

Drug Link: Incarceration Insights

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Abstract—This paper will explore the relationship between the Opioid and Fentanyl epidemic overdose deaths and incarceration rates over the last 20 years. It will also explore spikes of other drug overdose deaths on incarceration rates. A considerable amount of the prison population in the United States has drug-related offense charges. These range from drug possession to drug trafficking to other drug offenses. Additionally, drug addictions have become more prevalent in prison with an estimated eighty-five percent having a substance use disorder (SUD) [4]. By analyzing the impact of drug epidemics, specifically the ongoing Opioid and Fentanyl epidemic, this paper will show a correlation between key heights in the epidemics and overdose rates. These factors contribute to the incarceration rates for drug related crimes, and therefore influence the particular drug that may be the cause of incarceration. It will show that there is a need for more improved substance abuse treatment in the criminal justice system as well as substance use disorder prevention strategies.

I. INTRODUCTION

Today, eighty-five percent of the prison population falls victim to drug use, possession, trafficking, and other drug-related crimes [4]. Substance use treatment for inmates will be crucial for when they reintegrate back into the community. Not only will it reduce the inmate's continual visits to prison, but it will also reduce overall drug use and crime in the community [4]. However, insufficient substance use treatment could lead to overdose and death, leading the cycle to continue. There are many efforts to deal with the aftermath of drug use when people come to prison, but another focal point should be the prevention of drug use before it gets severe enough to get incarcerated.

The current epidemic impacting America is the Opioid and Fentanyl Epidemic, which has skyrocketed to almost fifty thousand drug overdose deaths every year and is the leading cause of death for Americans over fifty [1]. When those with opioid SUDs enter the prison system, untreated inmates will have reduced tolerance to opioids due to the lack of use. When they leave the prison system without substantial help, they return to their usual dosages and increase the likelihood of dying of overdose because their tolerances were weakened from imprisonment [4]. Opioids were the cause of 14.8 percent of former prisoner deaths from 1999 to 2009 [4]. This project investigates the link between the various drug epidemics throughout the years and their impact on incarceration rates in the United States. By proving that drug epidemics, such as the Opioid Epidemic, are a cause of increased incarceration rates, this paper will show a need for more improved substance treatment in the criminal justice system and SUD prevention strategies directed towards combating the drug epidemics.

II. BACKGROUND

A. Objective

The objective of this project is to study the correlation between the number of inmates in the state and federal prisons and the Opioid and Fentanyl epidemic overdose rates. We will cross reference the drug epidemic time period and the data to see if there is a correlation between the rise of this particular drug epidemic and increased incarceration rates. By exposing the connection, it will highlight the current SUD strategies, and if there is more that needs to be done to prevent SUD.

B. Brief Motivation

The motivation behind this project is an interest in true crime. One of our members has recently been interested in various true crime documentaries that revolve around the drug epidemics. There have been a lot more documentaries released in the past few years that shed light on the current drug epidemic situations. There has been a lot of news recently about how the Opioid Epidemic has impacted incarceration rates. There is also the impact that this particular impact has on families and people's lives, and the fact that it continues to be prescribed daily.

III. DATA

The data that we selected was from the Bureau of Justice Statistics (BJS). Each year, the BJS releases an annual prisoner report highlighting the estimated and actual incarceration rates. We were able to gather data from 2002 to 2021 to include in our analysis.

We found data that represented the "estimated number of sentenced prisoners under state jurisdiction, by offense" and "estimated number of sentenced prisoners under state jurisdiction, by offense, sex, race, and Hispanic origin" to gather information about the inmate population imprisoned for drug use [2]. Next, we collected information about "estimated unconditional releases from state prison, by race, Hispanic origin, and most serious offense" [2]. We also found data about "sentenced federal prisoners, by sex and most serious offense" to include both state and federal prisons [2]. Next we found data about "drug offenders admitted to state prison and in the year-end prison population, by type of admission" [2]. Finally, we found data about "prisoners who received a sentence of any length in the custody of publicly or privately operated federal correctional facilities, numbers by most serious offense, sex, race, and Hispanic origin" [2]. These were all located in different excel sheets that had more specific information.

We sorted through the various CSVs because there was a distinction between rates and percentages. We hand-parsed the specific CSVs in order to only have rates and not percentage data. We wanted to make sure that we had consistent data in this project.

A. How it Was Collected

We compiled the data from the Bureau of Justice Statistics into one cohesive spreadsheet where we pulled data specifically for drug-related incidents. We opted to create our own CSV of estimated and actual data as it was easier to only pull relevant, drug-related information that we needed. We then used pandas to create data frames and read in the data.

B. How it Was Used

After reading and processing the data, we began our analysis. We created a variety of different graphs and charts in order to visually see what was occurring. This then allowed us to complete our analysis.

IV. PROCESS

The first step that we took was researching and finding data. After finding data, we specifically searched through each spreadsheet to determine if it was usable data for our project. Next, we saved the specific CSV files that would be useful. We then re-examined our data to determine the best data sets to use to eliminate repetitive data.

We compiled these into one big file displaying all of the information. We broke this into the two categories of estimated and actual data in order to complete appropriate analysis. The various columns that existed in this file are as follows: date, estimate or actual, federal or state, offense, all inmates, male, female, White, Black, Hispanic, other, American Indian/Alaska native, and Asian. The offenses included the following: drug, drug possession, and other. The other included drug trafficking, drug possession, and other drug offenses.

We then created a Jupyter Notebook that would allow us to easily manage work between the three of us. First, we read in the data into different data frames and arrays, so that we could easily visualize the data. We first printed out the data in order to determine which graph would best display the data. It was important that we do not skew the data with a non-appropriate representation. After determining the best visualizations to use, we created the various graphics representing the data.

V. RESULTS

Overall, we determined that the Opioid and Fentanyl epidemics heavily contributed to the number of inmates incarcerated for drug-related offenses. There are a few key years that contributed to more significance of data results. The year 2008 was the Great Recession which was the worst economic downturn in the history of the United States since the Great Depression. According to the Centers for Disease Control, 2010 was the rise in Heroin-related deaths and 2013 was the rise in Synthetic Opioid overdose deaths [7].

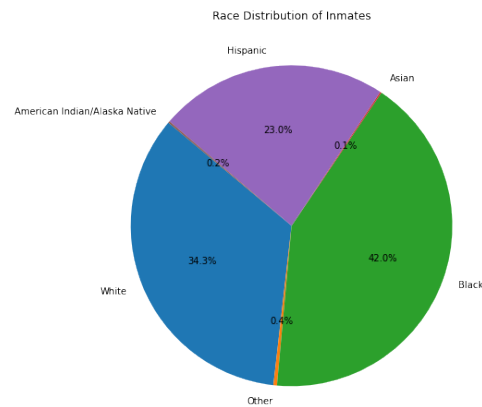


Fig. 1. Race Distribution Across Inmates

In Figure 1, we graphed the race distribution across inmates for drug-related offenses. There are three main races that have the most distribution: Black, White, and Hispanic. There were 42% Black, 34.3% White, and 23% Hispanic. The lowest races were American/Indian, Asian, and other. They all had percentages less than 0.5%.

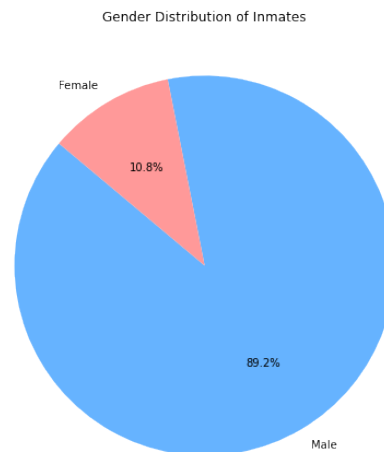


Fig. 2. Gender Distribution Across Inmates

In Figure 2, we graphed the gender distribution across inmates for drug-related offenses. According to the data, 89.2% are male and 10.8% are female. This demonstrates a vast discrepancy in the amount of male and female inmates.

In Figure 3, we graphed the estimated and actual inmate numbers per year for drug-related offenses. As previously stated, not every year has estimated and actual data. The blue indicates estimated data and after 2015 there is no more estimated data information. Additionally, there is actual data in 2002, but there is no actual data again until 2011. One key thing to note is that in 2012, there was a high estimated number but a lower actual number. However, in 2014 and 2015, there was a low estimated number, but there was a high actual number of inmates.

In Figure 4, we graphed the inmate totals by drug offense

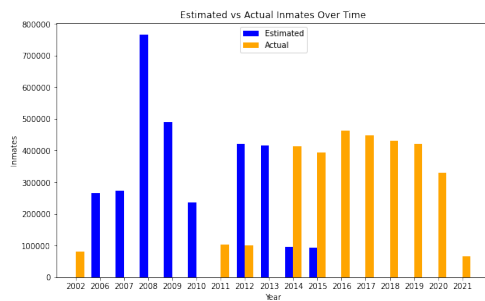


Fig. 3. Estimated Vs. Actual Inmates Over Time

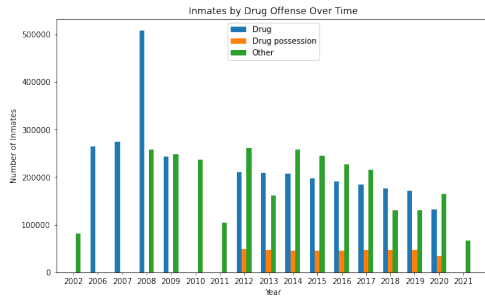


Fig. 4. Inmate Totals by Drug Offense Over Time

over time for drug-related offenses. The three different offenses are drug, drug possession, and other. According to the data, other includes trafficking, possession, and other drug offenses. In 2008, there was a rise in drug-related charges which may be due to the Great Recession. Another thing to note is from 2012 to 2014, there was a steady number of drug-related offenses. This falls in between the rise of Heroin-related deaths and the rise of synthetic opioid deaths. Additionally, in 2012 and 2014 there was a similar number of other offenses which may indicate a lot of trafficking and possession. This could be in relation to the rise in heroin and synthetic opioid usage.

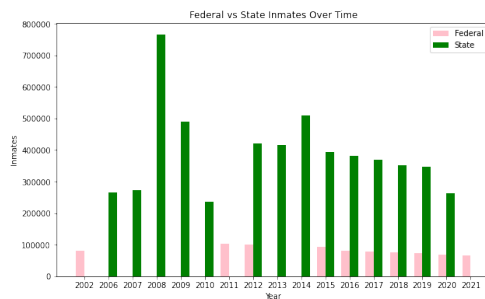


Fig. 5. Federal Vs. State Distribution Across Years

In Figure 5, we graphed the federal versus state distribution of inmates over time for drug-related offenses. There was a lot more federal data than state data. With the exception of 2012, there is only federal and state data available after 2015 until 2021. In 2008, there was a high number of federal inmates which may be due to the Great Recession.

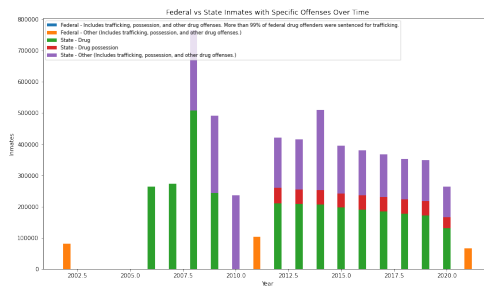


Fig. 6. Federal Vs. State Offense Distribution Across Years

In Figure 6, we graphed the federal versus state distribution for specific drug-related offenses over time. The federal data includes trafficking, possession, and other drug offenses with more of an emphasis on trafficking while the state has three different offenses: drug, drug possession, and other (includes trafficking, possession, and other drug offenses). These numbers are consistent with the other figures previously discussed. For federal, the main offense is drug trafficking while for state the main offenses are drug and other.

During the analysis and exploration of the data, there is an emergence of trends relating to the epidemics. In 2008, there was a clear spike in the amount of drug-related charges which can be attributed to the Great Recession. After the rise in Heroin Overdose deaths in 2010, there was a slow trend of increased charges until 2013. In order to fully analyze our results and draw conclusions, we referenced End the Epidemic dashboards to draw correlations between our data and available information. One specific dashboard highlighted the "Overdose Mortality by Drug Class" which studies the trends in overdose deaths from 2013 to 2021 for the following drugs: cocaine, methadone, psychostimulants (methamphetamine), heroin, synthetic opioids (e.g., illicit fentanyl), and other opioids [5]. According to this dashboard, there were spikes in particular epidemics which lead us to believe that the particular drug offenses would be these specific drugs, and therefore they do have a positive correlation. From 2015 to 2016 there was a steady rise in synthetic opioid overdose deaths according to the End the Epidemic dashboard which may contribute to the spike in 2015-2016 in Figure 3 [5]. In 2019 there was a small rise in both cocaine overdoses and methadone overdoses according to the dashboard [5]. According to Figure 3, there were about 400,000 inmates incarcerated in 2019 and over 350,000 inmates incarcerated in 2020 which correlates with the rise in cocaine and methadone usage. However, one key point is that there was a drastic drop in inmates in 2021 with less than 100,000 inmates for drug-related offenses. According to the dashboard, there was a huge spike in overdose deaths for synthetic opioids [5].

Furthermore, there is a need for Substance Abuse Prevention programs. There is "data from 2007 to 2009's National Inmate Surveys [that estimates] that 58 percent of people incarcerated in state prisons and 63 percent of people

serving sentences in jails met the criteria for a substance use disorder” [6]. Additionally, the amount of drug-related overdose deaths has increased over the years which may suggest that these programs have not been as successful as needed. However, according to Figure 3, the year 2021 had the least amount of inmates for drug-related offenses. Despite rates of incarceration for drug-related causes going down, there are still over 100,000 inmates incarcerated for drug-related charges. It is unknown whether this data accounts for inmates who acquire new drug-related charges while in prison.

Overall, the Opioid and Fentanyl epidemics heavily contributed to the amount of inmates incarcerated for drug-related offenses. There is a correlation between overdose deaths and incarceration rates. Finally, substance abuse prevention programs need to be improved upon in order to continue seeing a decrease in incarceration rates for drug-related offenses.

VI. PRIMARY ISSUES

We ran into some issues with the structure of the data. There are a few gaps within our data due to the various reports. There are a few years such as 2003, 2004, and 2005 that are not accounted for. It was hard to find any data before 2002, and there is no recent data from after 2021. We also had an issue with finding data because there is only so much specific information that is available to the public about incarceration rates. This required us to study different drug epidemic trends in order to determine which drug was most popular during a specific time period. This was an issue because a lot of the CSVs we found simply only stated drugs or drug paraphernalia as the arrest.

Another issue we ran into was differentiating between all the data that we found. There were a lot of different CSV sheets that needed to be analyzed. This led to us compiling a document that highlighted what each CSV file analyzed. It was important that we not duplicate information or use inconsistent measurements. With this, we had to determine what CSV files to use. There were both percentages and raw data that were the same information. We determined that using raw data would be easier and better to work with in this circumstance. Additionally, there was the issue with estimated versus actual data which led to more analysis to see if the data matched in the end. This created the question of whether the actual data reflected what was previously estimated, and how the data estimation changed in accuracy over the years.

A final issue that we had with the data was incomplete data. We had some data that wasn’t fully filled out for every field, so we had to set this to 0 to display that no data existed. This is important to note as it explains why particular aspects of our graphs are not as filled out. It was important that we addressed this issue because it shows that we did the analysis and determined the best course of action was to set these to 0. We did our best to find more data and mitigate the issue, but unfortunately, we were limited by what the Bureau of Justice Statistics released.

VII. RESPONSIBILITIES

During the duration of this project, each person had specific responsibilities in order to successfully complete the project. As a team, we worked together to understand the visualizations and write the final report.

A. Arshita

Arshita was in charge of visualizing the data using Matplotlib, creating Figures 1 and 2. She was also responsible for proofreading the data and handling cases where the data was null or not present.

B. Juliana

Juliana was in charge of researching and determining the validity of the data. She located the various CSV files then parsed through them by hand to determine which files should be used for the project. Juliana created a MD file called "data breakdown.md" that explained what each CSV file contained. She created Figures 3-6.

C. Sarah

Sarah was in charge of cleaning up the data and reading in the data. Sarah created a Jupyter notebook in order to read in the data easily using pandas. Sarah created a CSV entitled "drug data.csv" that displayed all the appropriate data needed for analysis and visualization. She hand-filled in information in order to create one cohesive CSV to use.

D. Timeline of Milestones

The following timeline highlights the key tasks that we accomplished before the final deadline.

- By Mid-October, we determined which sources and data that we will use. We confirmed the validity of the data. We sorted the data in the appropriate file types.
- By the beginning of November, we began the ingestion of the data. We analyzed the different CSV files before creating a master file that listed the important information.
- By the middle of November, we displayed our data in the appropriate tables and graphs within our Jupyter notebook. We began analysis to determine the most appropriate graph to display the data that we collected.
- By the end of November, we visually displayed our data into six figures. We completed our analysis of the graphs.

E. Future Work

After completing the visualization and analysis of this project, we wish to continue exploring how drug epidemics impact incarceration rates. It would be really neat to have data from the 1960s to 2000s that covered the heroin and crack-cocaine epidemics [3]. This project focused more on the Opioid and Fentanyl Epidemic that is currently plaguing the United States. We believe it would be very valuable to study trends from other known drug epidemics to see how those numbers compare to the current numbers. We also wish to further study how overdoses correlate with

incarceration rates, and there effect of drugs in prison. Finally, we also wish to investigate current substance abuse prevention programs more in-depth and determine if these are actually successful.

VIII. CONCLUSION

In conclusion, there is a correlation between drug epidemics, overdose deaths, and incarceration rates. There is a clear correlation between the Opioid and Fentanyl epidemics and overdoses in relation to drug-related incarceration rates. Our data illustrates the rising incarceration rates after the peak of the synthetic opioid overdose deaths in 2013. Through our utilization of available resources, such as the End the Epidemic Dashboard and the Centers for Disease Control report, we were able to further analyze the data. These resources helped us make correlations between our results and the various drug epidemics.

During our analysis, we determined that there were key points where spikes in incarceration rates were noticed. The years 2008, 2010, and 2013 are the three key years we focused on, and there are clear trends in drug-related charges increasing during these particular times. Next, we created six figures to highlight our data and further aid in the analysis. The three key years aligned with our data, and this allowed us to further determine what occurred in the surrounding years. In our opinion, there is a need for more substance abuse prevention programs as there are still over 100,000 inmates incarcerated for drug-related offenses as of 2021. In the future, we wish to expand upon the data collected to analyze more years.

APPENDIX

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