratio Measures for Model-Based Areas." *U.S. Bureau of Labor Statistics*, U.S. Bureau of Labor Statistics, 20 Mar. 2020, www.bls.gov/lau/rdscnp16.htm.

Dasgupta, Nabarun, et al. "Opioid Crisis: No Easy Fix to Its Social and Economic Determinants." *American Journal of Public Health*, vol. 108, no. 2, 2018, pp. 182–186., doi:10.2105/ajph.2017.304187.

"Educational Attainment." *Data.census.gov*, data.census.gov/cedsci/table?q=Educational%2BAttainment%2Bby%2Bstate&g=0100000US.04000.001&hidePreview=true&tid=ACSST5Y2010.S1501&t=Educational%2BAttainment&y=2010.

"Expenditure Reports From MBES/CBES." *Medicaid*, www.medicaid.gov/medicaid/financial-management/state-expenditure-reporting-medicaid-chip/expenditure-reports-mbescbes/index.html.

Florence, Curtis S., et al. "The Economic Burden of Prescription Opioid Overdose, Abuse, and Dependence in the United States, 2013." *Medical Care*, vol. 54, no. 10, 2016, pp. 901–906., doi:10.1097/mlr.0000000000000625.

Kiser Family Foundation. "Opioid Overdose Deaths by Race/Ethnicity." *KFF*, 13 Feb. 2020, www.kff.org/other/state-indicator/opioid-overdose-deaths-by-raceethnicity/?activeTab=graph¤tTimeframe=0&startTimeframe=18&sortModel=%7B%22colId%22%3A%22Location%22%2C%22sort%22%3A%22asc%22%7D.

"Per Capita GDP by State ." *U.S. Bureau of Economic Analysis (BEA)*, www.bea.gov/iTable/index_regional.cfm.

Scavette, "Adam Exploring the Economic Effects of the Opioid Epidemic" Federal Reserve Bank of Philadelphia Research Department, 2019 Q2.

"Total Medicare Spending by State (in Millions)." *The Henry J. Kaiser Family Foundation*, 30 Aug. 2017, www.kff.org/medicare/state-indicator/medicare-spending-by-residence/?currentTimeframe=0&sortModel=%7B%22colId%22%3A%22Location%22%2C%22sort%22%3A%22asc%22%7D.

"Unemployment Rates for States Annual Average Rankings." *DLT,* www.dlt.ri.gov/lmi/laus/us/annavg.htm.

US Census Bureau. "American Community Survey Tables for Health Insurance Coverage." *The United States Census Bureau*, 19 Sept. 2019, www.census.gov/data/tables/time-series/demo/health-insurance/acs-hi.html.

US Census Bureau. "Health Insurance Historical Tables - HIB Series." *The United States Census Bureau*, 5 Sept. 2017, www.census.gov/data/tables/time-series/demo/health-insurance/historical-series/hib.html.

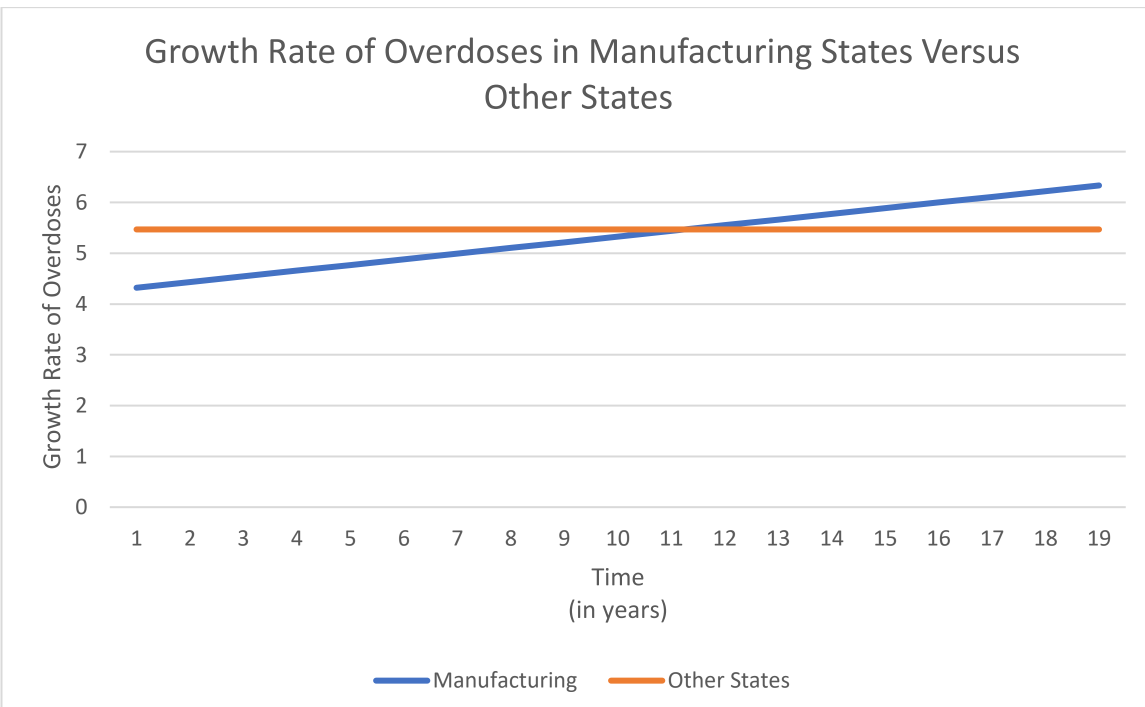
US Census Bureau. "Historical Income Tables: Households." *The United States Census Bureau*, 29 Aug. 2019, www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html.

US Census Bureau. "State Intercensal Tables: 2000-2010." *The United States Census Bureau*, 30 Nov. 2016, www.census.gov/data/tables/time-series/demo/popest/intercensal-2000-2010-state.html.

US Census Bureau. "State Population Totals: 2010-2019." *The United States Census Bureau*, 30 Dec. 2019, www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html.

Section 10: Graphs and Tables

Graph 1 (sheet 1)



Graph 2 (sheet 3)

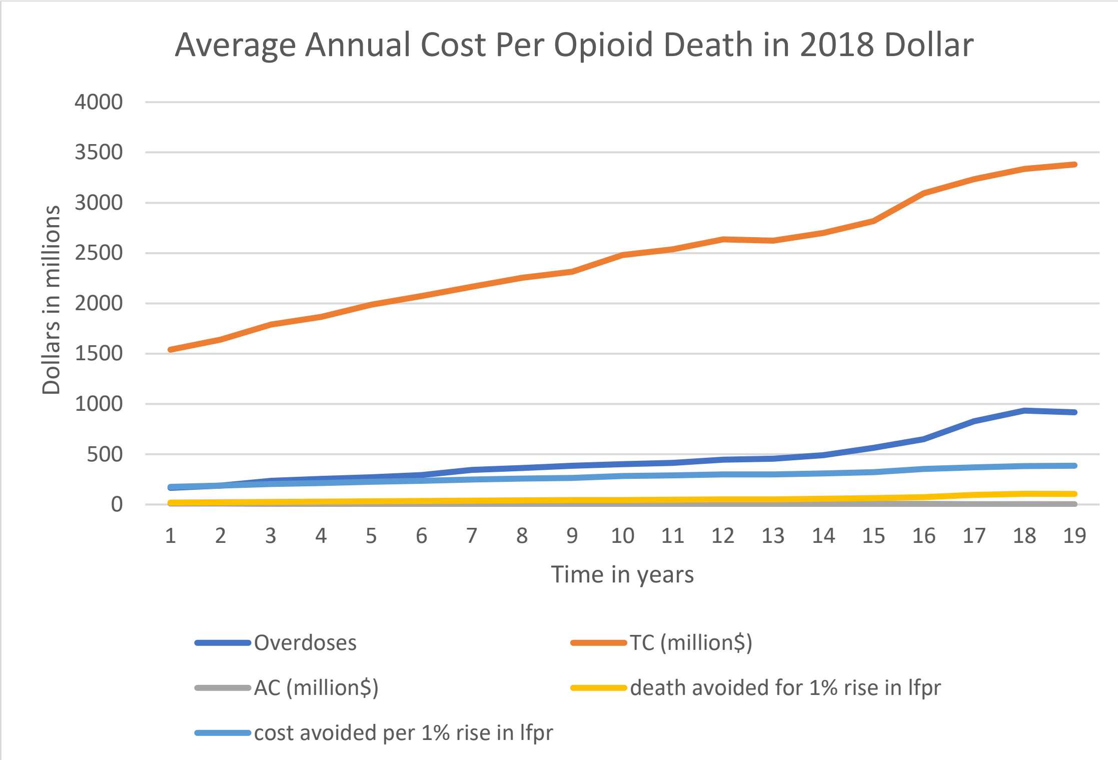


Table 1

State	# of Overdoses	TC	AC	Ranking (TC)	Ranking (AC)	Manufacturing
Alabama	181.8421	1820.181	10.00968	24	6	y
Alaska	53.60526	253.0687	4.720968	49	29	n
Arizona	536.9474	2338.25	4.35471	16	34	n
Arkansas	147.1053	1217.054	8.273352	31	11	y
California	1702.737	14605.34	8.577567	1	10	n
Colorado	367.2105	1417.421	3.859969	27	40	n
Connecticut	366.4737	1723.167	4.702021	26	31	n
Delaware	98.36842	484.3887	4.92423	41	26	n
Dist of Columbia	73.52632	312.917	4.25585	46	35	n
Florida	1567.053	7992.363	5.100251	4	25	n
Georgia	495.6842	2930.71	5.912454	12	19	n

Hawaii	58.63158	437.9829	7.470085	44	14	n
Idaho	70.68421	452.1524	6.396795	43	18	n
Illinois	1022.526	4665.597	4.562815	7	33	n
Indiana	373.3684	2397.251	6.420605	15	17	y
Iowa	118.2105	1086.637	9.19239	32	7	y
Kansas	118.2632	937.9204	7.930788	33	13	y
Kentucky	525.0526	1892.367	3.604147	23	44	y
Louisiana	197.2632	2096.583	10.62835	21	4	n
Maine	139.6316	656.5531	4.702038	37	30	n
Maryland	825.1579	2282.158	2.765723	18	47	n
Massachusetts	883.9474	3473.971	3.930065	11	39	n
Michigan	807.1053	4182.234	5.18177	8	23	y
Minnesota	231.7368	2124.117	9.166075	20	8	y
Mississippi	90.31579	1330.114	14.72737	30	1	n
Missouri	517.5263	2507.402	4.844975	14	27	n
Montana	48.94737	318.2895	6.502688	45	16	n
Nebraska	42.42105	609.9557	14.37861	38	2	y
Nevada	353	763.4683	2.1628	36	50	n
New Hampshire	180.6316	474.4543	2.626641	42	48	y
New Jersey	693.5263	3777.019	5.446108	9	21	n
New Mexico	264.2632	826.1894	3.126388	35	46	n
New York	1382.105	12374.34	8.953256	2	9	n
North Carolina	870.3684	3585.335	4.11933	10	37	n

North Dakota	21.15789	228.1669	10.78401	50	3	n
Ohio	1399.579	4994.355	3.56847	6	45	y
Oklahoma	382.0526	1396.493	3.655238	29	42	n
Oregon	296.1053	1399.881	4.727646	28	28	n
Pennsylvania	936.4211	6160.709	6.578994	5	15	n
Rhode Island	148.5789	547.6693	3.68605	40	41	n
South Carolina	303.5789	1772.172	5.837599	25	20	n
South Dakota	25.86842	263.6295	10.19117	48	5	n
Tennessee	626.6316	2624.949	4.188983	13	36	n
Texas	1026.158	8445.792	8.230499	3	12	n
Utah	347.7368	582.3602	1.674715	39	51	n
Vermont	59	307.2209	5.207134	47	22	n
Virginia	588.6842	2320.885	3.942496	17	38	n
Washington	616	2226.951	3.61518	19	43	n
West Virginia	396.4211	888.1068	2.240312	34	49	n
Wisconsin	444.5789	2041.393	4.591745	22	32	y
Wyoming	31.97368	164.8015	5.154286	51	24	n

Appendix: Stata outputs

```
reg logoverdoses manufacturing tmanufacturing


      Source |       SS           df       MS      Number of obs   =       969
-------------+----------------------------------   F(2, 966)       =     28.98
       Model |  89.1114717         2  44.5557359   Prob > F        =    0.0000
    Residual |  1485.40097       966  1.53768217   R-squared       =    0.0566
-------------+----------------------------------   Adj R-squared   =    0.0546
       Total |  1574.51244       968  1.62656244   Root MSE        =      1.24
```

```
------------------------------------------------------------------------------
logoverdoses |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
manufactur~g |  -1.148639   .1644043    -6.99   0.000    -1.471269   -.8260079
tmanufactu~g |   .1118731   .0149936     7.46   0.000     .0824494    .1412969
       _cons |    5.46791   .0455538   120.03   0.000     5.378514    5.557306
------------------------------------------------------------------------------

. reg logoverdoses recession recmanu medianhouseholdincomein2018dolla stategdpi
> n2018dollars percentinsured percentofhighschoolgraduate unemploymentrate labo
> rforceparticipationrate d1 d2 d3 d4 d5 d6 d7 d8 d9 d10 d11 d12 d13 d14 d15 d1
> 6 d17 d18, robust
note: d18 omitted because of collinearity

Linear regression                               Number of obs     =        969
                                                F(25, 943)        =      43.95
                                                Prob > F          =     0.0000
                                                R-squared         =     0.6086
                                                Root MSE          =      .8084

------------------------------------------------------------------------------
             |               Robust
logoverdoses |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   recession |    1.08437   .1930946     5.62   0.000     .7054249    1.463315
     recmanu |   .4578976   .0757328     6.05   0.000     .3092733     .606522
medianhous~a |   .0000351   4.46e-06     7.87   0.000     .0000264    .0000439
stategdpin~s |   1.45e-06   1.03e-07    14.13   0.000     1.25e-06    1.65e-06
percentins~d |  -.0121643   .0098091    -1.24   0.215    -.0314144    .0070858
percentofh~e |    .008148   .0129301     0.63   0.529    -.0172271    .0335232
unemployme~e |   .1488418   .0270495     5.50   0.000     .0957576    .2019259
laborforce~e |   -.113999   .0110026   -10.36   0.000    -.1355914   -.0924067
          d1 |   .1592047   .1581759     1.01   0.314    -.1512127    .4696221
          d2 |   .1855796   .1591656     1.17   0.244    -.1267801    .4979394
          d3 |   .2175676   .1690793     1.29   0.198    -.1142476    .5493829
          d4 |   .3296542   .1674566     1.97   0.049     .0010234    .6582849
          d5 |   .4709435   .1675931     2.81   0.005     .1420448    .7998422
```

```
          d6 |   .6913191   .1641959     4.21   0.000     .3690874    1.013551
          d7 |   .7233171   .1656814     4.37   0.000     .3981703    1.048464
          d8 |   -.430444   .1877656    -2.29   0.022    -.7989307   -.0619573
          d9 |  -.8695772   .2470724    -3.52   0.000    -1.354453   -.3847019
         d10 |  -.9959247   .2288538    -4.35   0.000    -1.445046   -.5468031
         d11 |  -.8543239   .2190385    -3.90   0.000    -1.284183   -.4244646
         d12 |  -.7844752   .2098578    -3.74   0.000    -1.196318   -.3726328
         d13 |  -.6509623   .1977026    -3.29   0.001     -1.03895   -.2629744
         d14 |  -.4294533   .1850145    -2.32   0.020    -.7925412   -.0663655
         d15 |  -.2890282   .1788725    -1.62   0.106    -.6400625     .062006
         d16 |  -.0827196   .1847143    -0.45   0.654    -.4452183    .2797791
         d17 |   .0129847   .1901914     0.07   0.946    -.3602627    .3862321
         d18 |          0  (omitted)
       _cons |    9.27487   .9313651     9.96   0.000     7.447082    11.10266
------------------------------------------------------------------------------

. predict uhat, resid
variable uhat already defined
r(110);

. reg logtmcaremcaidreal recession manufacturing logoverdoses medianhouseholdin
> comein2018dolla stategdpin2018dollars percentinsured percentofhighschoolgradu
> ate unemploymentrate uhat

      Source |       SS           df       MS      Number of obs   =       969
-------------+----------------------------------   F(9, 959)       =    789.85
       Model |  1028.87307         9  114.31923   Prob > F        =    0.0000
    Residual |  138.800705       959  .144734833   R-squared       =    0.8811
-------------+----------------------------------   Adj R-squared   =    0.8800
       Total |  1167.67378       968  1.20627457   Root MSE        =    .38044

------------------------------------------------------------------------------
logtmcarem~l |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   recession |  -.0667315   .0365419    -1.83   0.068    -.1384429    .0049798
manufactur~g |   .3018936   .0307225     9.83   0.000     .2416025    .3621848
logoverdoses |    .555052   .0258287    21.49   0.000     .5043646    .6057393
medianhous~a |  -.0000114   1.82e-06    -6.28   0.000     -.000015   -7.84e-06
```

```
stategdpin~s |   9.51e-07   5.22e-08    18.20   0.000     8.48e-07    1.05e-06
percentins~d |    .027083   .0038874     6.97   0.000     .0194541    .0347118
percentofh~e |  -.0265567   .0051266    -5.18   0.000    -.0366174   -.0164959
unemployme~e |   .0311781   .0079132     3.94   0.000      .015649    .0467073
        uhat |    -.00639   .0300267    -0.21   0.832    -.0653156    .0525356
       _cons |   6.320635   .4900097    12.90   0.000      5.35902     7.28225
------------------------------------------------------------------------------

. reg logtmcaremcaidreal recession manufacturing logoverdoses medianhouseholdin
> comein2018dolla stategdpin2018dollars percentinsured percentofhighschoolgradu
> ate unemploymentrate state2 state3 state4 state5 state6 state7 state8 state9
> state10 state11 state12 state13 state14 state15 state16 state17 state18 state
> 19 state20 state21 state22 state23 state24 state25 state26 state27 state28 st
> ate29 state30 state31 state32 state33 state34 state35 state36 state37 state38
>  state40 state41 state42 state43 state44 state45 state46 state47 state48 stat
> e49 state50 state51, robust

Linear regression                               Number of obs     =        969
                                                F(57, 911)        =    2320.36
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9911
                                                Root MSE          =     .10689

------------------------------------------------------------------------------
             |               Robust
logtmcarem~l |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   recession |   .2435599   .0123389    19.74   0.000      .219344    .2677758
manufactur~g |  -.7826068   .0372054   -21.03   0.000    -.8556251   -.7095885
logoverdoses |   .1287909   .0112128    11.49   0.000     .1067851    .1507968
medianhous~a |   8.37e-07   1.34e-06     0.63   0.532    -1.79e-06    3.47e-06
stategdpin~s |   4.80e-08   2.09e-08     2.30   0.022     7.02e-09    8.91e-08
percentins~d |   .0139577   .0019992     6.98   0.000     .0100342    .0178812
percentofh~e |   .0265149   .0035737     7.42   0.000     .0195014    .0335285
unemployme~e |   .0002787   .0029664     0.09   0.925     -.005543    .0061005
      state2 |  -2.825309   .0644826   -43.82   0.000    -2.951861   -2.698757
      state3 |  -.7665695   .0504782   -15.19   0.000    -.8656365   -.6675025
      state4 |  -.3739846   .0265724   -14.07   0.000    -.4261349   -.3218343
```

state5	.9117126	.058	15.72	0.000	.7978834	1.025542
state6	-1.391744	.0435258	-31.98	0.000	-1.477166	-1.306321
state7	-1.192051	.0351191	-33.94	0.000	-1.260975	-1.123127
state8	-2.232694	.0436314	-51.17	0.000	-2.318324	-2.147065
state9	-2.587985	.0443242	-58.39	0.000	-2.674975	-2.500996
state10	.3277618	.035011	9.36	0.000	.2590503	.3964734
state11	-.4770514	.0299412	-15.93	0.000	-.5358132	-.4182896
state12	-2.398516	.0508786	-47.14	0.000	-2.498369	-2.298663
state13	-2.237946	.0484283	-46.21	0.000	-2.33299	-2.142902
state14	-.2583379	.0288397	-8.96	0.000	-.3149379	-.201738
state15	.0333382	.0289374	1.15	0.250	-.0234536	.0901299
state16	-.7540608	.0419554	-17.97	0.000	-.8364013	-.6717204
state17	-.8493557	.0378102	-22.46	0.000	-.923561	-.7751505
state18	-.110762	.0288147	-3.84	0.000	-.1673129	-.0542111
state19	-.5904184	.0388109	-15.21	0.000	-.6665876	-.5142491
state20	-2.015574	.0434042	-46.44	0.000	-2.100757	-1.93039
state21	-.9929577	.040657	-24.42	0.000	-1.07275	-.9131654
state22	-.647575	.0308965	-20.96	0.000	-.7082115	-.5869384
state23	.4048334	.0338866	11.95	0.000	.3383284	.4713383
state24	-.2662213	.047584	-5.59	0.000	-.3596083	-.1728342
state25	-.9224203	.0417676	-22.08	0.000	-1.004392	-.8404484
state26	-.773149	.0282705	-27.35	0.000	-.828632	-.7176661
state27	-2.600258	.0579922	-44.84	0.000	-2.714072	-2.486444
state28	-1.176219	.0495203	-23.75	0.000	-1.273406	-1.079032
state29	-1.834108	.062679	-29.26	0.000	-1.95712	-1.711096
state30	-1.656751	.0503348	-32.91	0.000	-1.755537	-1.557966
state31	-.4006764	.0372787	-10.75	0.000	-.4738385	-.3275144
state32	-1.606911	.0421774	-38.10	0.000	-1.689687	-1.524135
state33	.7198904	.0385842	18.66	0.000	.6441661	.7956147
state34	-.3579907	.0298765	-11.98	0.000	-.4166254	-.2993559
state35	-2.8468	.0626796	-45.42	0.000	-2.969813	-2.723787
state36	.5361457	.0375293	14.29	0.000	.4624918	.6097996
state37	-1.220829	.0341622	-35.74	0.000	-1.287875	-1.153783
state38	-1.338995	.0415055	-32.26	0.000	-1.420453	-1.257537
state40	-2.068315	.0388311	-53.26	0.000	-2.144524	-1.992107
state41	-.8997637	.0329333	-27.32	0.000	-.9643977	-.8351297
state42	-2.708768	.0557956	-48.55	0.000	-2.818271	-2.599265
state43	-.6041162	.0349611	-17.28	0.000	-.6727299	-.5355025

```
     state44 |   .6052238   .0520884    11.62   0.000     .5029966    .7074511
     state45 |  -2.296716   .0472777   -48.58   0.000    -2.389502    -2.20393
     state46 |  -2.743572   .0497807   -55.11   0.000     -2.84127   -2.645873
     state47 |  -.9020049    .038792   -23.25   0.000    -.9781369   -.8258729
     state48 |  -1.035543    .035742   -28.97   0.000    -1.105689   -.9653965
     state49 |  -1.606462   .0386321   -41.58   0.000     -1.68228   -1.530644
     state50 |   -.293573   .0349588    -8.40   0.000    -.3621821    -.224964
     state51 |  -3.213432   .0598029   -53.73   0.000      -3.3308   -3.096065
       _cons |   6.088324   .2874616    21.18   0.000      5.52416    6.652488
------------------------------------------------------------------------------

. sum overdoses_n  tcopioid if year==2000

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    165.1765    194.0031         10       1012
    tcopioid |         51    1538.903    1888.161   97.44191    9161.64

.
. sum overdoses_n  tcopioid if year==2001

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    186.5392    191.1489         12        846
    tcopioid |         51    1640.231    1967.461   103.8055   9292.986

.
. sum overdoses_n  tcopioid if year==2002

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    233.8333    270.9274         12       1453
    tcopioid |         51    1788.755    2151.394   110.6668   10242.66

.
. sum overdoses_n  tcopioid if year==2003

    Variable |        Obs        Mean    Std. Dev.       Min        Max
```

```
-------------+---------------------------------------------------------
 overdoses_n |         51    254.1176     272.662         11       1398
    tcopioid |         51    1864.271    2273.319   125.8859    10816.3

.
. sum overdoses_n  tcopioid if year==2004

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    269.7255    282.0492         10       1413
    tcopioid |         51    1985.302    2362.622   135.5093   11104.57

.
. sum overdoses_n  tcopioid if year==2005

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    292.6078    284.1811         10       1372
    tcopioid |         51    2070.888    2469.442   143.1711   11462.08

.
. sum overdoses_n  tcopioid if year==2006

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    344.2353    332.9543         14       1511
    tcopioid |         51    2165.205    2572.463   151.5522   11974.79

.
. sum overdoses_n  tcopioid if year==2007

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    363.0588    352.8229         15       1657
    tcopioid |         51    2254.162    2652.949   154.2764   12356.47

.
. sum overdoses_n  tcopioid if year==2008
```

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    383.9608    371.0422         29       1801
    tcopioid |         51    2314.731    2745.144   162.0823   13082.39

. 
. sum overdoses_n  tcopioid if year==2009

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    400.4314    403.8558         13       1987
    tcopioid |         51    2480.839    2913.807   174.3642   13941.36

. 
. sum overdoses_n  tcopioid if year==2010

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    413.5098     409.584         18       1929
    tcopioid |         51    2535.517    2979.008   178.7896   14029.81

. 
. sum overdoses_n  tcopioid if year==2011

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    446.7451    425.8471         10       1938
    tcopioid |         51     2635.97    3191.437   181.5464      16114

. 
. sum overdoses_n  tcopioid if year==2012

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    454.2647    418.3831       10.5       1719
    tcopioid |         51    2624.262    3106.267   181.6137   15405.56
```

```
.

. sum overdoses_n  tcopioid if year==2013

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    491.2157    452.8093         11       1948
    tcopioid |         51    2700.141    3273.804   186.3338   17196.81

.

. sum overdoses_n  tcopioid if year==2014

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    561.7059    507.8842         31       2106
    tcopioid |         51    2817.313    3359.228   188.4277   17556.73

.

. sum overdoses_n  tcopioid if year==2015

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    648.8431    617.3873         27       2698
    tcopioid |         51    3094.238    3826.579   200.1386   21170.88

.

. sum overdoses_n  tcopioid if year==2016

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    828.4118    846.7209         42       3613
    tcopioid |         51    3234.983    3947.716   208.9497   21307.14

.

. sum overdoses_n  tcopioid if year==2017

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         51    933.3333    971.7007         35       4293
```

```
    tcopioid |         51    3335.592    4081.717   216.3191    21408.8

.

. sum overdoses_n  tcopioid if year==2018

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |         51    917.6863    933.4335         28       3237

    tcopioid |         51    3380.215    4075.669   230.3544    21582.6

. *find overdoses and tc of overdoses for each state

.

. sum overdoses_n  tcopioid if state1==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |         19    181.8421    113.2526         43        422

    tcopioid |         19    1820.181    345.8654   1212.096   2403.814

.

. sum overdoses_n  tcopioid if state2==2

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |          0

    tcopioid |          0

.

. sum overdoses_n  tcopioid if state1==2

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |          0

    tcopioid |          0

.

. sum overdoses_n  tcopioid if state2==1
```

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    53.60526     33.7452         10        102
    tcopioid |         19    253.0687    71.70903   132.0224   388.4505

.
. sum overdoses_n  tcopioid if state3==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    536.9474    222.7112        235       1106
    tcopioid |         19     2338.25    744.6204   1033.895   3523.677

.
. sum overdoses_n  tcopioid if state4==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    147.1053    55.54167         20        208
    tcopioid |         19    1217.054    307.8423   699.2443   1728.359

.
. sum overdoses_n  tcopioid if state5==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    1702.737    440.5302        551       2410
    tcopioid |         19    14605.34    4386.018   8532.129    21582.6

.
. sum overdoses_n  tcopioid if state6==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    367.2105    131.8006        174        578
    tcopioid |         19    1417.421    471.8072   797.4127   2206.438
```

```
.
. sum overdoses_n  tcopioid if state7==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    366.4737    282.9767        149        955
    tcopioid |         19    1723.167    354.8949   1204.086   2308.462

.
. sum overdoses_n  tcopioid if state8==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    98.36842    83.79287         29        355
    tcopioid |         19    484.3887    140.1784   274.0463   713.7862

.
. sum overdoses_n  tcopioid if state9==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    73.52632    65.82584         13        244
    tcopioid |         19     312.917    73.77396   206.4306   436.8117

.
. sum overdoses_n  tcopioid if state10==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    1567.053    741.7311        556       3245
    tcopioid |         19    7992.363    1924.387   4791.785   11284.39

.
. sum overdoses_n  tcopioid if state11==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    495.6842    268.6038        115       1014
```

```
    tcopioid |         19     2930.71    625.6842   1750.677   3999.058

.

. sum overdoses_n  tcopioid if state12==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |         19    58.63158    13.50807         29         78

    tcopioid |         19    437.9829    126.4428   260.7411   649.0218

.

. sum overdoses_n  tcopioid if state13==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |         19    70.68421    24.50862         28        120

    tcopioid |         19    452.1524    128.5271   248.3475   679.9894

.

. sum overdoses_n  tcopioid if state14==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |         19    1022.526    546.4333        460       2202

    tcopioid |         19    4665.597     893.548   3153.754    6089.03

.

. sum overdoses_n  tcopioid if state15==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max

-------------+---------------------------------------------------------

 overdoses_n |         19    373.3684    326.7818         41       1176

    tcopioid |         19    2397.251    608.4162   1458.019   3434.562

.

. sum overdoses_n  tcopioid if state16==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
```

```
-------------+---------------------------------------------------------
 overdoses_n |         19    118.2105    60.29242         19        206
    tcopioid |         19    1086.637     232.992   701.2697    1462.85

.
. sum overdoses_n  tcopioid if state17==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    118.2632    41.26048         22        173
    tcopioid |         19    937.9204    172.6409   635.3589   1226.711

.
. sum overdoses_n  tcopioid if state18==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    525.0526    321.8627         92       1160
    tcopioid |         19    1892.367    489.9302    1170.13   2688.128

.
. sum overdoses_n  tcopioid if state19==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    197.2632    111.7263         52        444
    tcopioid |         19    2096.583    390.3423   1429.174   2899.766

.
. sum overdoses_n  tcopioid if state20==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    139.6316    89.01761         41        360
    tcopioid |         19    656.5531    123.4209   419.5587   862.7437

.
. sum overdoses_n  tcopioid if state21==1
```

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    825.1579    532.2057        481       2087
    tcopioid |         19    2282.158    584.2351   1366.036   3243.249

.
. sum overdoses_n  tcopioid if state22==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    883.9474    551.9417        314       1991
    tcopioid |         19    3473.971    655.4356    2457.13   4535.967

.
. sum overdoses_n  tcopioid if state23==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    807.1053     583.034        180       2033
    tcopioid |         19    4182.234    896.8324   2812.664   5672.475

.
. sum overdoses_n  tcopioid if state24==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    231.7368    109.6179         57        422
    tcopioid |         19    2124.117    553.6981   1203.997   3032.418

.
. sum overdoses_n  tcopioid if state25==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    90.31579    54.92121         12        185
    tcopioid |         19    1330.114    266.7105   811.5468   1765.327
```

```
.

. sum overdoses_n  tcopioid if state26==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    517.5263    280.1488        131       1132
    tcopioid |         19    2507.402    490.8242   1599.003   3321.217

.

. sum overdoses_n  tcopioid if state27==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    48.94737    18.85168         11         89
    tcopioid |         19    318.2895    85.07315   194.5238   496.1627

.

. sum overdoses_n  tcopioid if state28==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    42.42105    15.84409         14         66
    tcopioid |         19    609.9557    101.2055   421.1222   786.5786

.

. sum overdoses_n  tcopioid if state29==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19         353    90.62193        178        461
    tcopioid |         19    763.4683    296.7754   355.0133   1293.594

.

. sum overdoses_n  tcopioid if state30==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    180.6316    134.9338         29        437
```

```
    tcopioid |         19    474.4543    110.4732   300.9563   678.3592

.
. sum overdoses_n  tcopioid if state31==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    693.5263    632.3952         55       2583
    tcopioid |         19    3777.019    689.8457   2672.477   4956.574

.
. sum overdoses_n  tcopioid if state32==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    264.2632     74.4803        151        402
    tcopioid |         19    826.1894    244.2601    416.612   1216.812

.
. sum overdoses_n  tcopioid if state33==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    1382.105    888.8509        479       3224
    tcopioid |         19    12374.34    1908.027    9161.64   16552.62

.
. sum overdoses_n  tcopioid if state34==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    870.3684    452.7712        286       1953
    tcopioid |         19    3585.335    829.2392   2116.523   5011.044

.
. sum overdoses_n  tcopioid if state35==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
```

```
-------------+---------------------------------------------------------
 overdoses_n |         19    21.15789    12.10837         10         54
    tcopioid |         19    228.1669    56.59607    159.204   336.6124

.
. sum overdoses_n  tcopioid if state36==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    1399.579    1222.476        250       4293
    tcopioid |         19    4994.355    1118.074   3134.126   6809.439

.
. sum overdoses_n  tcopioid if state37==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    382.0526    136.9118        127        568
    tcopioid |         19    1396.493    310.1864   832.4014   1901.192

.
. sum overdoses_n  tcopioid if state38==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    296.1053    81.58356        106        392
    tcopioid |         19    1399.881    457.0003   817.1143   2171.331

.
. sum overdoses_n  tcopioid if state39==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    936.4211    775.7339        252       2866
    tcopioid |         19    6160.709    1150.644   4346.745   8012.902

.
. sum overdoses_n  tcopioid if state40==1
```

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    148.5789    74.16821         57        279
    tcopioid |         19    547.6693    91.58472   393.9012   694.9562

.
. sum overdoses_n  tcopioid if state41==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    303.5789    233.4534         81        835
    tcopioid |         19    1772.172    420.7593   1080.663   2539.346

.
. sum overdoses_n  tcopioid if state42==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    25.86842    9.005927         12         42
    tcopioid |         19    263.6295     53.6615   169.9445   357.5425

.
. sum overdoses_n  tcopioid if state43==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    626.6316    369.1113        100       1307
    tcopioid |         19    2624.949    475.7935   1755.417   3424.607

.
. sum overdoses_n  tcopioid if state44==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    1026.158    283.1329        379       1458
    tcopioid |         19    8445.792    2454.027   4608.526   12582.13
```

```
.
. sum overdoses_n  tcopioid if state45==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    347.7368    99.89708        156        466
    tcopioid |         19    582.3602    163.3041   320.6758   866.9642

.
. sum overdoses_n  tcopioid if state46==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19          59     28.4312         22        127
    tcopioid |         19    307.2209    79.78067   176.5642   437.7292

.
. sum overdoses_n  tcopioid if state47==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    588.6842    303.9695        250       1241
    tcopioid |         19    2320.885    630.4747   1332.933     3399.3

.
. sum overdoses_n  tcopioid if state48==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19         616    125.1958        324        742
    tcopioid |         19    2226.951    564.4163   1408.384   3267.221

.
. sum overdoses_n  tcopioid if state49==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    396.4211    228.7338         50        833
```

```
    tcopioid |         19    888.1068    194.7923   571.1217   1204.757

.
. sum overdoses_n  tcopioid if state50==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    444.5789    247.6845        112        926
    tcopioid |         19    2041.393    442.3723   1277.992   2781.464

.
. sum overdoses_n  tcopioid if state51==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         19    31.97368    16.26215         10         54
    tcopioid |         19    164.8015    38.25605   97.44191   230.3544

.
. *measuring overdoses and TC in manu states for the 19 year period.

.
. sum overdoses_n tcopioid if year==2000 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    73.41667    74.06933         16        250
    tcopioid |         12    1252.248    885.0125   300.9563   3134.126

.
. sum overdoses_n tcopioid if year==2001 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12      101.75    90.69642         27        336
    tcopioid |         12    1354.928    947.6288   324.3369   3377.416

.
```

```
. sum overdoses_n tcopioid if year==2002 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12      128.25    110.1983         25        421
    tcopioid |         12    1467.121    1004.308   358.3384   3678.558

.
. sum overdoses_n tcopioid if year==2003 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    136.8333    104.7619         14        365
    tcopioid |         12    1510.122    1052.436   350.1527   3821.666

.
. sum overdoses_n tcopioid if year==2004 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    173.6667    138.3101         26        515
    tcopioid |         12    1619.354    1137.468   402.6953   4191.906

.
. sum overdoses_n tcopioid if year==2005 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12      202.75    166.9709         43        560
    tcopioid |         12    1676.964    1166.345   423.3624   4272.289

.
. sum overdoses_n tcopioid if year==2006 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    236.8333    197.4302         34        634
    tcopioid |         12    1768.815    1217.245   419.6436   4515.975
```

```
.
. sum overdoses_n tcopioid if year==2007 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    255.5833     193.478         39        705
    tcopioid |         12    1844.681    1282.334    440.674   4706.271

.
. sum overdoses_n tcopioid if year==2008 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    288.0833    234.6822         29        814
    tcopioid |         12    1878.115    1280.767   457.7231   4619.296

.
. sum overdoses_n tcopioid if year==2009 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    309.1667    213.6581         66        736
    tcopioid |         12    2014.148    1391.987   483.6989   5051.019

.
. sum overdoses_n tcopioid if year==2010 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    345.8333    314.9862         58       1124
    tcopioid |         12    2046.157    1427.083   482.5885   5180.724

.
. sum overdoses_n tcopioid if year==2011 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
```

```
 overdoses_n |         12    384.3333    352.2172         53       1272
    tcopioid |         12    2113.251    1464.112   502.3125   5303.749

.
. sum overdoses_n tcopioid if year==2012 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    393.5833    368.2964         53       1355
    tcopioid |         12    2131.565    1478.452   476.5857   5334.021

.
. sum overdoses_n tcopioid if year==2013 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12      444.25    454.8397         41       1630
    tcopioid |         12    2160.865    1498.189   487.8043   5436.525

.
. sum overdoses_n tcopioid if year==2014 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    535.0833    571.6304         56       2106
    tcopioid |         12     2299.96    1601.618   515.1413   5848.629

.
. sum overdoses_n tcopioid if year==2015 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    635.5833    740.7138         55       2698
    tcopioid |         12    2503.308    1750.557   596.1829   6345.401

.
. sum overdoses_n tcopioid if year==2016 & manufacturing==1
```

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    811.8333    1007.191         44       3613
    tcopioid |         12    2608.845    1803.854   650.4076   6493.765

.
. sum overdoses_n tcopioid if year==2017 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    954.4167    1200.606         59       4293
    tcopioid |         12     2678.92    1870.094   678.3592   6771.971

.
. sum overdoses_n tcopioid if year==2018 & manufacturing==1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         12    824.4167    944.0513         63       3237
    tcopioid |         12    2719.006     1881.14   663.6678   6809.439

.
. *measuring ovedoses and TC in non manu states for the 19 year period

.
. sum overdoses_n tcopioid if year==2000 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    193.4103    210.8494         10       1012
    tcopioid |         39    1627.105    2104.834   97.44191    9161.64

.
. sum overdoses_n tcopioid if year==2001 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    212.6282    206.7032         12        846
```

```
    tcopioid |         39    1728.017    2190.829   103.8055   9292.986

.
. sum overdoses_n tcopioid if year==2002 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    266.3205    297.4261         12       1453
    tcopioid |         39     1887.72    2399.049   110.6668   10242.66

.
. sum overdoses_n tcopioid if year==2003 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    290.2051    298.2689         11       1398
    tcopioid |         39    1973.241    2535.261   125.8859    10816.3

.
. sum overdoses_n tcopioid if year==2004 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    299.2821    308.7481         10       1413
    tcopioid |         39    2097.901    2629.616   135.5093   11104.57

.
. sum overdoses_n tcopioid if year==2005 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    320.2564    307.9886         10       1372
    tcopioid |         39    2192.095    2750.637   143.1711   11462.08

.
. sum overdoses_n tcopioid if year==2006 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
```

```
-------------+---------------------------------------------------------
 overdoses_n |         39    377.2821     360.305         14       1511
    tcopioid |         39    2287.171    2865.926   151.5522   11974.79

.
. sum overdoses_n tcopioid if year==2007 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    396.1282    384.9528         15       1657
    tcopioid |         39    2380.156    2952.196   154.2764   12356.47

.
. sum overdoses_n tcopioid if year==2008 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    413.4615    401.7571         31       1801
    tcopioid |         39    2449.074    3059.735   162.0823   13082.39

.
. sum overdoses_n tcopioid if year==2009 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    428.5128    444.9164         13       1987
    tcopioid |         39    2624.436    3243.543   174.3642   13941.36

.
. sum overdoses_n tcopioid if year==2010 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    434.3333    436.0318         18       1929
    tcopioid |         39    2686.089    3314.896   178.7896   14029.81

.
. sum overdoses_n tcopioid if year==2011 & manufacturing==0
```

```
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    465.9487    448.4341         10       1938
    tcopioid |         39    2796.806    3559.258   181.5464      16114

.
. sum overdoses_n tcopioid if year==2012 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    472.9359    435.3574       10.5       1719
    tcopioid |         39    2775.861    3458.748   181.6137   15405.56

.
. sum overdoses_n tcopioid if year==2013 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    505.6667    457.1517         11       1948
    tcopioid |         39    2866.072    3651.372   186.3338   17196.81

.
. sum overdoses_n tcopioid if year==2014 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    569.8974    494.4913         31       2024
    tcopioid |         39    2976.498    3740.967   188.4277   17556.73

.
. sum overdoses_n tcopioid if year==2015 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    652.9231    585.3556         27       2166
    tcopioid |         39    3276.062    4270.297   200.1386   21170.88
```

```
.
. sum overdoses_n tcopioid if year==2016 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    833.5128    805.9601         42       3009
    tcopioid |         39    3427.641    4404.776   208.9497   21307.14

.
. sum overdoses_n tcopioid if year==2017 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    926.8462    908.2537         35       3245
    tcopioid |         39    3537.645    4553.149   216.3191    21408.8

.
. sum overdoses_n tcopioid if year==2018 & manufacturing==0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
 overdoses_n |         39    946.3846    940.6721         28       3189
    tcopioid |         39    3583.664    4544.423   230.3544    21582.6

.
```