

On the Opioid Crisis and Deaths Rates as Functions of Time and Geography in the United States

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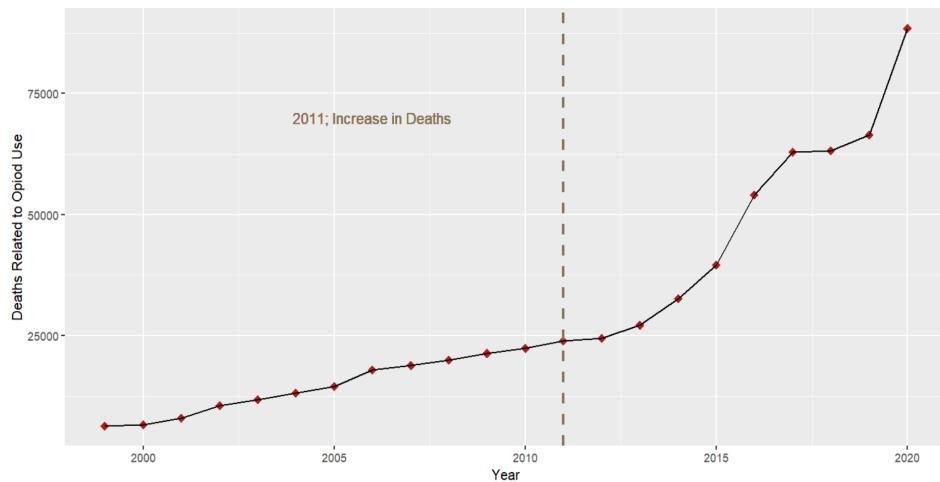
Professor Nicholas Reich

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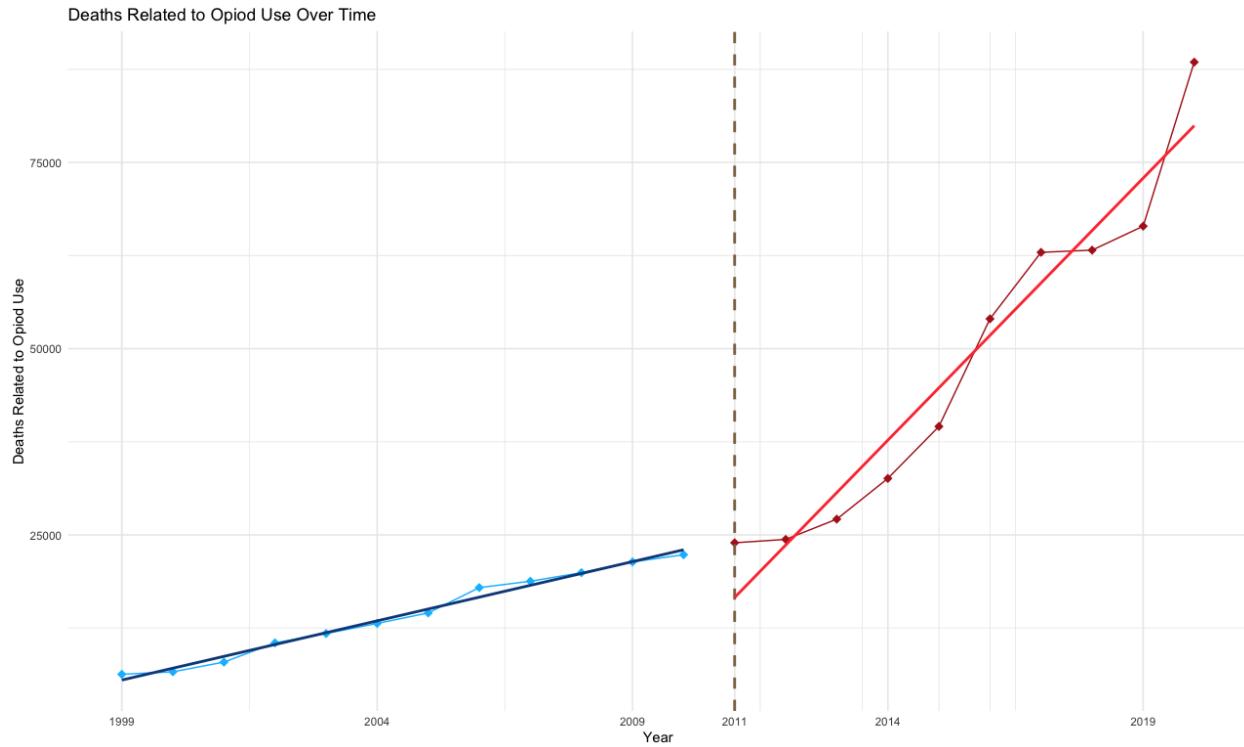
Over the past, approximately, 25 years, there has been a stark increase in the misuse of opioids, originally due to a rise in the accessibility to prescription drugs. This trend continues to this day, as there is continued news headlines and coverage of this “opioid crisis”. Thus, it was desirable to look at these trends over the duration of the crisis and to analyze if these trends are localized, or are a part of an overall pattern.

The selected dataset contained information regarding the death rates related to opioid use from the years 1999 to 2020, and was sourced from the CDC Wonder database (“Multiple Cause of Death 1999-2020”). It’s worth considering that suppressed and missing values are not included, since they are considered inaccurate (“Multiple Cause of Death 1999-2020”).

The first case we considered was the total, aggregate, change over time in the total deaths, as an overview of the trend. We find that the trend seems to have a constant increase from the years 1990 to 2010. Then, beginning in 2011, there seems to be an increase in the slope; that is, an increase in the number of deaths increases. We can see this in the following.

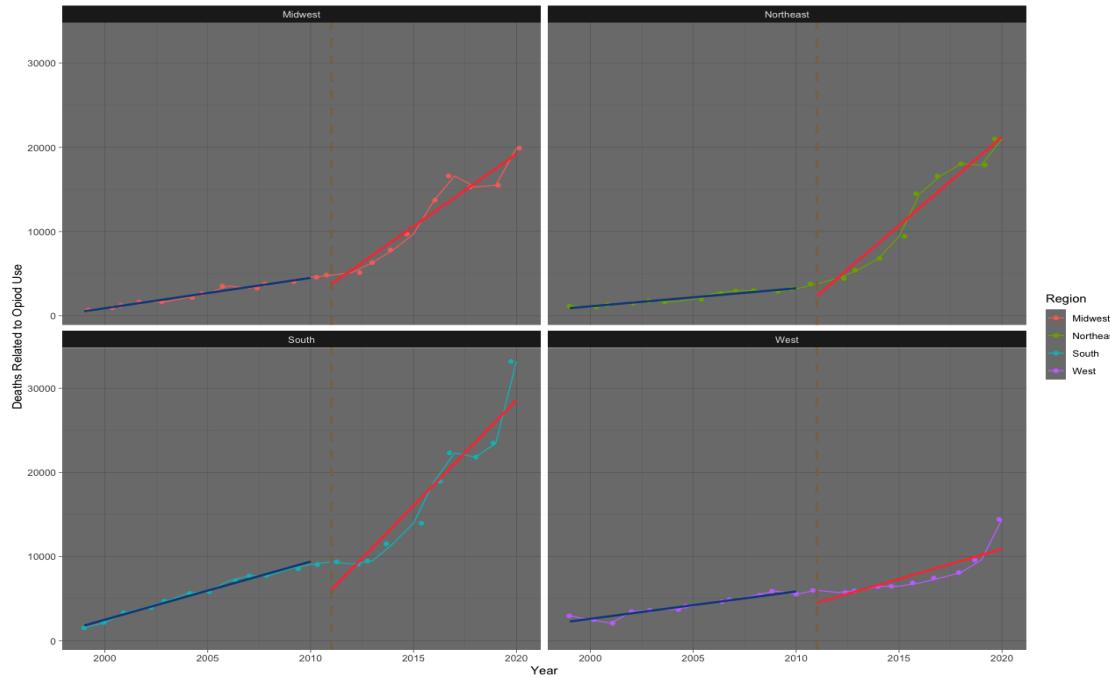


Plotting two linear regressions, it is found that its slope is about 4.5 times as large. This can be seen in the following plot.



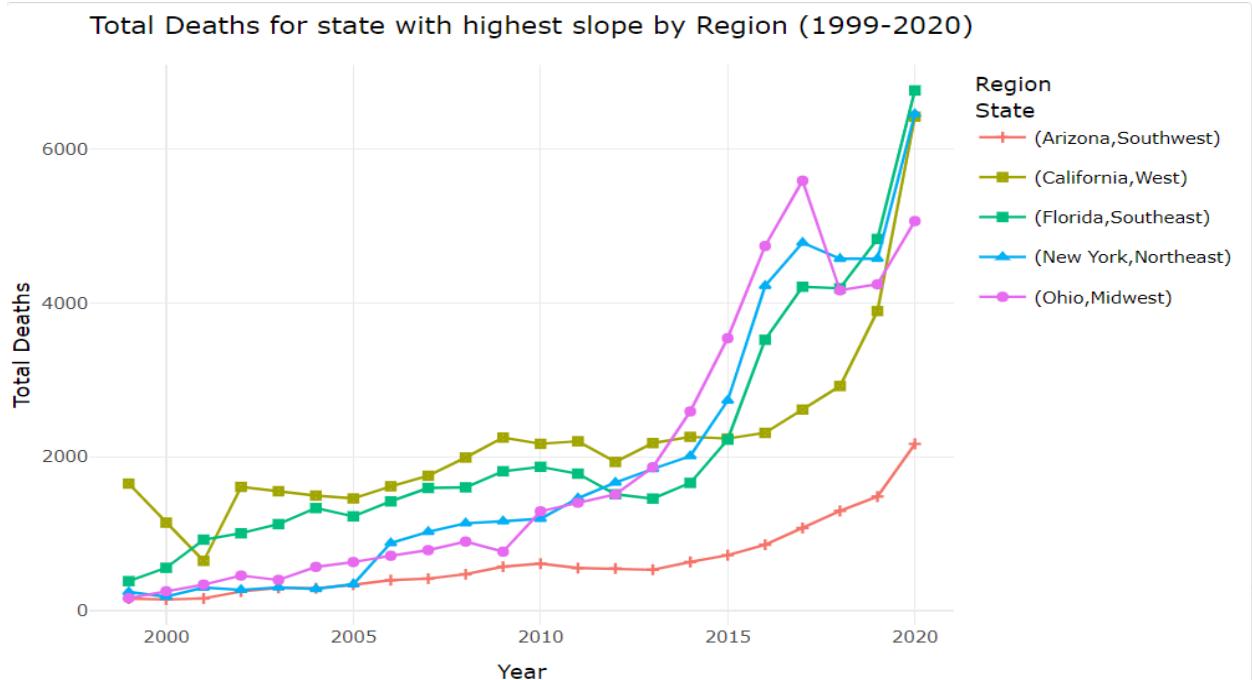
There exists a definite increase in the slope of the death plot.

Then, it is not known if the trend is a result of an universal trend or not; Simpson's paradox could occur. Thus, the data is faceted by region, then plotting once more.



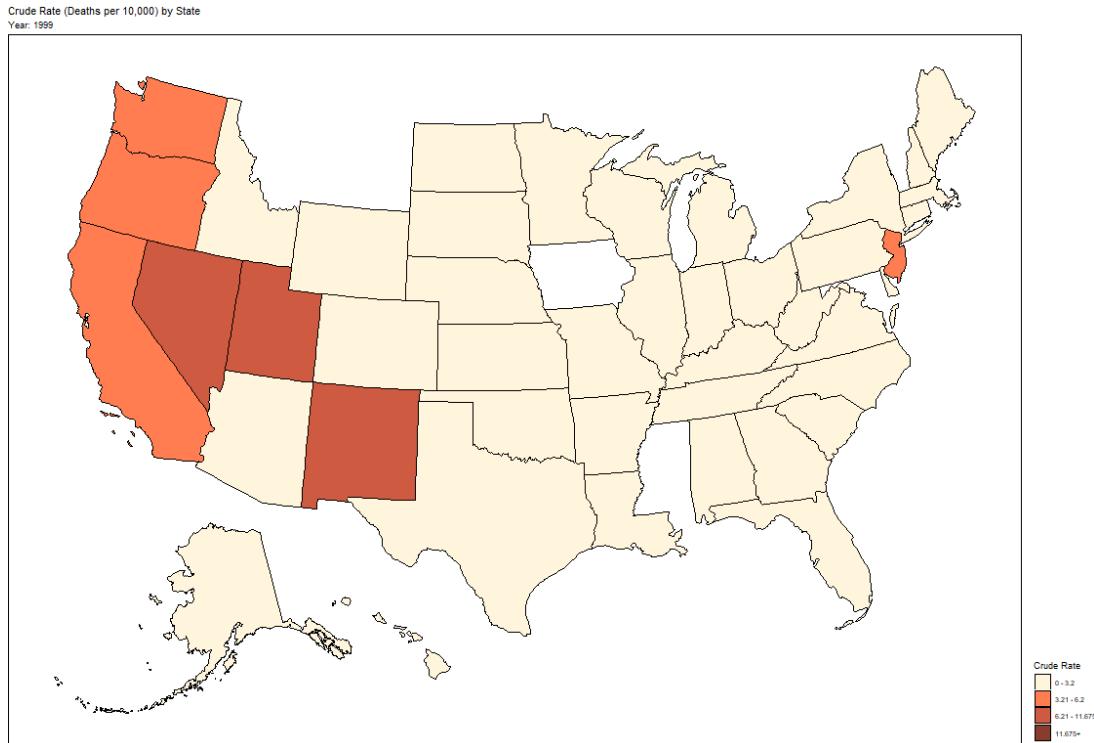
Each region displays a similar trend to the overall plot, meaning this is not a case of Simpson's paradox; this trend is universal among regions. It is worth noting that each of the R^2 values for these linear regressions are above .9, except the second half of the West region. This is because the data is not linear here, however the plot is still increasing so the issue is not severe.

Then, an analysis was performed regarding some states of interest, Arizona, Ohio, California, and New York, each representing a respective region. Similar to before, the trend matches the overall plot.



Then, for specificity, facets by state are considered. Also, the population of each state must be considered, since a higher population will result in higher aggregate deaths, normally. Thus, we analyze the crude rate; the number of deaths per 100,000 people in a population. This is

represented by the following plot.

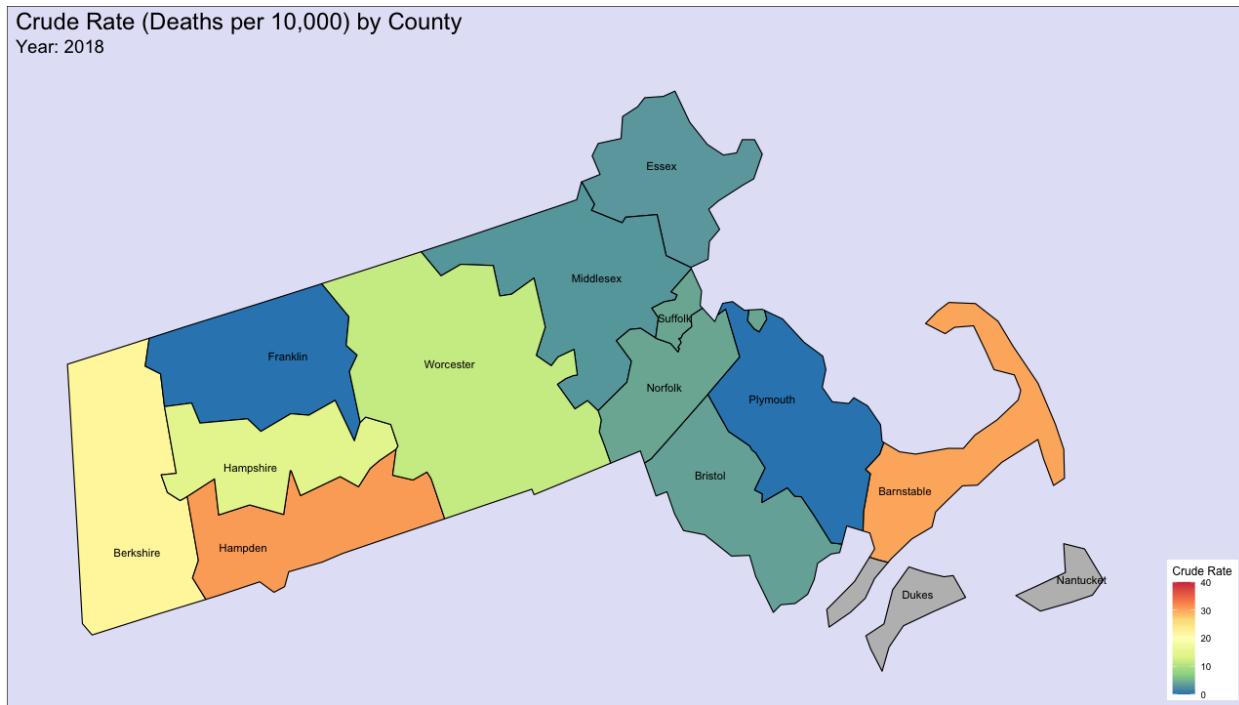
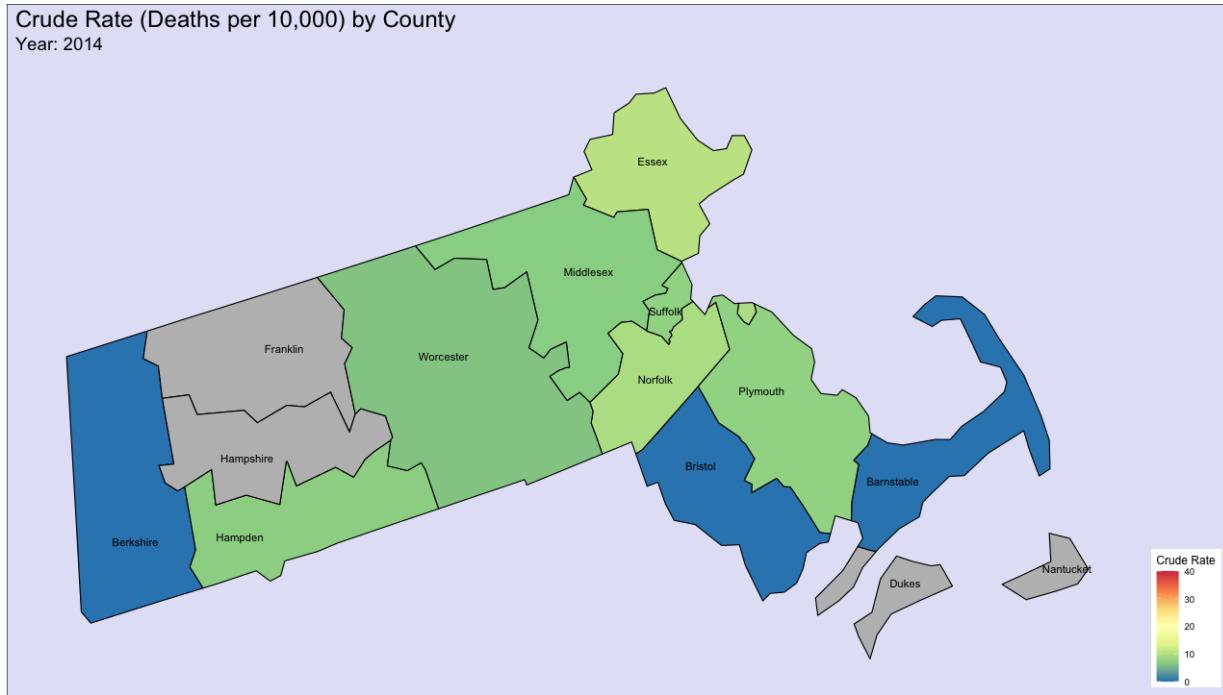


Darker colors represent a higher crude rate. It is seen that there is a universal increase in the crude rate over time and that the increase is more noticeable between 2011 and 2020, as previously predicted.

Finally, we considered a specific case study of particular interest, Massachusetts. We perform a similar analysis for the counties of Massachusetts and notice a similar trend, for the years 2014 to 2018.

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Thus, we may conclude that this trend is consistent, as a function of time, regardless of location.

Works Cited

“Multiple Cause of Death 1999-2020.” *CDC WONDER*,

<https://wonder.cdc.gov/wonder/help/mcd.html>. Accessed 7 December 2023.

“Tracking Federal Funding to Combat the Opioid Crisis.” *Bipartisan Policy Center*, March 2019,

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