Part 1: Identify and Understand a Problem

- A clear statement of the problem your team is interested in addressing.

Three days ago, a mass shooting happened in Nashville elementary school, leading to at least 3 children and 3 adults killed (Collinson, 2023). Over the last few decades, the United States has experienced many mass shooting events and other serious crimes. Compared to other developed countries, the United States has higher crime rates. In 2020, the crime rate in the United States was 3,558.1 crimes per 100,000 people whereas the overall crime rate in 2020 was 11.5 crimes per 100,000 people in Japan and 1.18 in Germany. Even more interestingly, though the crime rates have decreased, the public reported perceiving the crime rates to increase (Gramlich, 2020). While many factors can contribute to the crime rates, we are interested in its relationship with the presence of the death penalty as it was and has always been a controversial topic. In fact, in 2023, 23 states have abolished the death penalty while the remaining 27 states still retain it. The relationship between the death penalty and felony crime rates become interesting to our team. While proponents argue that the death penalty serves as a deterrent to potential offenders, opponents argue that it is not an effective way to reduce crime and violates human rights. As a result, we become interested in the relationship, if there is any, and more precisely, the causal relationship between the death penalty and the felony crime rates.

- A list of Exploratory Questions you set out to answer and, for each, an explanation for why you think answering the questions may be useful.

1. Is there a significant difference in felony crime rates between states that have the death penalty and those that have abolished it? This question is important as it directly addresses the relationship between the death penalty and felony crime rates. By analyzing the differences in crime rates between states with and without the death penalty, we can conclude the effectiveness of the death penalty as a deterrent for felony crimes.
2. Does the implementation of the death penalty lead to a decrease in the number of homicides? This question is important as it addresses the specific crime of homicide and whether the death penalty has an impact on reducing this crime. By analyzing the data, we can determine whether the death penalty serves as a deterrent for homicide or not.
3. How do crime rates in states with the death penalty compare to those without it over a period of time? This question is important as it helps us understand the long-term trends in crime rates and the impact of the death penalty on those trends. By examining the data over time, we can see whether the implementation or abolition of the death penalty has a sustained impact on crime rates.
4. Are there any demographic or socioeconomic factors that correlate with the effectiveness of the death penalty as a deterrent for felony crimes? This question is important as it helps us understand the complex relationship between the death penalty and crime rates. By

examining factors such as income, education, and race, we can determine whether the effectiveness of the death penalty varies across different population groups.
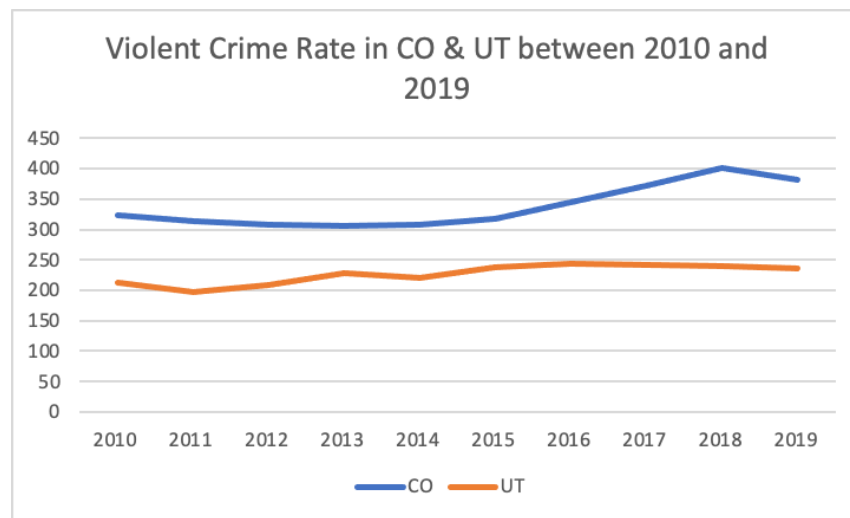
- Quantitative answers to your Exploratory Questions. Again, these will most likely be simple summary statistics, and while at least one answer must have been generated from your own calculations, you may also use data and statistics from secondary sources as answers to your other Exploratory Questions.
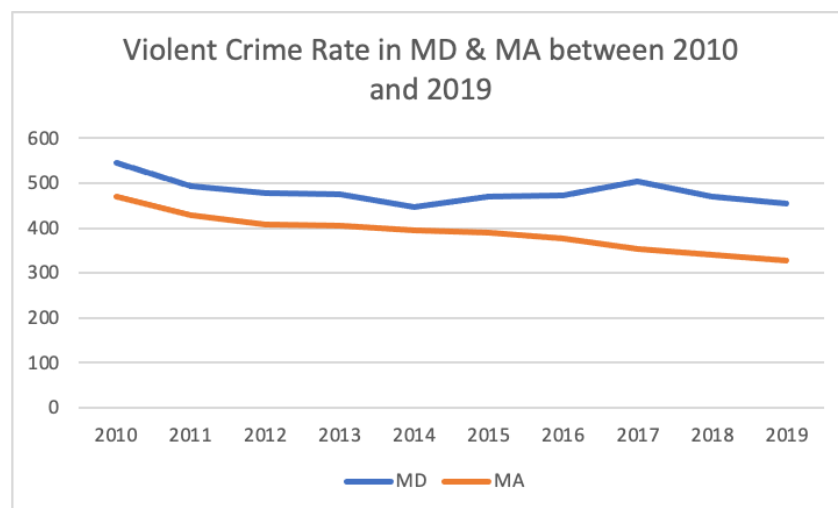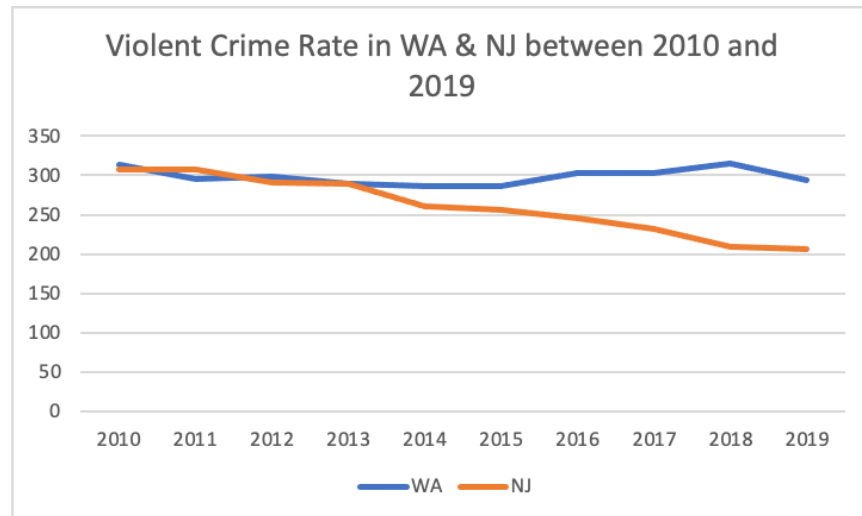
1. Is there a significant difference in felony crime rates between states that have the death penalty and those that have abolished it?

State	Violent Crime Rate	State	Violent Crime Rate	State	Violent Crime Rate
Colorado	423.058	Washington	293.698	Maryland	399.864
Comparison State					
Utah	260.656	New Jersey	195.365	Massachusetts	308.809

This table presents violent crime rates across six states in 2023 and compares the states with the death penalty and states without. This simple comparison seems to suggest there exists a difference in the violent crime rate between states that have the death penalty and those that have abolished it at least in current year.

2. How do crime rates in states with the death penalty compare to those without it over a period of time?

Violent Crime Rate in CO & UT between 2010 and 2019

Violent Crime Rate in WA & NJ between 2010 and 2019

Violent Crime Rate in MD & MA between 2010 and 2019

Here we briefly calculated the proportion of violent crime rate for three comparison groups. As we can observe, the comparison between WA and NJ might not be reasonable whereas the comparison between MD and MA as well as CO and UT approximately demonstrate a parallel trend before death penalty abolishment. The true effect need further analysis.

Part 2: Causal Project Backwards Design

1. Topic

Crime prevention and punishment are fundamental to maintain law and order in society. High crime rates can lead to a breakdown in the social order, causing fear and anxiety among the public. It can negatively impact the economy by reducing property values, discouraging investment, and increasing the cost of law enforcement and incarceration. Crime can further erode social cohesion and trust, creating divisions between different societal groups. According to the FBI's Uniform Crime Report, the total number of reported crimes in the United States in 2020 was approximately 9.7 million. If we divide the total number of reported crimes in the United States, which was approximately 9.7 million, by the estimated population of 331 million, we get a crime rate of around 2.94% per capita. Though this value assumes that each reported crime was committed by a different person and every committed crime is reported, it is still a concerning figure as it suggests that a significant portion of the population is affected by criminal activity. This number highlights the need for effective crime prevention measures and appropriate punishment for those who engage in criminal behavior to promote public safety and well-being and create a safer and more secure society for all.

Among different kinds of crimes, felony crimes are the most threatening to public safety and individual well-being. Felony crimes might vary by jurisdiction but include murder or homicide, rape or sexual assault, drug trafficking, kidnapping, and so on. Many public policies have been initiated in the United States to address felony crimes, including mandatory minimum sentencing laws and three-strikes laws. These laws aim to increase the cost of committing crimes. The most costly law enforcement is the death penalty, but the use of the death penalty as a form of punishment for certain serious crimes has been a controversial issue for many years. Many theories have been proposed to explain the relationship between the death penalty and felony crime rates and the mechanism.

One mechanism is deterrence theory, which suggests that the threat of punishment, including the death penalty, can deter individuals from committing crimes. According to this theory, potential offenders weigh the potential benefits of committing a crime against the perceived costs or punishments, and if the punishment is severe enough, they may decide not to commit the crime. Proponents of the death penalty argue that its use can act as a deterrent to potential offenders, reducing the incidence of felony crimes. Scholars have also argued for the opposite effect and proposed the brutalization effect. Such an effect suggests that the use of the death penalty may actually increase violence and aggression in society. This theory argues that the state-sanctioned killing of individuals through the death penalty sends a message that violence is an acceptable means of resolving conflicts, and this may lead to an increase in violent behavior. Therefore, they believe the death penalty may increase the incidence of felony crimes by contributing to a culture of violence and revenge.

Given the polarizing opinions surrounding the death penalty, it is important to examine the relationship of the death penalty with felony crime rates.

2. Project Question

In this project, we are particularly interested in *whether the existence/absence of the death penalty can **cause** a decrease/increase in felony crime rates*. While proponents argue that the death penalty serves as a powerful deterrent to potential offenders, critics argue that it is ineffective and costly and that there is no conclusive evidence to support its deterrent effect. Additionally, there are concerns about the potential for wrongful convictions and the disproportionate impact of the death penalty on marginalized communities. By examining the relationship between the death penalty and felony crime rates, we hope to shed light on the effectiveness of this controversial form of punishment and its impact on society as a whole. We will analyze data on crime rates, the use of the death penalty, and other relevant factors to determine whether the existence or absence of the death penalty is associated with changes in felony crime rates, and what policy implications may arise from our findings. Ultimately, our goal is to contribute to the ongoing discussion about the role of the death penalty in our criminal justice system and its impact on public safety and individual well-being.

3. How Will Answering This Problem Help Address Your Problem?

Exploring the relationship between the death penalty and felony crime rates in different states may reveal patterns that can inform hypotheses or guide the selection of relevant factors to control for in a regression analysis. Additionally, exploring related factors such as demographics, economic conditions, and policing practices can shed light on potential confounding variables that should be accounted for in further analysis. These exploratory questions can help us identify patterns and potential causal relationships that can inform the development of a robust research design and ultimately to answer our casual question.

4. Ideal Experiment

If we were the god, we would have two identical states, i.e, have similar demographic information including the distribution of age, gender, race, and class, similar economic conditions, i.e., similar GDP as well as historical trends, and other policing conditions, i.e., parole and probation policies, crime prevention measures, and law enforcement strategies, to experiment on the effect of the death penalty on felony crime rates. This would allow us to isolate the effect of the death penalty and determine whether its use leads to a decrease or increase in felony crime rates, without the confounding effects of other factors.

- Treatment variable: Absence of the death penalty
- Outcome variable: Felony crime rates

5. Pick a Study Context

- Treatment variable: Death Penalty Information Center has information about which state retain/abolish the death penalty and the year of abolishment.
- Outcome variable: Each state has crime rates information over at least the last 30 years in the government website. For instance, Washington state has a statistical analysis center. Other states also publish crime data on the official website. Moreover, the Federal Bureau of Investigation has Crime Data Explorer to query crime data by state and year. The disaster center has published the crime data from 1960 to 2019 for each state as well.

6. Project Design

A feasible design would be a **quasi-experimental** design. The treatment group would be states that abolished the death penalty, and the comparison group would be states that still retain the death penalty.

The first step would be to identify pairs of the treatment group (states that abolished the death penalty) and the comparison group (states that still retain the death penalty). Then, we woudl collect crime data from the official government websites and compile the crime rates over the past 30 years for each state. The crime rates for both groups would then be compared over time to see if there are any significant differences in crime rates between the two groups after the abolishment of the death penalty. Here we will also examine any significant difference through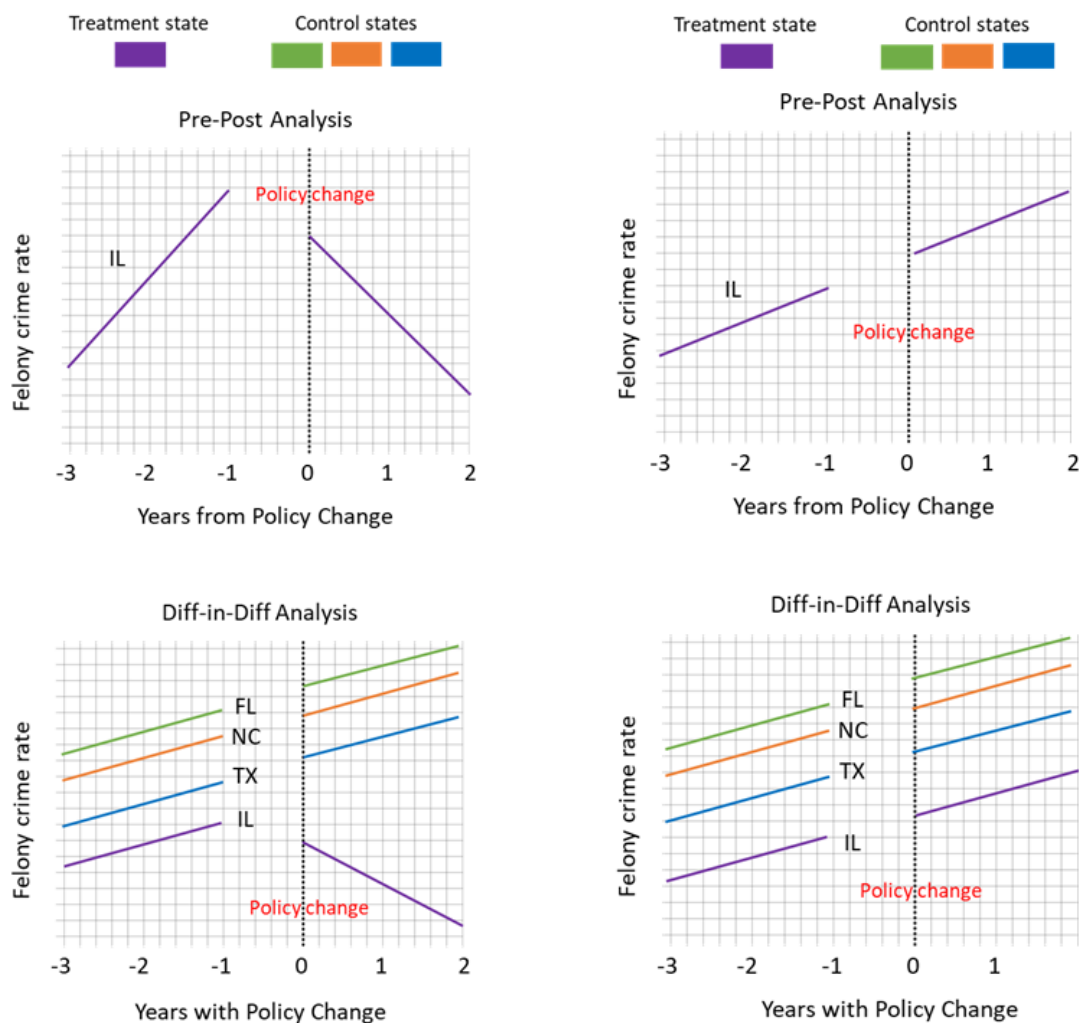 the **pre-post** and **difference-in-difference** method. Additionally, **regression analysis** could be used to control for other factors that may impact crime rates, such as demographic information, economic conditions, and policing conditions.

Overall, this design would allow for a comparison between states that have abolished the death penalty and those that still retain it, providing insight into the relationship between the death penalty and felony crime rates.

7. Model Results

Results if your hypothesis is true   Results if your hypothesis is false

8. Final Variables Required

- Primary variable of interest:
  - Here we list out a table of some states with abolishment and others retaining the death penalty

States	Abolishment Year	Comparison
Ilinois	2011	Michigan/ Ohio/ Wisconsin

Connecticut	2012	Massachusetts/ Vermont/ New York
Maryland	2013	Massachusetts/ Nevada/ New Jersey
Delaware	2016	Montana/ South Dakota/ Wyoming
Washington	2018	Minnesota/ New Jersey
New Hamsphire	2019	Maine/ Montana/ North Dakota
Colorado	2020	Utah/ Arizona
Virginia	2021	North Carolina/ South Carolina/ Georgia

Note: 1. we will decide the comparison states after conducting data analysis, however, we choose these states based on sociocultural and some general demographic information.
2. California, Oregon, and Pennsylvania are bit tricky, so excluded in our analysis.

- Control variables:
  - Demographic information: population, age, race
  - Economic conditions: unemployment rate, income inequality, GDP
  - Other socio-cultural factors: immigration, educational attainment
- Outcome variables:
  - Felony crime rates in each state across 2000 - 2019

9. Data Source

1) Death Penalty Information:
Death Penalty Information Center:
https://deathpenaltyinfo.org/state-and-federal-info/state-by-state
2) Crime Rates:
Disaster Center:
For example, Connecticut: https://www.disastercenter.com/crime/ctcrime.htm
3) Unemployment Rate (state by state from 1992 to 2021):

Statista:
For example, Illinois:
https://www.statista.com/statistics/189426/unemployment-rate-in-illinois-since-1992/
4) Income inequality (from 1984 to 2018):
US Census Bureau:
https://www2.census.gov/programs-surveys/cps/tables/time-series/historical-income-households/h08.xls
5) GDP (from 1997 to 2021):
FRED: https://fred.stlouisfed.org/release?rid=140
6) Immigration (domestic / international from 1990 to 2022)
US Census Bureau:
https://www2.census.gov/programs-surveys/popest/datasets/2010-2020/state/totals/
7) Age (separate by generation from 2008 to 2021):
KFF-Washington Post partnership survey:
https://www.kff.org/other/state-indicator/distribution-by-age/
8) Race (from 1990 to 2020)
CDC WONDER: https://wonder.cdc.gov/Bridged-Race-v2020.HTML
We will merge the dataset by state and year.

References

Collinson, S. (2023, March 28). America's kids are failed again | CNN politics. CNN.
        Retrieved March 30, 2023, from
        https://www.cnn.com/2023/03/28/politics/nashville-shooting-gun-reform-paralysis/index.html
Gramlich, J. (2020, November 23). *What the data says (and doesn't say) about crime in the
        United States*. Pew Research Center. Retrieved March 30, 2023, from
        https://www.pewresearch.org/fact-tank/2020/11/20/facts-about-crime-in-the-u-s/