

Visualization of Drug Overdoses in the United States since 1999

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Background

In the last two decades, the United States has been facing a surge in drug overdose deaths, especially opioid related deaths¹. This situation affects the life of people in all socio-economic layer of the population. Since 1999, the amount of opioid overdose deaths in US had quadrupled². The opioid crisis is considered the deadliest drug crisis in American history³. It had been reported that 90 Americans die of opioid overdose everyday². It is expected that the amount of opioid related deaths will continue to increase in the coming years, despite the fact that the amount of opioid prescriptions have been decreasing since 2010⁴. Furthermore, this crisis represents an economic burden for the United States. The Centers for Disease Control and Prevention (CDC) estimates that the total cost of opioid prescription in the US is \$78.5 billion a year⁵. Recently, the Trump administration declared the opioid crisis a “Health Emergency” as opposed to the “National Emergency” as recommended by the commission responsible of evaluating the opioid crisis⁶. All those efforts demonstrate the importance of understanding different aspects of this crisis. This visualization project aims at exploring several aspects of the crisis using data from the CDC WONDER system⁷.

Visualizing this data may help in identifying additional factors and trends that contribute to this national crisis with harmful public health consequences. Currently, there are several visualizations of opioid related deaths from several organizations like the New York Times⁸. There are limited (or no) interactions with those visualizations and some of them do not provide information at a granular level. This project will focus on developing an interactive visualization to facilitate not only healthcare professionals, but also people with limited healthcare experience understand the evolution of such a crisis at a national, state, and county level.

Despite the fact the number of opioid related death in US is increasing nationwide, it is possible to find areas where there is an inverse trend. The possibility of finding places with a decreasing trends would help policy maker pinpoint practices that are contributing to the decrease and try to replicate them nationwide. Moreover, this visualization ambitiously aims at helping decision makers in allocating resources to fight this national crisis.

Data

The data will come from the CDC WONDER system, which is a large database of health information⁷. Users can select the categories and information that they want by selecting from drop down menus and entering ICD diagnosis codes. We will query the database using any ICD code related to drug overdose.

The data contain information about cause of death in the united states on a state and county level. We are limiting our project to drug overdose deaths. Every year since 1999 is represented. Deaths can be reported by day of the week, age, gender, race, level of urbanization, and place of death (hospital, home, care center, etc.). The data are in tabular form.

Visualization and Feature Space

Ideally, we would show how drug overdoses have been changing in terms of absolute counts. We would show how deaths due to drug overdose compare to other top causes of death in the US. Hopefully the data tell a story about which parts of the country first began to see a drug overdose problem and how that problem spread geographically. Perhaps the problem started in Urban areas and spread to rural areas, or maybe the other way around. Maybe it started on one coast or the other, etc.

The design provides both topographical and numerical information. Trends and information encoded in position and color can be seen in the maps of the states, counties, and regions across the United States. The maps will allow users to get a geographical sense of where drug overdosing is a problem and can compare areas quickly. Allowing the user to zoom semantically on a state to overview the counties may allow public health officials, as an example, over a particular state see patterns and trends county-wide.

The bar chart will allow the user to see numerical differences in a wide range of categories such as gender, race, or even days of the week that drug overdoses occurred in a particular year. We'll need to explore the data further to know what other categories might be available for display. The time changing slider will give an interactive means to the user to change the above visualization elements for comparing different years.

The final visualization element will be to show the top causes of death (maybe the top 10) in the US for the selected year. The overall death rate of drug overdoses will appear next to the list (or in the list if it's included) to compare the rate to other leading causes of death. This has the intention to distill in the mind of the user the serious nature of the problem being conveyed.

There are several features implemented in this design. Clicking on a state will cause the state to open in the box to the side, revealing the counties and their rates of overdosing. Hovering over a state, county, or rectangle in the bar chart will reveal a tooltip with information about the elements overdose rates. Another feature is the use of a dropdown box and slider to allow for dynamic selection of different demographic categories and years, respectively.

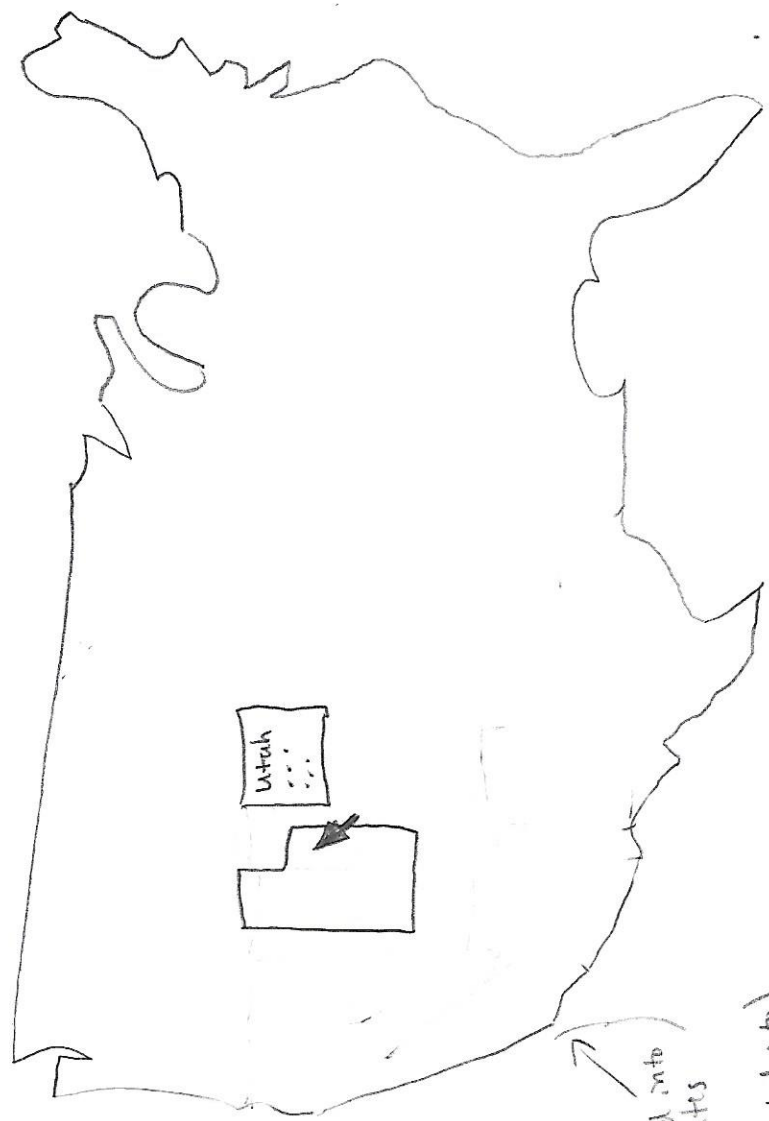
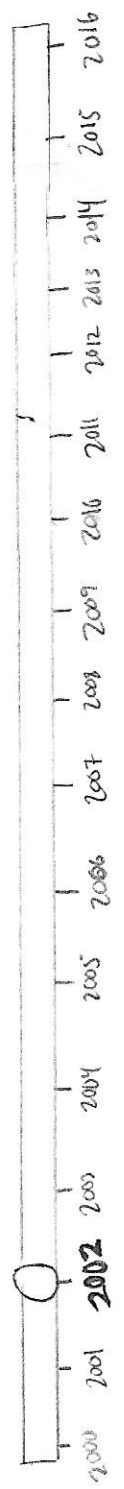
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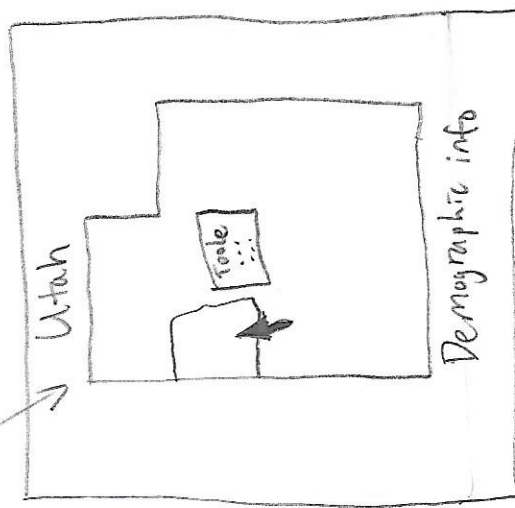
Overdose rates in the U.S. 2000-2016



Utah
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Divided into states

Divided into counties



- Leading Causes of Death
1. _____ (#)
 2. _____ (#)
 3. _____ (#)
 4. _____ (#)
 5. _____ (#)
 6. _____ (#)
 7. _____ (#)
 8. _____ (#)
 9. _____ (#)
 10. _____ (#)
- Drug overdoses (#)

Demographics ✓
Gender
Race
Days of week
...

