Opioid Abuse in a Global Context

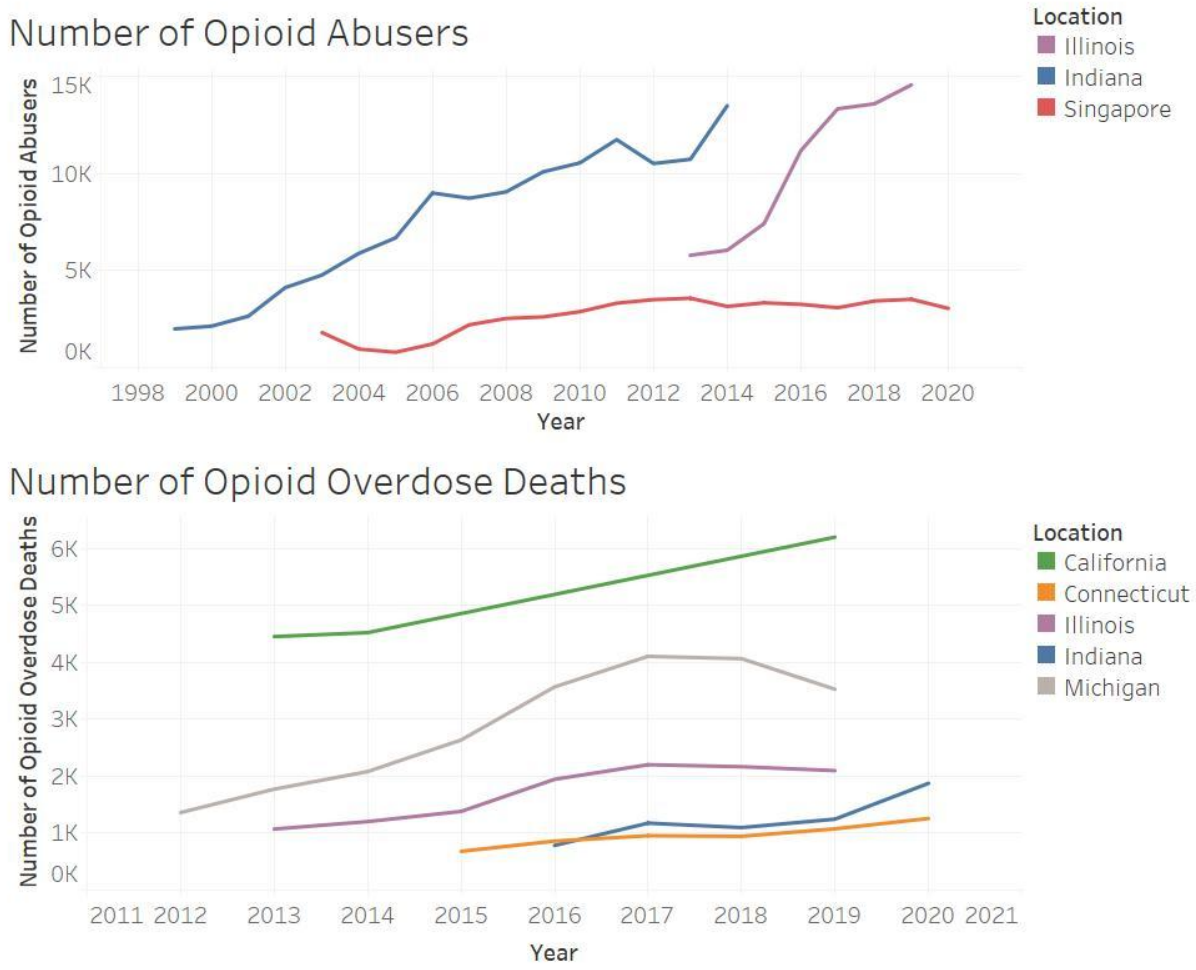

Figure 1. Our group's visualization, which was created by Wei Yi Tan, combined each individual's data set, one of the acquired data sets, and one of the provided data sets.

Team name: Visualizers

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Opioid Abuse in a Global Context

Introduction

For our group, we decided to focus on Opioid Abuse in the hometowns of our group members. Because all of us have different backgrounds, one even out of the United States, we wanted to see the variety in Opioid use and abuse with a wider lens, therefore focusing on different parts of the world. Because of this wider lens, the audience is able to see a clearer picture of the rises and falls of abuse in specific locations, as well as by year. One part of the world getting affected by Opioids may lead to another, which gives additional insight into real-world events as well.

Background

As a team, we decided we would like to learn more about the opioid crisis and how it affects us personally and as a group. In order to get personal insight and form our unique perspectives that are based on our geographics, we searched for datasets that displayed information about opioid deaths or the number of abusers from our home state/country (Illinois, Michigan, California, Connecticut, and Singapore) over a span of years. We then combined the visualizations made from those datasets to create two master group visualizations to see how our perspectives and background on opioids can differ or even be similar despite vastly different geographics including one comparing against Indiana's death rate (all outside data). We also worked with the MME dataset that was provided simply to gain more information on opioids (the types, classification, dosage, and lethal levels). Using the data provided, we created a dashboard to reference. We also got other outside datasets such as opioid death rate by ethnicity and drug death rate per 100k by the state over a span of years. The first additional dataset also helped us realize that not only our geographics matter but so do our ethnicity as we are an ethnically diverse group as well. The second outside dataset also helped just compare overall rates with our individual geographical visualizations. The last outside dataset helped us compare the number of opioid overdoses with our hometowns and country. During the entirety of the project, a theme that binds us is unity in diversity.

Questions

We wanted to address the effects of opioid abuse in each of our hometowns to acquire a better understanding of the issue at hand. We have a wide range of audiences, such as people that work in rehabilitation facilities, researchers that analyze the trends in opioid and drug abuse, pharmacists, toxicologists, and even the general public.

The opioid epidemic has been addressed before; the Centers for Disease Control and Prevention, or CDC, has launched a cooperative agreement named Overdose Data to Action, or the OD2A, whose goal is to rigorously track both fatal and nonfatal drug overdose incidents in order to observe trends and develop prevention methods to reduce the frequency of overdoses.[5]

Problem Statement

This data has been visualized before through an interactive dashboard on the Indiana Department of Health's website[4]. It shows the information on drug overdose injuries, opioid prescriptions, and prevention efforts in Indiana. National Institute on Drug Abuse has also created a visualization that illustrated drug overdose deaths involving opioids in Indiana from 1999 to 2018[8]. However, both visualizations have only been focused on the statistics in Indiana, while ours would include different states and countries. Hence, the significance of this project is to educate our audience about the trends of

opioid abuse and opioid deaths from a global perspective. We hope that creating a visualization of the alarming side effects of opioid abuse would discourage the public from using them and help researchers have a better analysis.

Methodology

One of our goals for a team visualization was to compare opioid abuse over time, around the world. Wei Yi Tan gathered three more open-source data sets; one on opioid-related deaths per 100k, one on statistics of opioid overdose deaths in relation to ethnicity, and the other on Indiana's number of opioid overdoses. The team gathered data sources on opioid abuse and opioid-related deaths in relation to time, then compiled them into two summary visualizations. Our goal was to create visualizations that can incorporate the data for Indiana and also each of our individual regional datasets.

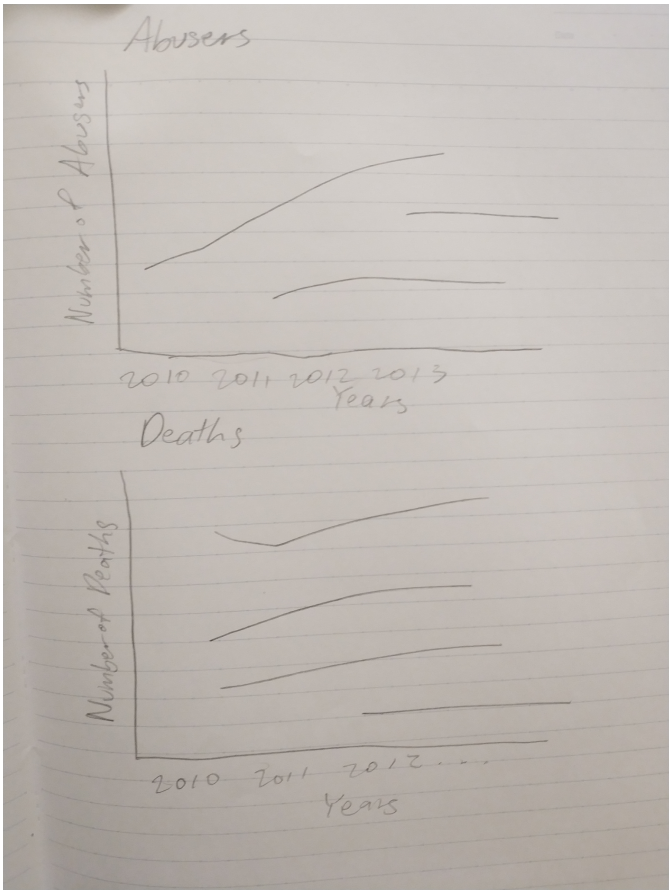

Figure 2. A rough sketch of our project's visualization was created by Joy (Chia-Hua) Lin.

Afterward, we compiled all of our datasets and created the visualizations in Tableau.

Results

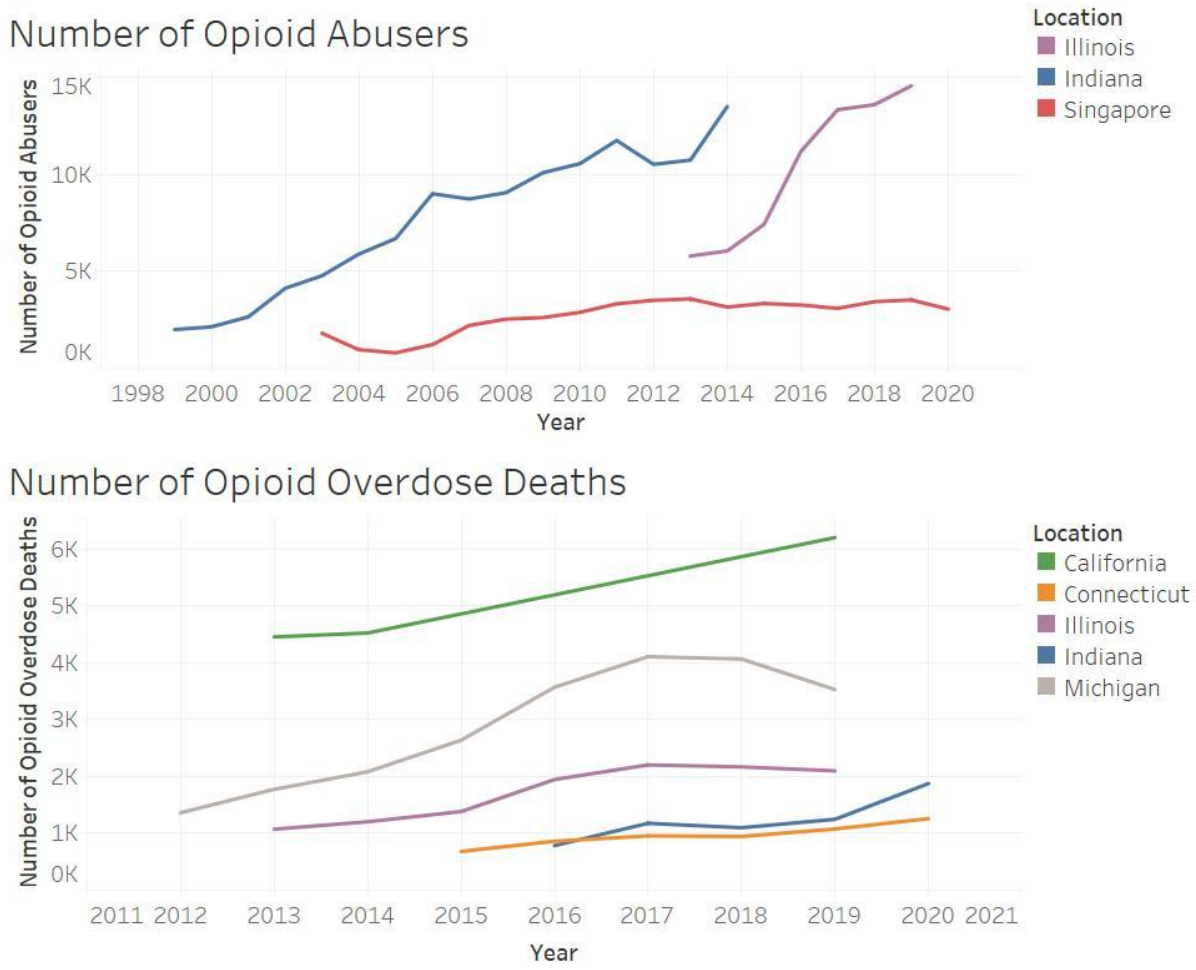

Figure 3. Our group's visualization, which was created by Wei Yi Tan, combined each individual's data set, one of the acquired data sets, and one of the provided data sets.

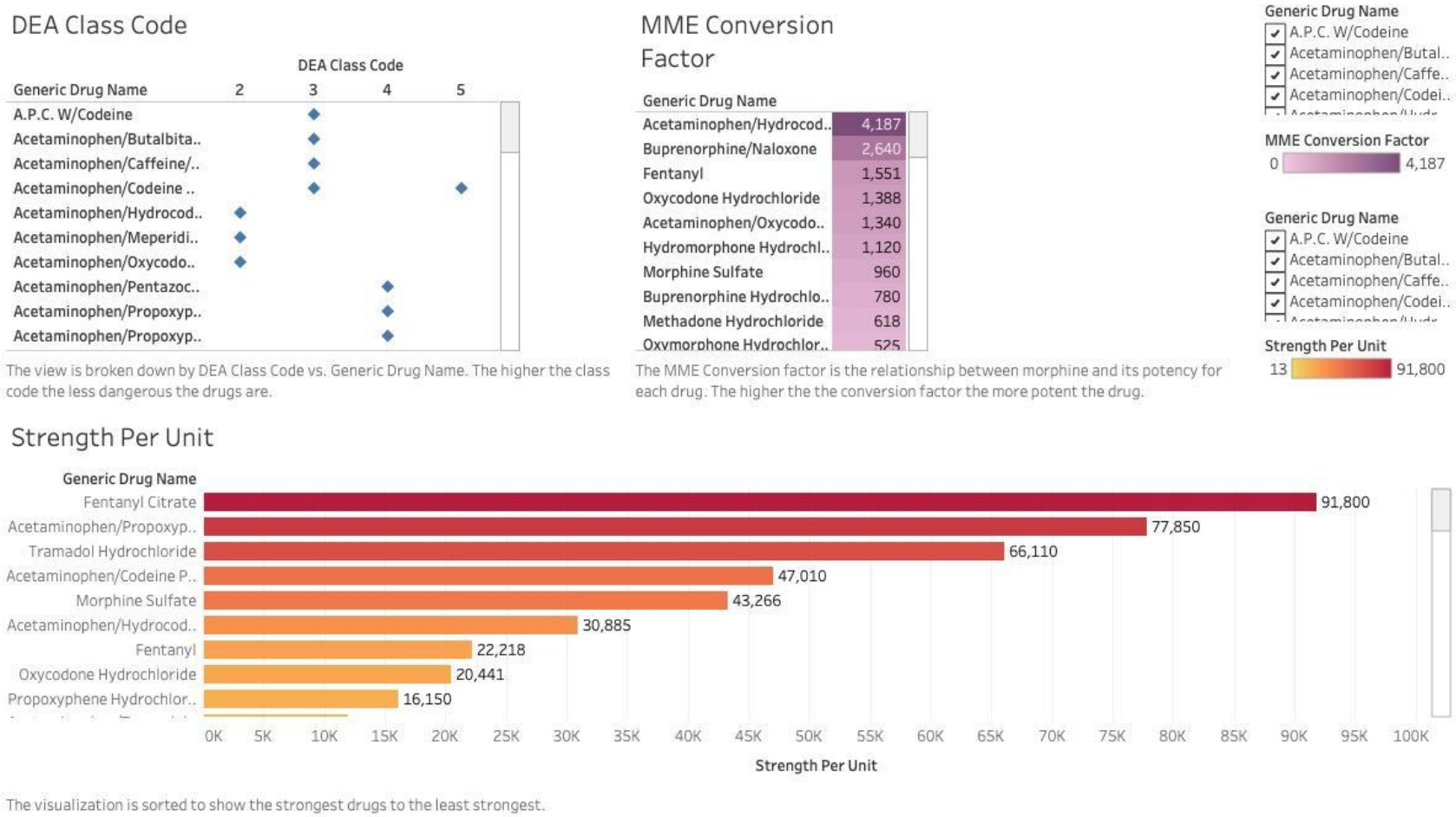

Figure 4. The visualization was created by Shreya Vasant and was based on the MME dataset provided. The visualization took what we considered important aspects of the MME dataset that would help users to understand the different opioids and their effects.

Discussion and Conclusion

Our visualizations have achieved the goal of educating our audience about the trends of opioid abuse and opioid deaths from a global perspective. The main visualization includes the opioid abuse trend, in terms of the number of abusers and number of deaths, from a regional and global perspective. On the other hand, the supplementary visualization includes information about opioids, such as the different drug names and strengths. This could help our audience to have a better understanding of the alarming effects of opioid abuse from different perspectives and enhance opioid abuse prevention efforts.

While researching for our country or hometown's dataset, we found out that Michigan had abundant resources and helplines, which made us realize that Michigan had a severe case of opioid abuse. This was also the case for California, as the number of websites and resources one of the members found for help and raising awareness on opioid abuse was startling high. Hence, as the dataset for California was minimal and therefore to find out more about opioids and their effect, we decided to use the MME dataset and create a visualization to better understand how opioids and their crisis works.

From the visualization, it can be seen that Singapore has the lowest and most stable number of opioid abusers compared to Indiana and Illinois. This is not surprising as Singapore has much better control over its drug situation compared to the United States[10]. Likewise, Connecticut had consistently the lowest and most stable number of opioid-related deaths. However, using just the count of deaths and abusers may have been nonoptimal for our setup though, since the population of Connecticut and Singapore is much lower than the other places listed on our visualization. If we accounted for the differences in population and used something like the proportion of opioid-related deaths per 100k people, we may get different insights about the opioid crisis in all the locations.

Based on the above insights and visualizations, it is recommended that the United States should follow approaches taken by countries that have great drug abuse control, such as Singapore. Singapore has invested in great preventive efforts such as compulsory rehabilitation programs and education on the harms and consequences of drug abuse[10]. Similarly, it would be recommended to keep an eye out for places with significant inlines in opioid overdoses correlating to opioid abusers to be able to maintain the problem.

In conclusion, the opioid abuse problem is an increasing problem in every country, no matter how low the statistics are. There should be more preventive efforts being planned and executed at every location as there are devastating consequences for misusing opioids. We hope that our visualizations will highlight the alarming statistics that come from opioid abuse and overdoses.

References

If references are listed, make sure they are cited in the body of the document.

1. https://mi-suddr.com/opioids/
2. https://opioid.amfar.org/indicator/drugdeathrate
3. https://www.kff.org/other/state-indicator/opioid-overdose-deaths-by-raceethnicity/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7
4. https://www.in.gov/health/overdose-prevention/data/indiana/
5. https://www.cdc.gov/opioids/basics/epidemic.html
6. https://www.drugabuse.gov/drug-topics/opioids/opioid-summaries-by-state
7. https://data.gov.sg/dataset/demographic-profile-of-drug-abusers

8. https://www.drugabuse.gov/drug-topics/opioids/opioid-summaries-by-state/indiana-opioid-involved-deaths-related-harms
9. https://www.cdc.gov/drugoverdose/deaths
10. https://www.washingtonpost.com/opinions/singapore-is-winning-the-war-on-drugs-heres-how/2018/03/11/b8c25278-22e9-11e8-946c-9420060cb7bd_story.html
11. http://idph.illinois.gov/opioiddatadashboard/

Appendix A – Resources Used

Datasets

The data sets provided to us are the demographic data, frequency data, and MME equivalent data on opioid abuse in Indiana. We have acquired three additional data sets that relate to our given data set. One of which is the drug-related death rate per 100,000 in the United States[2], which contains the rate of death from drug poisoning, including both illicit and prescription drugs, per 100,000 population and separated by state. The second data set shows the number of opioid deaths by ethnicity, which includes three different ethnicities and is also separated by state[3]. Lastly, we have found a data set that provides information on the number of opioid deaths from 2016 to 2021[4].

Tools used

List all tools used in the project and a brief description (see the examples below); add more if applicable.

Tool/Application	**Description**
Tableau	Data visualization
Python3 pandas	Data cleaning, Data transformation
Microsoft Excel	Data combination
Adobe Premiere Pro	Video Editing
Google Slides	Presentation Slides
Wix Website Editor	Website Editing

Appendix B

Group Contributions

As a group, we worked on gathering our individual data set for our respective countries or states and composing a visualization, rotated team leaders, worked on different parts of the report, wrote the short story attributed to the individual visualizations, contributed to the slide show and the 5-minute video for the final deliverable.

Individual Contributions

In the table below list each team member's full name, their contribution (body of work), and their % of the work completed. The total must add up to 100%

Team Member	Description	Contribution
Haemi (Alice) Lee	Developed the project web page from start to finish with all visualizations and the summary of report questions. Also worked on introducing the problem of the project, writing the diversity statement, as well as helping others on various parts of the report. Helped make the presentation and made sure team members were doing their work.	*23*
Shreya Vasant	Worked on the background aspect of the report as well as contributed to other sections. I also gathered a dataset for my home state and created a visualization. Additionally, I worked with the MME dataset to create a dashboard to get more general knowledge on opioids to reference.	*23*
Joy (Chia-Hua) Lin	Responsible for work on report summary and on the final video presentation, Acquired a detailed dataset for opioid abuse in Connecticut, US and created an individual visualization. Wrote an outline for the video presentation, compiled and edited the final video presentation.	*26*
Wei Yi Tan	Acquired a data set and created the visualization that relates to the drug abuse in my home country. I also acquired three additional data sets that are related to opioid abuse in Indiana. I worked on the problem statement and compiled all of the insights for the discussions. Lastly, I picked up Gabby's task (creating the main visualization) as she didn't finish it on time. I combined all the data sets everybody acquired into one Excel file and used it to create the main visualization for the project.	*23*
Gabby Willard	Provided insight and explanations about the opioid crisis in Illinois with an official dataset from the Illinois Department of Public Health using their opioid dashboard. Contributed to the group's diversity statement.	*5*
	Total	100%

Appendix C – Individual Contributions

In this appendix each team member must contribute a one-page document relating the team's topic/data to their home town or home country. The one-page document must contain: (1) a description of the problem, (2) a comparison of the team's findings with insights about your home town/country related to the hackathon data (3) a visualization to support items (1) and (2).

Each person should create their individual page and make it available to the designated team member who will upload the final document.

This will be viewed and assessed as part of each person's individual contribution.

Leave this page as is.

Start adding individual page content on the next page.

REMOVE any blank pages before submitting.

Team Member #1: Haemi (Alice) Lee

My Hometown/City/Country: Michigan Hackathon Topic (dataset): Opioid Abuse

Opioid Abuse happens in much of the United States. One of the states that have a high overdose death rate is Michigan. Opioid Abuse in Michigan can be seen as one of the severe cases compared to other US states. It isn't the most problematic, but it does indicate that it is higher than the majority of the US states[6]. Compared to the team's findings, it seems to have one of the highest, if not, the highest rate of overdose deaths in states our group focused on, as well as in Indiana (the dataset we will base our comparisons from).

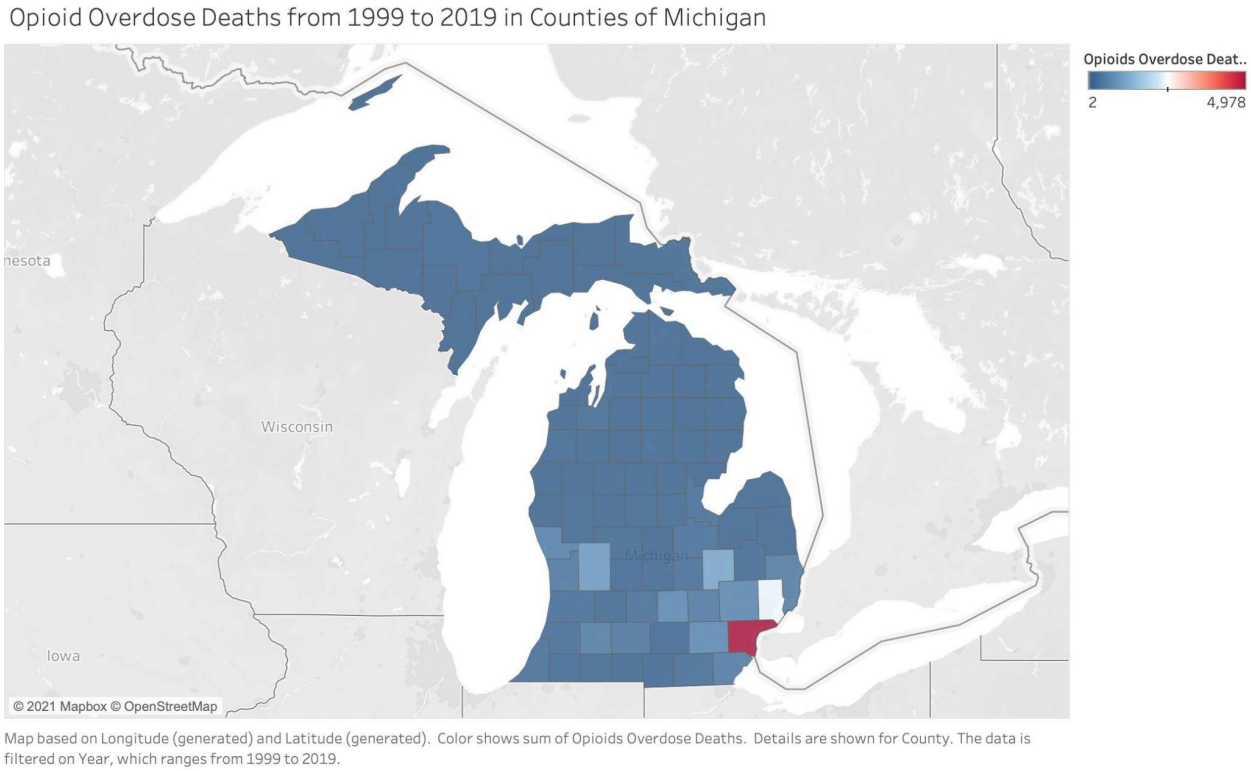

Figure 5. Visualization on opioid overdose deaths in Michigan[1]

Team Member #2: Shreya Vasant

My Hometown/City/Country: California Hackathon Topic (dataset): Opioid Abuse

The opioid abuse crisis initially began in the 1990s with doctors prescribing opioids as a pain management regimen. In terms of the rest of the states who would be considered to have an opioid crisis, California does not have an extreme of a crisis with 35.1% of the state population per 100,000 getting an opioid prescription and 5.8 rates per 100,000 resulting in deaths, according to the CDC[9]. While these numbers in comparison to other team members are not as high, the crisis is alive and well in California. However, due to its large population, when compared to other states as a whole the number of opioid deaths is greater.

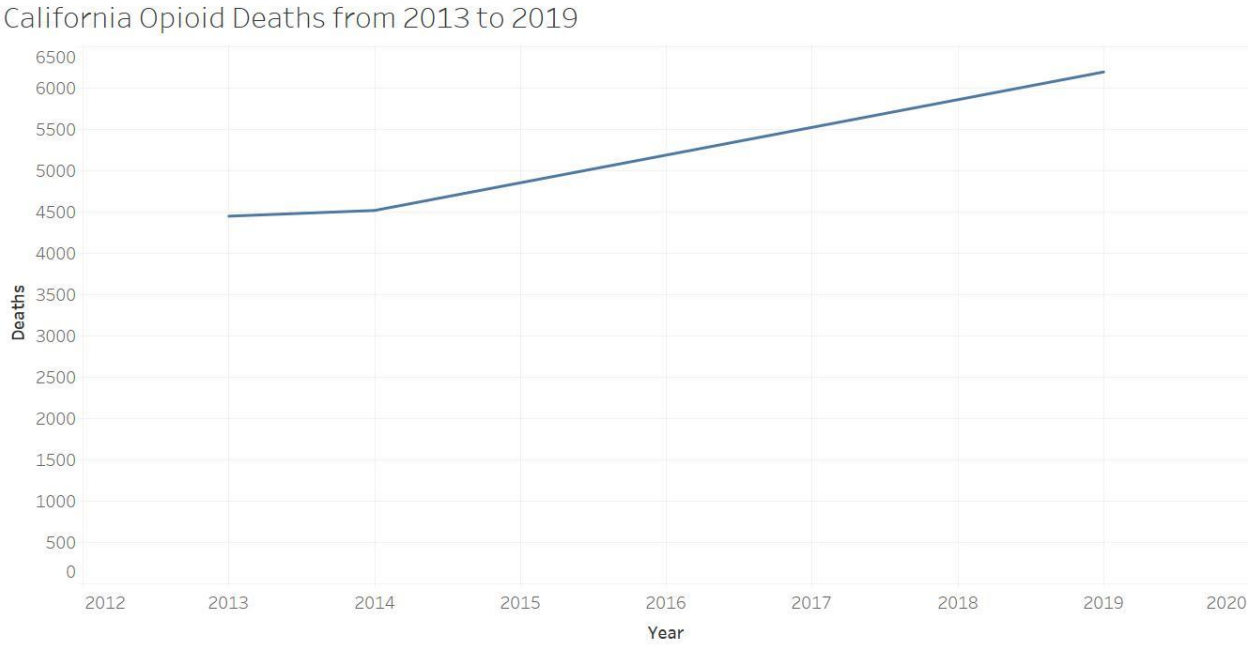

Figure 6. Visualization on opioid overdose deaths in California[9]

Team Member #3: Joy (Chia-Hua) Lin

My Hometown/City/Country: Connecticut Hackathon Topic (dataset): Opioid Abuse

I was interested in which age groups that opioid abuse and overdose hit the hardest. My hypothesis was that since a large portion of the opioid crisis is caused by prescription opioids, middle-aged or older people would have more exposure to opioids and in turn, would be more likely to die from overdose or other such conditions. This was confirmed with my visualization; most people who die from opioid-related causes are between 35 and 40 years old.

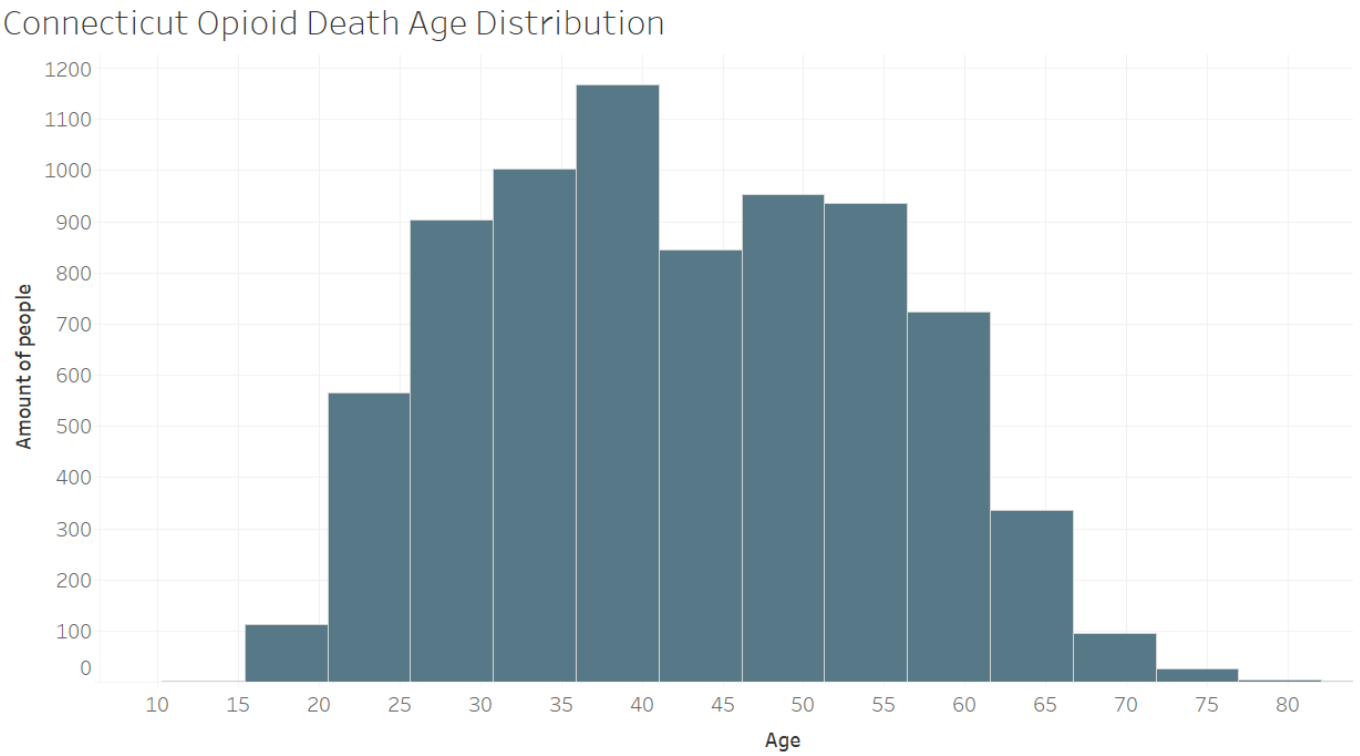

Figure 7. A histogram data visualization was created by Joy Lin, depicting the age distribution of opioid death ages.

Team Member #4: Wei Yi Tan

My Hometown/City/Country: Singapore Hackathon Topic (dataset): Opioid Abuse

Singapore is known to have good drug abuse control due to its compulsory rehabilitation program and efforts to educate the youths on the consequences and harm of drug abuse[10]. However, while the numbers are low, there is still an increase in new and repeat opioid abusers in Singapore every year. Nonetheless, compared to the team's findings, Singapore has the lowest number of opioid abusers and a more stable trend, whereas other states in the United States could be seen having an upward trend in the total number of opioid abusers.

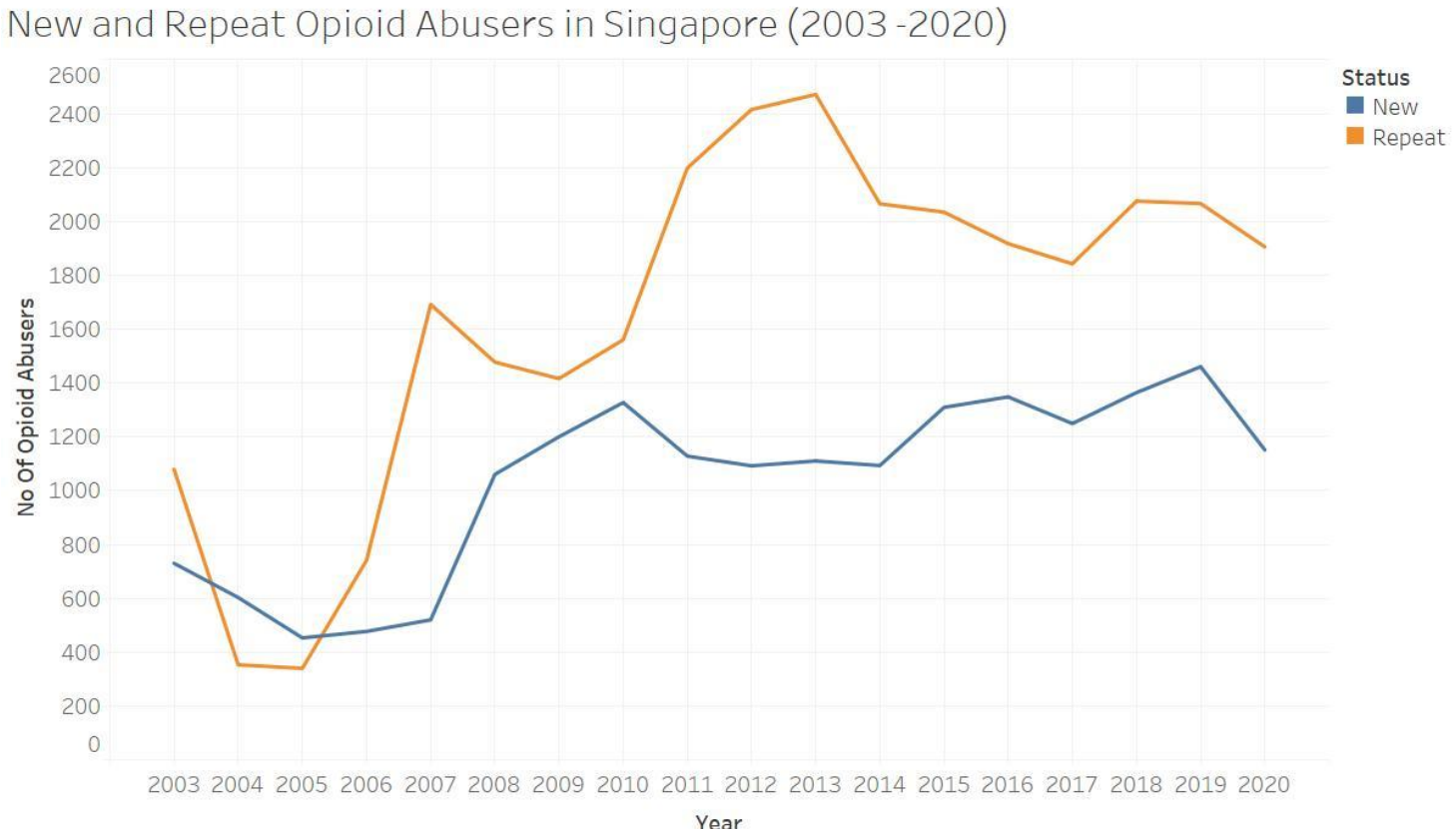

Figure 8. Visualization on the new and repeat opioid abusers in Singapore[7]

Team Member #5: Gabby Willard

My Hometown/City/Country: Illinois Hackathon Topic (dataset): Opioid Abuse

The opioid crisis has been on an incline in numbers overall in Illinois. The number of non-fatal overdoses has always been way more than fatal overdoses. The number of fatal overdoses started at around 1,000 in 2013 and reached 2,000 in 2016 and remains around 2,000 to this present day. The non-fatal overdoses are getting worse as time goes on, starting around 6,000 in 2013 and getting worse in the year 2016 with over 11,000 non-fatal overdoses. Once the number of non-fatal overdoses reaches over 13,000 in 2017, the number in 2018 does not increase as much as the previous years would have predicted.

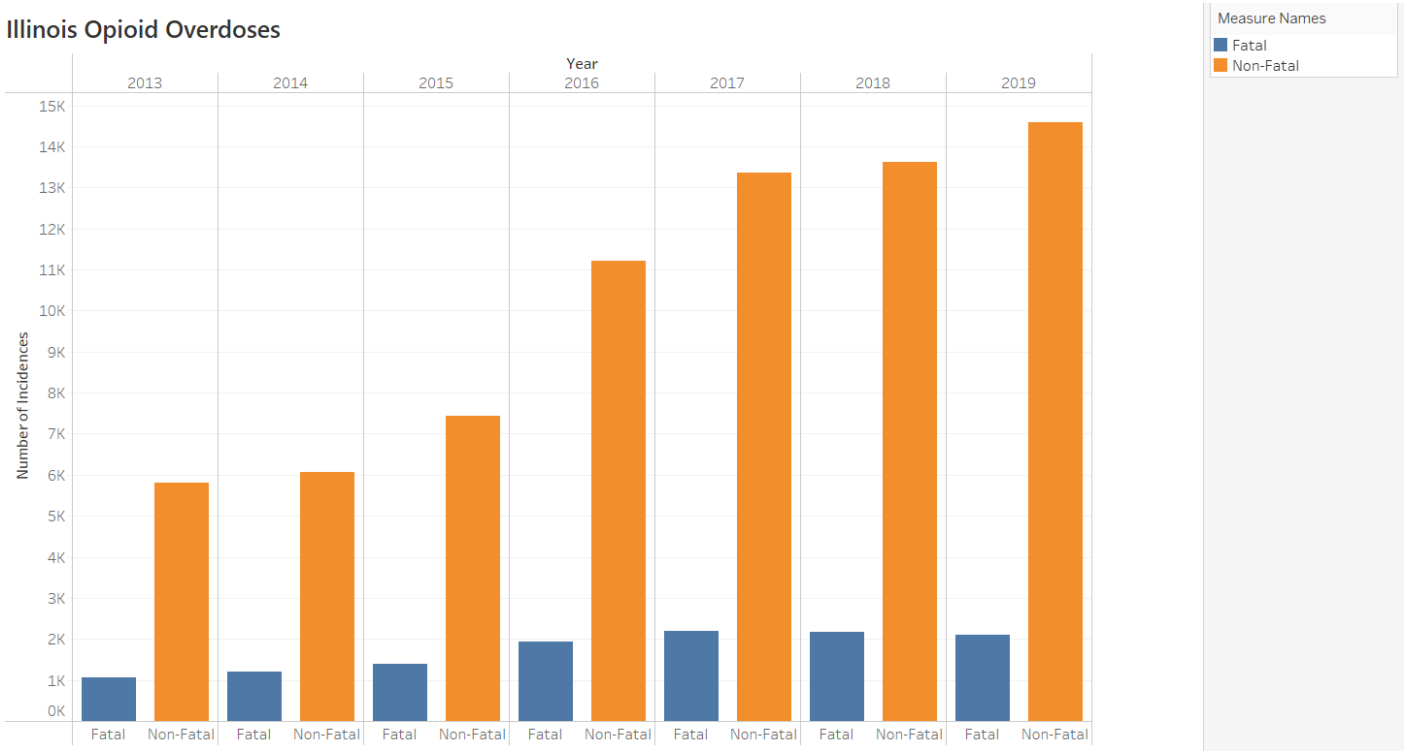

Figure 9. Visualization on Illinois opioid overdose[11]

Appendix D - Diversity Statement

Team Visualizers have a very diverse group of members as we are of different majors, class standings, cultures, and backgrounds. Some of us are majoring in data science (Haemi Lee and Shreya Vasant), computer science (Wei Yi Tan), computer graphics technology (Gabby Willard), and one of us is even in exploratory studies. In terms of cultures and backgrounds, we are composed of two members who are Chinese, one from Singapore and one from Connecticut; one member who is a Korean from Michigan, but originally from South Korea; one member who is an Indian from California; one member who is an American from Illinois. There is a lot that diversifies us, but because of this, it makes our team unique since we are able to share ideas and acknowledge the differences. It unites us by learning and respecting all of the member's ideas. Most of the members worked hard to complete the project.

Appendix E – Team Consensus

Team Consensus

I have read and approve of the content as a representation of the team's work and my contribution.

Team Member (full name)	Signature	Date
Haemi (Alice) Lee	*Haemi (Alice) Lee*	11/29/21
Shreya Vasant	*Shreya Vasant*	11/29/21
Joy (Chia-Hua) Lin	*Joy Lin*	11/29/21
Wei Yi Tan	*Wei Yi Tan*	11/29/21
Gabby Willard	*Gabby Willard*	11/29/21