Group 1 Final Project Presentation

Presented by: Iris Belensky, Milos Popov, Patrick Gilchrist, Olga Mironova, and Anastassia Tatarskaja

Meet our Team

Iris Belensky

Milos Popov

Olga Mironova

Patrick Gilchrist

Anastassia Tatarskaja

Presentation Requirements

- The selected topic and the reasoning for that selection (2 points)
- A description of the data (3 points)
- The questions that the team originally planned to answer with the project (2 points)
- A description of the data exploration phase of the project (5 points)
- A description of the analysis phase of the project (5 points)
- The technologies, languages, tools, and algorithms that the team used throughout the project (3 points)

Question to the audience

Using the chat feature, identify major public health crisis in the United States?

Let’s ask Chat GPT

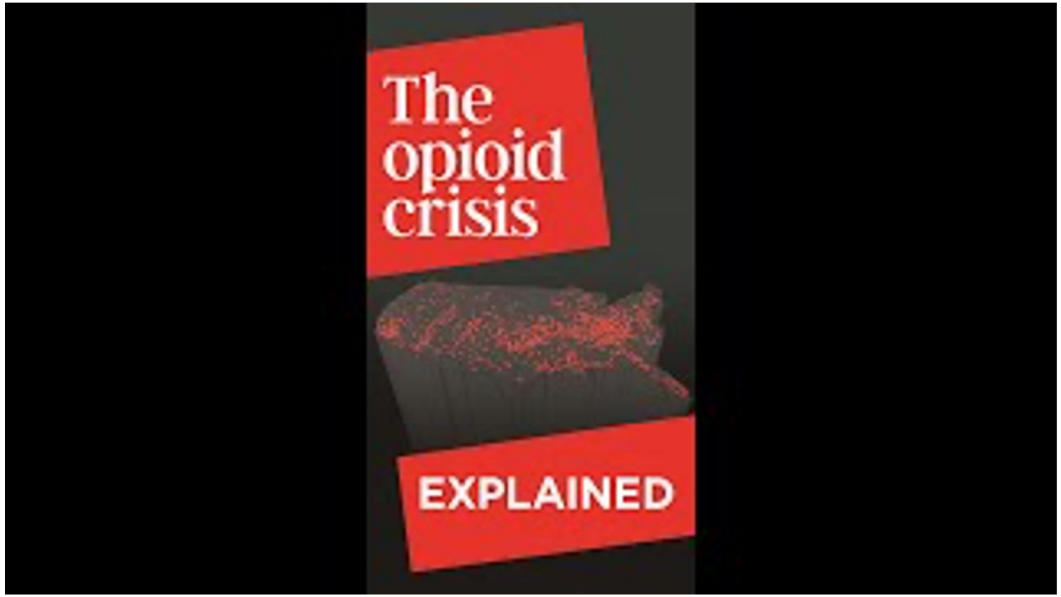
A

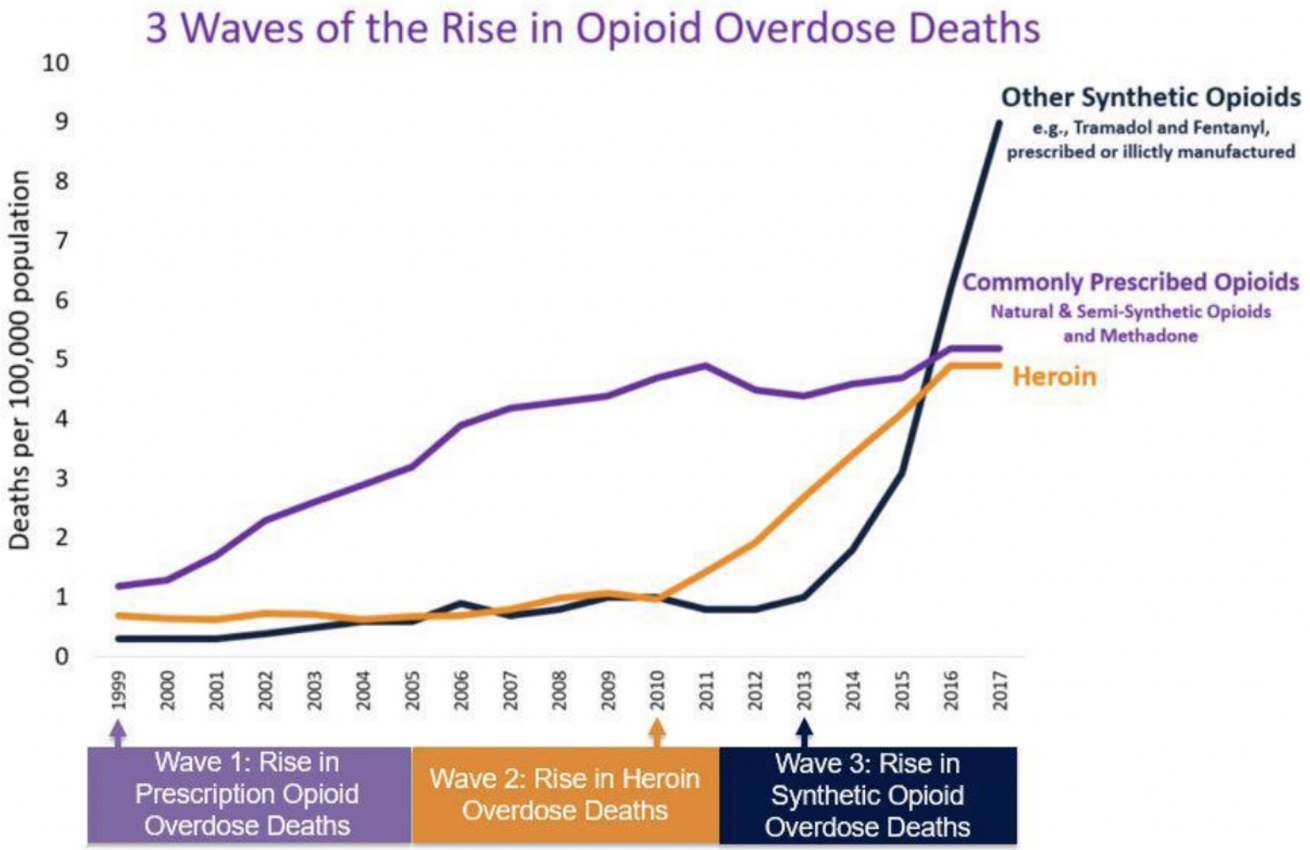
major public health crisis in the US

The United States has faced several major public health crises in recent years, including:

1. COVID-19 pandemic: This ongoing pandemic, caused by the SARS-CoV-2 virus, has had a significant impact on public health, causing widespread illness and death, overwhelming healthcare systems, and disrupting daily life for millions of people.
2. Opioid epidemic: This crisis is characterized by the widespread misuse and abuse of prescription opioids and illicit drugs, leading to a sharp increase in overdose deaths and related health problems.

Why is it Important?





Source: Centers for Disease Control and Prevention, National Vital Statistics System

Exploring Root Causes

The Opioid Crisis by the Numbers

- **700,000** Americans died from a drug overdose between **1999 and 2017**, and **400,000** of these deaths involved a prescribed or illicit opioid.
- Nearly **48,000 died in 2017** from an overdose involving an opioid.
- Each day, more than **130 Americans** die from an opioid related overdose.
- Opioid overdose deaths today are **six times** higher than in 1999.
- The US consumes **about 80%** of all the world's opioids.
- **38%** of U.S. adults (92 million) use prescription opioids.
- **11.4 million Americans** misuse opioid prescriptions, and **2.1 million** are addicted to opioids.
- The annual economic burden of prescription opioid misuse in the United States is **$78.5 billion**

Research Questions

Our project aims to answer the following questions:

- Can we predict the **rate of opioid overdose deaths** by county based on basic socio-economic variables AND the **dispensing rate** of prescription opioids for that county?
- Which of the selected factors contribute the **most** to our prediction for the rate of opioid deaths?

Exploratory Data Analysis Questions

- What is the trajectory of opioid deaths in the counties that we have focused on over the years?
- What is the correlation (if any) of opioid deaths to education (income/poverty/unemployment/prescription rate) in the counties we have chosen?
- Which of our independent variables shows the strongest correlation to overdose deaths?
- Which form of opioid is responsible for the most deaths in the counties we have chosen?

Data Ethics and Compliance Disclosure

- Used the data exclusively for health statistical reporting and analysis in the context of our project.
- Ensured that any sub-national geographic data presented or published does not include death counts of 9 or fewer, or death rates based on counts of nine or fewer.
- Made no attempts to discover the identity of any person or establishment included in the data.
- Committed to reporting any inadvertent discoveries of personal or establishment identities to the NCHS Confidentiality Officer, and refraining from disclosing or using such information.

Data Sources

- Death by Opioid Type: Detailed mortality data provided by the CDC WONDER database.
- Education: Educational attainment data for adults age 25 and older in US counties, provided by the USDA.
- Unemployment: Unemployment and median household income data for US counties, also provided by the USDA .
- Income: Personal income data by county and metropolitan area, including government social benefits, provided by the Bureau of Economic Analysis.
- Dispensing Rate: US county opioid dispensing rates based on prescriber location, provided by the CDC.

Machine Learning Model

We explored two different machine learning algorithms: a neural network (MLPRegressor) and a random forest (RandomForestRegressor). We will train both models on the training data and make predictions on the test data. The performance of each model was evaluated using mean squared error (MSE) and R2 score.

After we evaluated both models, we compared their performance and chose the best one based on the evaluation metrics. We explored incorporating other models, such as those that utilize confusion matrices for evaluation, to further improve our predictions and potentially gain additional insights.

ERD

Insert ERD picture

Machine Learning screenshots

Post Machine learning Screenshots here

Post Tableau Visualizations here

***Dashboard must contain at least one interactive element**

***A database that stores the data for the project and that contains at least two tables or collections**

Geographical locations and volume

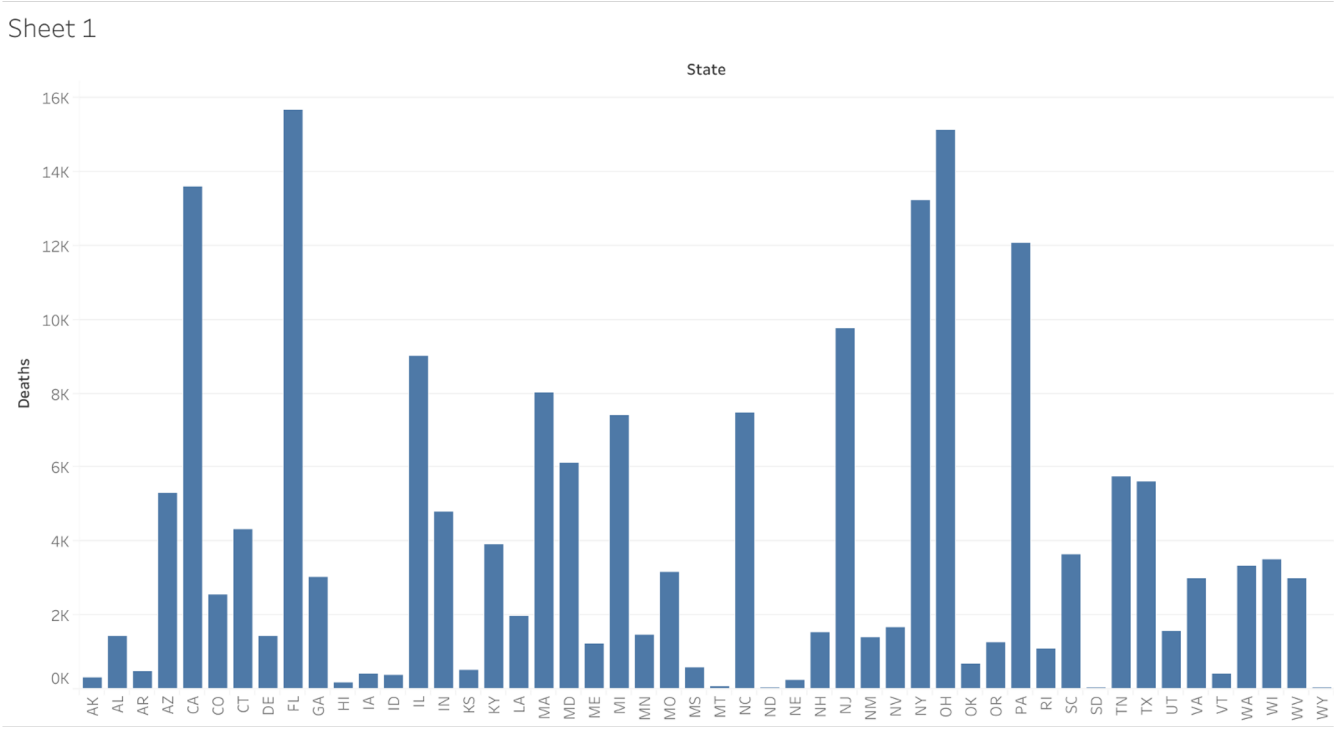
Total deaths 2017-2020

Graphs of correlation on two variables

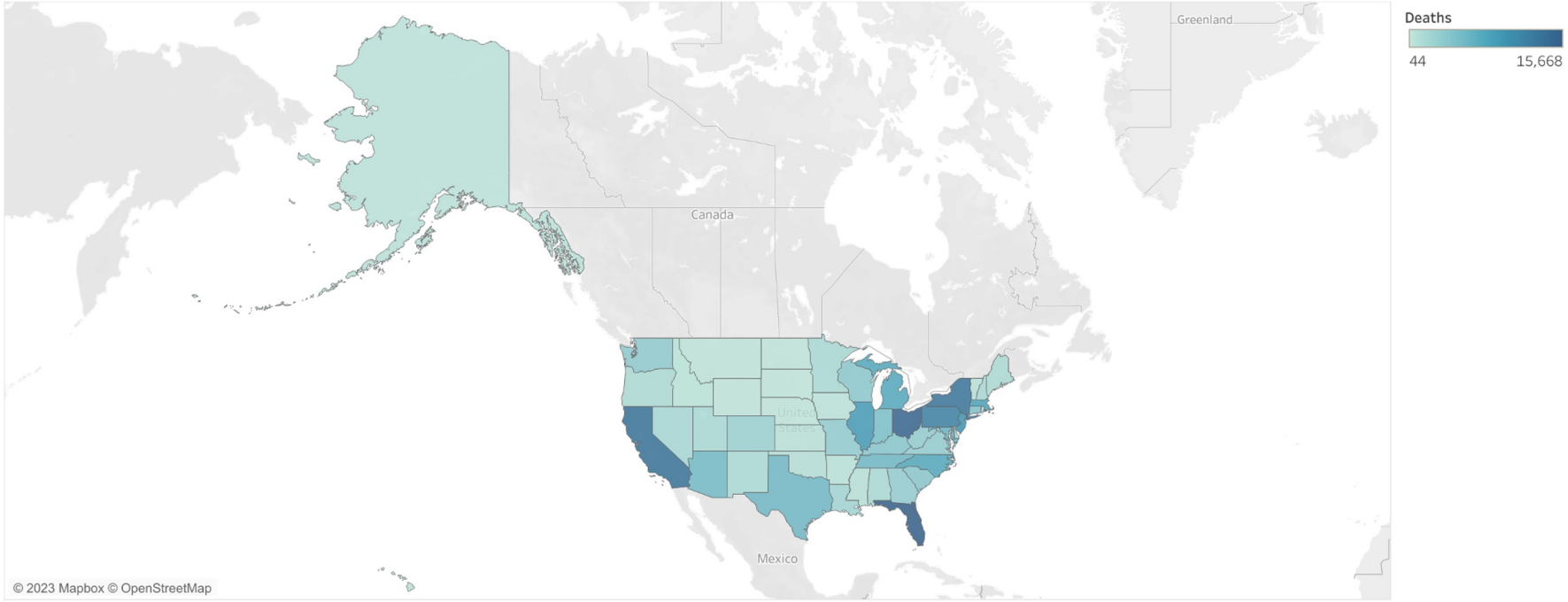
Example of a Dashboard:

https://health.mo.gov/data/opioids/

Rate of deaths per state



Sheet 1


Greenland
Canada
Mexico
Deaths
44
15,668
© 2023 Mapbox © OpenStreetMap

Analysis

What can we do?

Explore various options for opioid death prevention

Emotional and Mental Health

Research shows that art and music therapies contribute to successful substance abuse treatments. Such arts based interventions can help motivate deeper engagement in substance abuse counseling by facilitating communication, mitigating feelings of shame and breaking down resistance to treatments.

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Ways to prevent an opioid epidemic

Preventing an opioid epidemic requires a multifaceted approach, including strategies aimed at reducing the supply of opioids, addressing the root causes of addiction, and promoting alternative pain management options. Here are some ways to prevent an opioid epidemic:

1. Improve prescription drug monitoring: Better monitoring of prescription drug use can help identify potential cases of abuse or diversion and prevent unnecessary or inappropriate prescriptions.
2. Increase access to addiction treatment: People struggling with opioid addiction need access to effective treatment, including medication-assisted treatment (MAT) and behavioral therapy.
3. Expand access to non-opioid pain management options: Healthcare providers should consider non-opioid pain management options, such as physical therapy or alternative therapies, for patients with chronic pain.
4. Increase public awareness and education: Educating the public about the risks of opioid use and the signs of addiction can help prevent misuse and overdose.
5. Enforce laws and regulations: Strict enforcement of laws and regulations around the prescribing, dispensing, and distribution of opioids can help prevent diversion and misuse.
6. Promote responsible prescribing: Healthcare providers should use caution when prescribing opioids, including screening patients for risk factors and prescribing the lowest effective dose for the shortest duration possible.
7. Support research and innovation: More research is needed to understand the causes and consequences of the opioid epidemic and develop innovative approaches to prevention and treatment.