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Final Report

Opioid and Drug Overdoses in the United States (1999-2021)

Data provided by the Center for Disease Control

Introduction

The topic of my research is Opioid Drug Overdose Deaths by State and County in the United States between 1999-2021. I want to know the trends for deaths by nation, state and by county. I want to see growth rate trends that are higher and lower than the average rate, I want to see areas that have significant data sets that standout. What states have significant difference in rates, and are there certain years that show growth patterns? Do any states defy that 'norm'? What counties are geographically most affect and is there a correlation? What counties have the highest rates? What states differ from the national average? What counties differ from state averages? I work with a company that provides outpatient addiction treatment for substance use disorders, and we operate in nine states across the country. This data is not only relevant due to our national public health emergency, but also personally relevant to the work that I do. I actively help push policy and advocate for substance use recovery and I am creating the Eastern Washington Recovery Coalition to help create initiatives to combat the drug abuse problem in Washington State.

The dataset that I am using includes all 50 U.S. states but does not include other territories such as Puerto Rico. Each state then includes data for each county within the state. The data includes total population, deaths, crude rate, and age-adjusted rate. Additionally, data is available for the years 1999-2021. The most relevant variables will be state and county deaths over the last 15 years.

Descriptive Statistics

The Opioid Drug Overdose Deaths data from the Drug and Opioid Overdoses Database provided by the Centers for Disease Control and Prevention included all available data for deaths associated with opioid and drug overdose for each state during the span of 1999-2021. Some states do not report any data for certain years, which does not allow for an entirely representative analysis, however the data that is available provides significant insight into yearly trends by state.

Chart 1 shows the total death count from the years 1999-2021 for each state. As represented in Chart 1, there is not an equal distribution of deaths across the states. Data shows that some states, such as Ohio, New York, and Pennsylvania having a much greater death count compared to Washington DC and New Mexico.
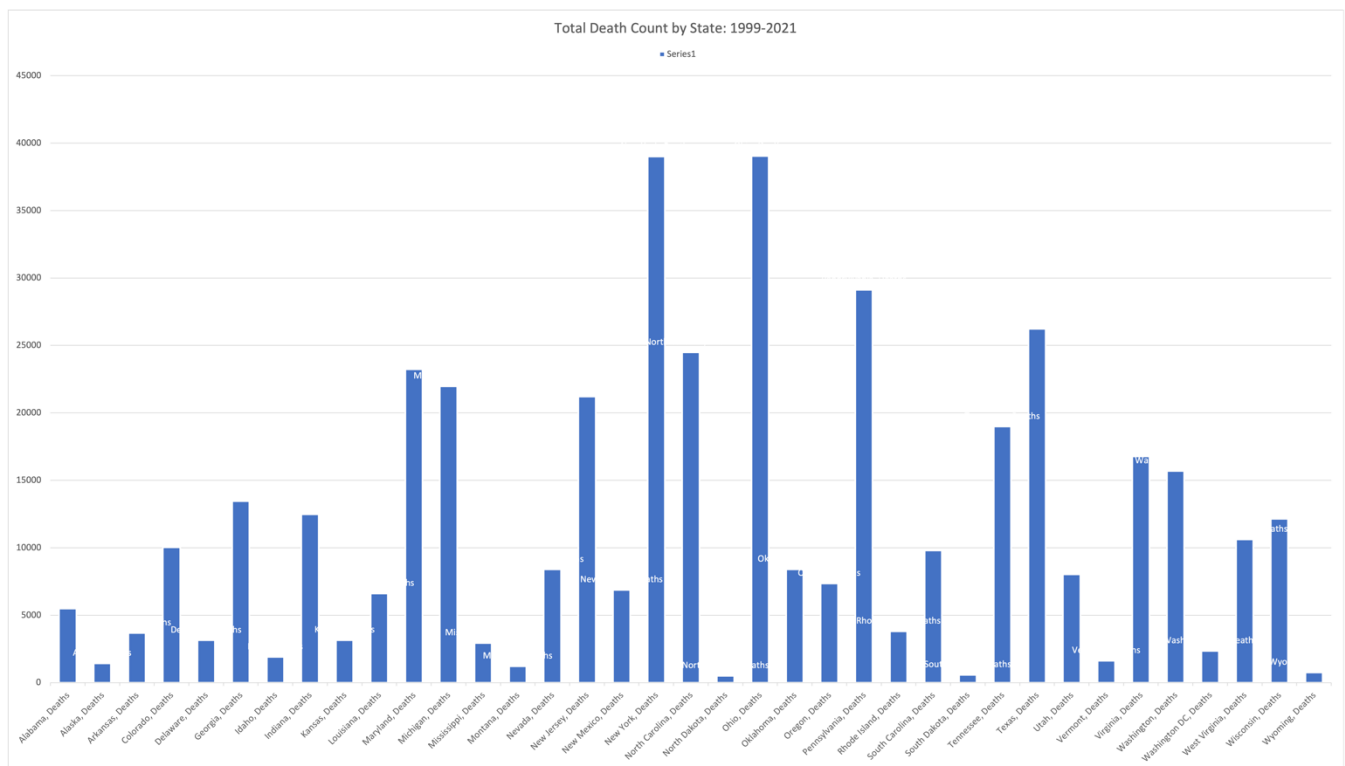
However, when we use the same data to create a chart that represents the death rate, which takes into consideration the population of each state, we see a much different ranking. Chart 2 now shows that the actual rate of death by drug overdose per capita is higher in states like New Mexico and Washington DC, states the ranked on the lower end in Chart 1. Chart 2 shows a more accurate representation of the percentage of people dying from drug overdose. There are numerous examples of lesser populated states having a higher overdose death rate, which means that in these states, more of their community is dying from overdose.
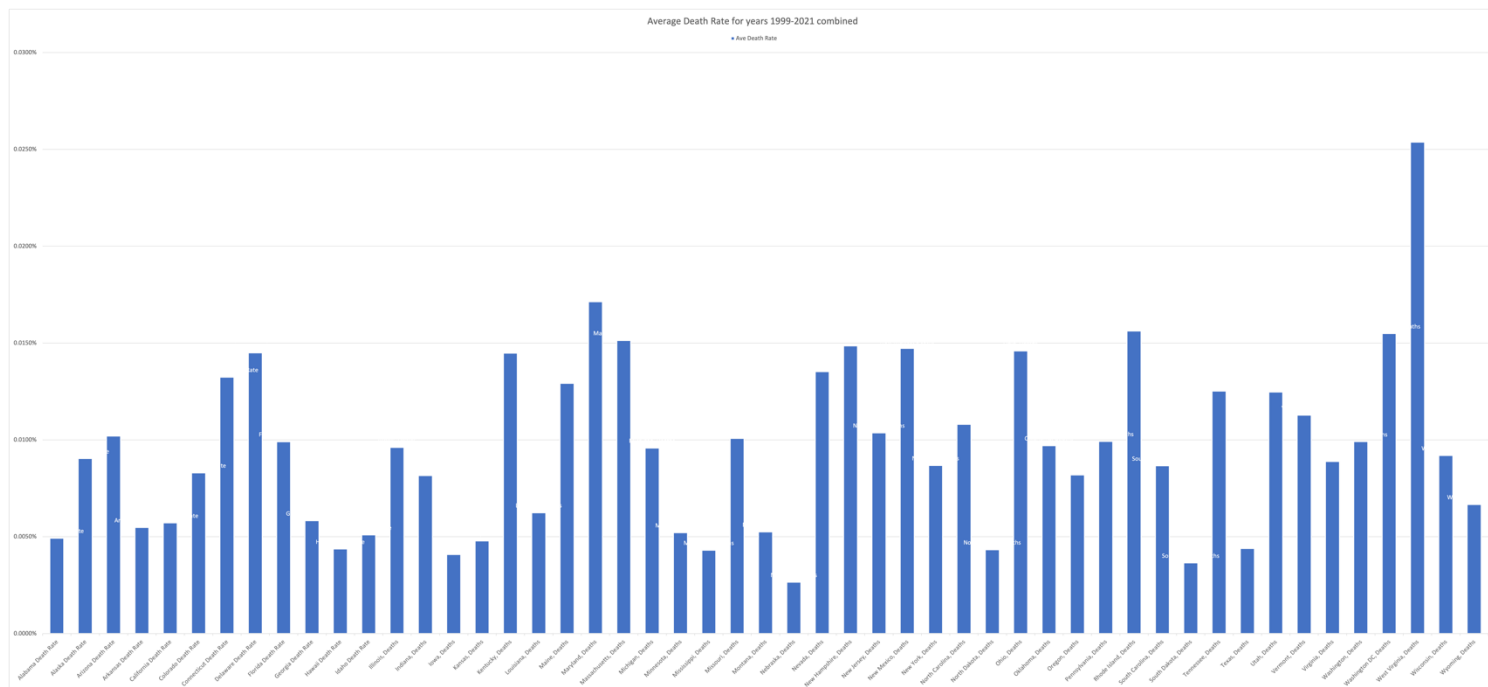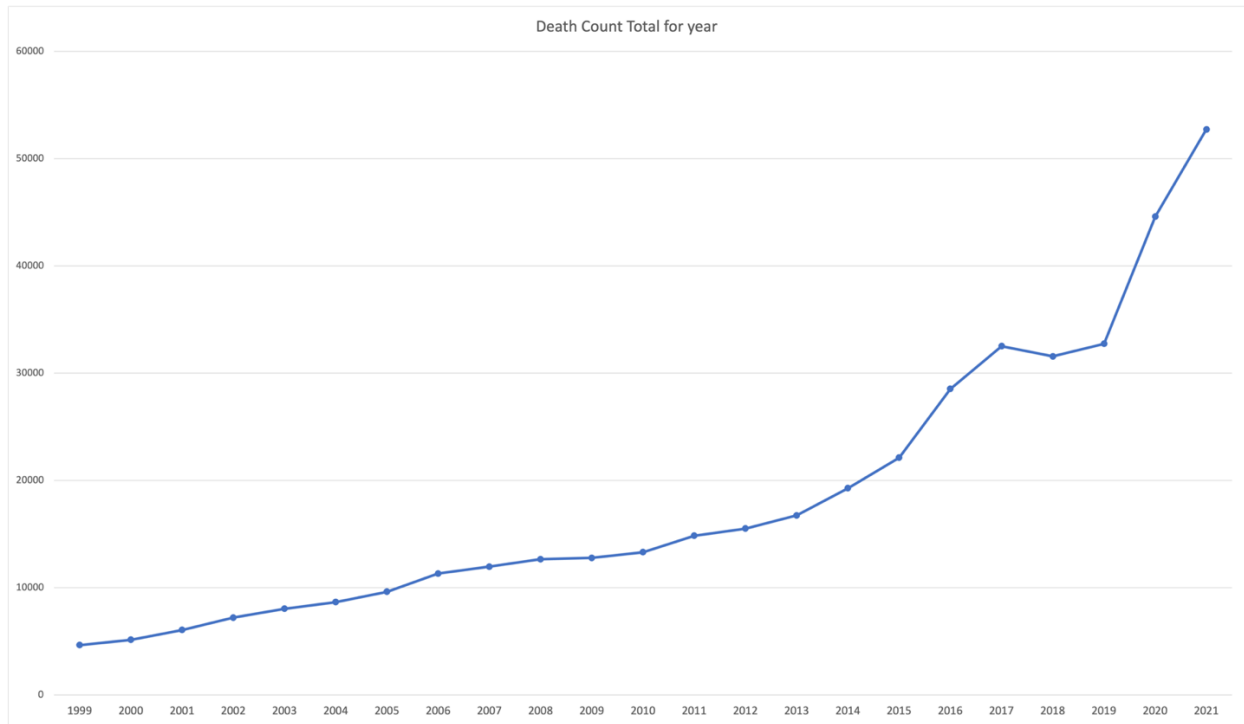
Chart 2

Chart 4 shows the total drug overdose death count of all states that provided data grouped into years 1999-2021. Chart 4 shows that almost every year there is an increase in the total drug overdose deaths, with the exception of a couple years. A notable trend is the significant uptick in deaths from the year 2019 to 2020, and then again to 2021. We see drastic growth in a small period compared to the rest of the years.

Death Count Total for year

Chart 4

Chart 5 shows a similar trend, however the data that is represented is the average overdose deaths of each year's total, of all included state data. Chart 5 shows us the national average for deaths associated with drug overdose from 1999-2021. As shown in Chart 5, there is again a significant increase in the death count from 2018-2021, although in this case shown as a national average.
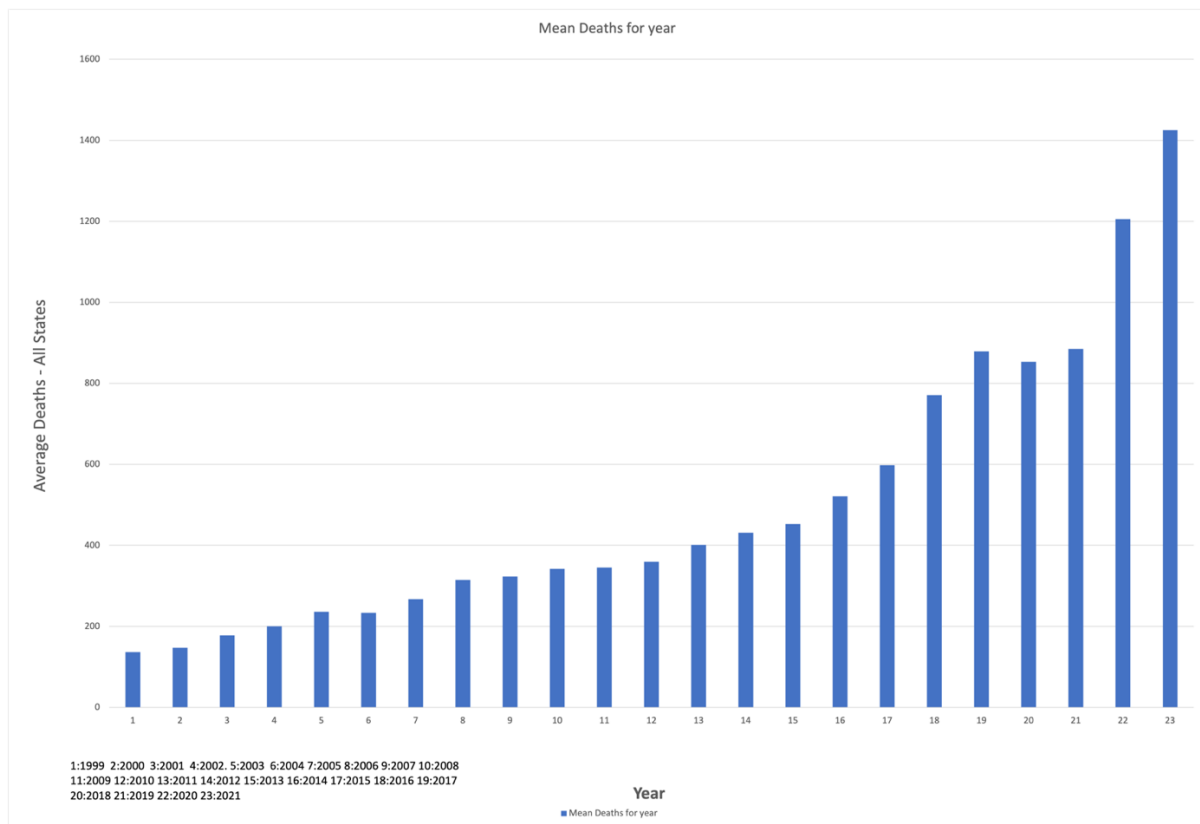
Mean Deaths for year

1:1999 2:2000 3:2001 4:2002. 5:2003 6:2004 7:2005 8:2006 9:2007 10:2008
11:2009 12:2010 13:2011 14:2012 15:2013 16:2014 17:2015 18:2016 19:2017
20:2018 21:2019 22:2020 23:2021

Year

■ Mean Deaths for year

Chart 5

Chart 6 represents the historical trends of the death rate for each state during every year between 1999-2021. Chart 6 shows an interesting similarity across all the states around the death rates rise and fall. Most states follow a similar pattern as one another. It is important to note that Chart 6 represents the rates of overdose deaths, not the death count, so population does not misrepresent the trends.
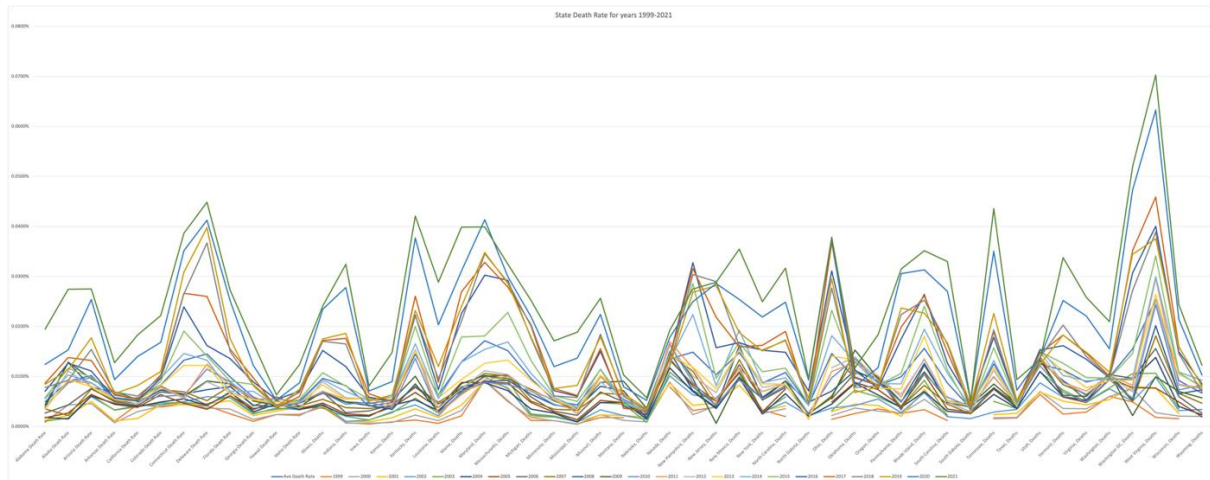
Chart 6

Altogether, the data shows that opioid and drug overdose deaths are on the rise in the United States, and there has been significant growth in the death rates from 2018-2021. The span of 2018-2021 saw a significant increase in the growth of overdose death rates across the United States. If the death rate continues to grow at the rapid rate between 2018-2021, the United States will be facing an unprecedented and alarming drug overdose death crisis even worse than 2018-2021.

One-sample hypothesis testing

The hypothesis that is being tested is the comparison between the national death rate average for 1999 and for 2021. The hypothesis is that there is no increase in the mean death rate for the country between 1999 and 2021.

H0: There is no increase in mean death rate for the country between 1999 and 2021.
H1: There is an increase in mean death rate for the country between 1999 and 2021.

136.6470588 < 1425.162162, therefor we must reject the null hypothesis. We determine that there is an increase in the mean death rate for the country between 1999 and 2021.

Two-sample hypothesis testing and Correlation.

The variables of interest are the average death rate by year, for each state and then the national average death rate for the corresponding year. The hypothesis that is being tested is that the national death rate for 2021 is greater than the national death rate for 1999. The alternative hypothesis is that the national death rate for 2021 is not greater than the national death rate for 1999 (2021 vs 1999). The second hypothesis is that 2021 death rate is greater than 2011, only a

ten-year difference. The alternative hypothesis being that the death rate in 2021 is not greater than the death rate in 2011 (2021 vs 2011).

There is a 0.862685402 correlation between the death rates in 2021 and 1999. There is a 0.588407596 correlation between 2021 and 2011 death rates across the states. This shows that there is less of a difference in the 2021 sample by state than the difference in death rates across the states in 1999.

Regression analysis

I tried really hard to accomplish this, but I just cannot figure it out with my data set. This is really hard for me to comprehend and understand with my own data.

Conclusions

The main insights from the data analysis are that the death rates, for the most part, are increasing across the United States year over year. However, there have been years where the death rate has decreased. Similarly, most years there was a growth in population, however not all years saw growth. One thing to consider is that data is only as good as what is put into it. There were many missing data points from various states between 1999-2021. The missing data can potentially give misleading results.

Final Reflection

Data Analysis is exceptionally useful for Public Administration. Data can be used to make sense of the seemingly nonsensical. As humans, we may believe or have bias in certain behaviors or what we perceive as reality. With robust and sound data, we can start to paint a picture of what is happening based on facts versus assumptions. Data often reveals different behaviors or answers than we were expecting or had even considered. Data analysis also allows for us to adapt in real time and adjust our regulations and behavior to best achieve our desired outcomes. To be completely honest, this class was entirely over my head. I had to get a lot of help and spend a lot of time trying to understand our lessons. I found the work to be more stressful than insightful, however it does not change my opinion on the importance of data analysis. I use data analysis every day in my work, however I struggle with math, and I do not work on compiling the data, I mostly work on using the data to develop strategic action plans. I did learn some interesting new functions in excel that I am sure will come in useful. I think if I would have selected a different data set that perhaps I would have been able to grasp this assignment better, but perhaps not.

References

National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention . (2023,
     July 13). Drug and opioid overdoses: Opioid drug overdose deaths, Deaths, Population,
     1999 - 2013. [Data set]. Sage Data. Sage Publishing Ltd https://doi-
     org.proxy.libraries.rutgers.edu/10.6068/DP18E5EB07ADB1