Study and Research Work (TER)

CRIMINAL JUSTICE SYSTEM IN THE USA
Is there a systemic racial bias?

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Abstract

In this research work we deal with issues relating to the Criminal Justice System in the United States of America, which is comprised of three branches: the police, the courts, and the corrections system. A specific problem was analyzed for each branch, as an attempt to see if racial discrepancy emerged. Concerning *the Police*, it was examined the number of police homicides, per state. Regarding *the Courts*, it was studied: the years until individuals were exonerated from 1989 until 2019. As for *the Correctional system* it was analyzed the percentage of black prisoners. The output showed that individuals belonging to black race had a higher chance of getting killed by the police and waiting longer until they were exonerated. Additionally, the result showed a positive relationship between an ex Pro-Slavery state and the percentage of black convicts.

Résumé

Dans ce travail de recherche, nous traitons des questions relatives au système de justice pénale aux États-Unis d'Amérique, qui comprend trois branches: la police, les tribunaux et le système correctionnel. Un problème spécifique a été analysé pour chaque branche, comme une tentative de voir si une discordance raciale a émergé. Concernant *la police*, il a été examiné le nombre d'homicides par la police, par Etat. En ce qui concerne *les tribunaux*, il a été étudié: les années jusqu'à ce que les individus soient disculpés de 1989 à 2019. Quant au *système correctionnel*, il a été analysé le pourcentage de prisonniers noirs. Les résultats ont montré que les personnes appartenant à la race noire avaient plus de chances d'être tuées par la police et d'attendre plus longtemps jusqu'à ce qu'elles soient disculpées. De plus, le résultat a montré une relation positive entre un ancien État pro-esclavagiste et le pourcentage de condamnés noirs.

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I. INTRODUCTION

Recent media attention to police killings of civilians in the United States, as well as Black Lives Matters activists and criminal justice reform advocates protests have served as an inspiration for this research. In addition, the U.S. incarcerates nearly 1% of all its adults, the highest rate in the World. Therefore, it seemed thought provoking to study the whole "Justice ecosystem" in the US, in order to understand if the problem was systematic or more of a recent one.

In this paper, was studied the connection between political, and demographic factors and criminal justice in 50 states of the United States. It was attempted the examination of a specific problem for each of its three branches, in order to see if racial bias emerges, notably, if this bias is noteworthy in states that were Pro-Slavery. This study highlights the role and potential impact of these factors on the number of homicides by the police, number of exonerations, and the percentage of black prisoners, given the demographic, and social differentiations of victims/inmates.

Regarding political characteristics, we will refer to the fact if the governor of each state was Republican or Democrat and if the state was Pro – Slavery during the Civil War in the US[1]. As a means to obtain information on demographic attributes, were used data on the gender and the race of the victim/convicted.

This paper is organized as follows:

Chapter 2 analyses if the number of homicides by the police in each state is impacted by : if the State was Pro-Slavery during the Civil War, if the governor is republican or democrat, the gender, and the race of the deceased.

Chapter 3 examines the link between individuals that were exonerated since 1989 until 2019 and if the State was Pro-Slavery during the Civil War, if the governor is republican or democrat, the gender, and the race of the exoneree.

Chapter 4 assesses the relationship between the percentage of black prisoners and the total prisoners in each state, if the state was Pro-Slavery during the Civil War, if the governor is republican or democrat, the gender, and the race of the convicts.

In addition, in Section 5 are included some concluding remarks, the limits of the study and recommendations for future research.

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[1] This variable was included as a political factor in order to see if there is a difference between southern and northern states in the US, due to the fact that southern states were pro-slavery in the Civil War in the US.

I.1. LITERATURE REVIEW

The American historian Denis Rothman stated, "the least controversial observation about the American criminal justice today is that it is remarkably ineffective, absurdly expensive, grossly inhumane, and riddled with discrimination". The United States' unique history of categorization, political subjugation, and empowerment along lines of race, and cultural beliefs about racial categories. (Lowndes, Novkov, & Warren, 2008) This is especially true for the politics of crime and crime control policy, where policy makers are more likely to manipulate and be influenced by racial stereotypes that link African-Americans or racialized immigrants with crime (Provine, 2007). In addition, (Whitman, 2005) argues that whereas other developed countries have lessened their punishment, America has not. In addition, he links the degradation of criminal offenders with the history of slavery in the United States.

Furthermore, (Thompson, 2020) states that the United States has the highest incarceration rate, as well as the largest number of people living under correctional control, then any other country on the globe. In addition to the size, the system is also racialized, where the number of non-white inmates is disproportional to that of white individuals[2]. According to (National Research Council, 2014), in 2012, close to 25 percent of the world's prisoners were held in American prisons, although the United States accounts for about 5 percent of the world's population.

According to (Stuntz, 2011), not considering southern states, criminal justice institutions, controlled crime effectively and treated the accused fairly. Unfortunately, he argues that this has changed the last 60 years, where discrimination towards black suspects and black crime victims has grown.

The role of political competition and ideology of the difference in incarceration rates has been confirmed by several authors. (Jacobs & Helms, Toward a Political Model of Incarceration: A Time-Series Examination of Multiple Explanations for Prison Admission Rates, 1996), (Jacobs & Charmichael, 2001) and (Jackson & Jacobs, 2010) show that there is a positive relationship between Republican-led states and the number of imprisonments. Whereas (Greenberg & West, 2006) does not have the same conclusion.

Concerning prisons, the biggest crises they are experiencing today has to do with overcrowding, mistreatment, the failure to provide adequate health care, and bloated budgets (Aviram, 2015), (Calavita & Jenness, 2014), (Simon, 2014).

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[2] White people constitute the majority of the U.S. population, in 2017, 73% of the US population was white.

There is a large body of research that explains the impact on the number of homicides associated with confrontation with the police primarily through crime rates. The articles in this literature use a wide variety of econometric approaches. Early empirical papers such as (Ehrlich, 1972) and (Wilson & Boland, 1978) focused on the cross-sectional association between police and crime. Several research papers use panel data to explain police killings (Cornwell & Trumbull, 1994), (Marvell & Moody, 1996), (Witt, Clarke, & Fielding, 1999), (Fajnzylber, Lederman, & Loayza, 2002), (Baltagi, 2006).

Political explanations suggest that police killings will be more common in economically stratified cities with higher percentages of minorities, as dominant groups have a lot to lose from threats to public order caused by a different ethnic or economic class (Jacobs & O'Brien, 1998). Furthermore, (Jacobs & Britt, 1979) find that income inequality is the best explanation for police murders.

(Jackson P. I., 1989) shows that the percentage of blacks in a city is related to the police force. Another possibility is that it is cheaper for the police to murder suspects than to prosecute them legally. As (Turk, 1966) puts it, where there are larger differences in resources, "normal court proceedings risk being unofficially abrogated in favor of summary and less expensive proceedings" because procedural law is expensive.

I.2. BACKGROUND: CRIMINAL JUSTICE SYSTEM IN THE USA

The criminal justice system is the government trying to enforce the law on its citizens, in order to protect the society. Consequently, through it, trying to punish those who do not obey the legal code.

The history of the justice system in what is known today the USA, starts in 1636, in Boston, where citizens organized patrols known as "night watches". Next to follow were New York in 1658 and Philadelphia in 1700.

The creation of a unified law was done after the American Revolution[3], via the writing of the Constitution, in 1789. In the beginning the Constitution consisted of 7 articles, and during the years it has been modified 27 times, in order to better adapt towards serving the citizens. Before, each colony had its own criminal codes, punishments, and courts.

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[3] It is the revolutionary war for independence between the 13 colonies and the British Crown. It happened during 1765 and 1783.

The prisons were established in the 18th century in the USA. Before their creation, the punishment was done via barbaric punishments like cutting body parts, or even worse, execution. It is worth mentioning that the death penalty is still legal in the US, and the last death penalty by hanging was done in Delaware in 1996.

In the 1880s prisons started working towards rehabilitating prisoners. This rehabilitation was done by experimenting different punishments like no communication with other people by putting prisoners in isolation, making prisoners work hard and by studying the Bible in silence and solitude.

Officially, the slavery in the US ended in 1865. The constitution of the US banned slavery "except as a punishment for crime whereof the party shall have been duly convicted." Southern States used "Black Codes"[4] to arrect any black person who was deemed problematic, disobedient, dangerous, or even lazy[5]. This was used as a way to criminalize former slaves and force them to work for free in farming or industrial operations[6]. Between 1880 and 1904, Alabama's profits from leasing state convicts made up 10 percent of the state's budget (Bauer, 2018).

In the beginning of the 1900s prison plantations were created as a modification of slavery[7]. Basically, the convicted, worked in cotton fields in terrible working conditions. According to (Bauer, 2018), in the 19th century, the US was exporting more cotton than all other nations combined. All this due to the inhuman work that prisoners were forced to do. In addition, Mr. Bauer adds how the annual convict death rates ranged from 16 to 25 percent, with a rate of more than 40% in Alabama.

When the States saw the profit was high, they started buying ex-slave plantations and turning them into prisons. By 1928 the state of Texas would be running 12 prison plantations (Bauer, 2018).

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[4] Laws that specified how, when, and where freed slaves could work and how much they would be paid. In addition, through these codes, it was restricted where freed slaves could live and the conditions of their travel.

[5] They were arrested for vagrancy, mischief, loitering, breaking curfew, insulting gestures, cruel treatment to animals, keeping firearms, cohabiting with white people, and not carrying proof of employment.

[6] The prison leased prisoners to work for whoever was able to pay for them. An example of this is in Mississippi, "Cotton King" Edmund Richardson, an ex-slave owner, convinced the State to "rent" him the convicts. The state agreed to pay him $18000 for their maintenance. In addition, Mr. Richardson kept all the profit from their labor.

[7] This is seen in the naming of prisons: Caledonia Correctional Institution used to be Caledonia Plantation, Louisiana State Penitentiary used to be Angola Plantation (unofficially the prison is called Angola), the Mississippi State Penitentiary used to be Parchman Plantation (unofficially the prison is called Parchman prison). Several other prisons have been constructed in the same place that plantations were, they just changed the name (often to ex-slave owners).

This continued until 1971, when it was prohibited by law, even though it was not illegal according to the 13 amendment of the Constitution.

In 1704, in the South of the US, slave patrols started to guard the forests and roads, looking for runaway slaves and preventing slave revolts. These slave patrols, eventually, after the slavery was abolished in the USA, transformed into what today are known as local sheriffs and police departments.

In 1838, the first department of police was created in Boston. By the end of the 1880s all major cities had a police department. Immigration, urbanization, and conflict over slavery increased crime. Alas, the new police were not able to maintain social order. Partially because they were not paid enough, and also, because they were not impartial, they were tools of politicians.

During the 20th century, law enforcement in the US was reformed. The first reform was about separating the police from politicians, with the aim of making police officers less corrupt and more professional. The second reform was on nationalizing the control of crime. In order to do this, the US created the Federal Bureau of Investigation (FBI). Through these reforms, the US goal was to create a more effective and professional law enforcement, with the intention of fighting crime and restoring social order.

The development of the court system as it exists today in the America, has been highly impacted by that of medieval England common law. In fact, the jury replaced trial by combat, and eventually witnesses were added during the trial.

Even today each of the 50 states has its own rules and legal procedure. Additionally, federal courts have their own rules and legal procedures as well.

Today's criminal justice system in the USA is a network of different agencies and institutions, whose role is to enforce a legal code, based on the Unites States of America Constitution. Since the US is decentralized government, its justice system is decentralized as well into Federal and State jurisdictions.

The U.S. criminal justice system is separated into three different branches: the police, the courts, and the corrections system **(Appendix 2)**.

II.   LAW ENFORCEMENT

II.1.   INTRODUCTION

The job of the law enforcement starts when a crime is detected. This can be either via a complaint made by another citizen or by catching a suspect in the act.

The power to be the law on the streets allowed police officers to be selective towards people they stop and frisk. Under the unclear nature of traffic laws, and the uncertainties presented by the 'probable cause' policy, law enforcement officers have the ability to decide who they are going to stop, no matter if they broke the law or not. Also, they have the possibility to use traffic stops to investigate other crimes. To illustrate, they stop someone because they speeded or for another minor violation of a traffic law, but they end up searching their cars for drugs. From this practice, of stopping cars in traffic, we have the phrase "racial profiling" [8]. (Stuntz, 2011)

The problem of social profiling is not a new issue that arose these last few years. An example of it would be during the period of the civil rights movement in the 1950's and 1960's, southern sheriffs did not get involved, while racists like the Ku Klux Klan terrorized African Americans. We have the U.S. President, Bill Clinton, who said in 1999, that racial profiling is "morally indefensible, deeply corrosive practice, it is in fact the opposite of good police work, where actions are based on hard facts, not stereotypes. It is wrong, it is destructive, and it must stop." In addition, it is not a circumstance concerning only black citizens. After the attacks of 9/11, it has been used towards Arabs and Muslims. And lately, during the presidency of Donald Trump, it has been done to undocumented citizens (mainly of Mexican origins). According to (United Nations , 2019), racial profiling has been found to be an ineffective policing tool, as it is largely unsuccessful in crime prevention.

Among others, racially biased policing, undermines the very legitimacy of the police, therefore, it is damaging to the society in general, and not just to certain communities. As stated by (Law, 2006), when the polices actions are viewed as discriminatory and unfair, people have the tendency to see the authority of the police as illegitimate. Additionally, it makes citizens less law abiding, less likely to help an officer in need, and less likely to ask the police for help.

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[8] The use of racial or ethnic appearance by police as one factor, among others, to decide who is suspicious enough to attract police attention that may result in detention, questioning, a search, or other routine police action.((Harris, 2017)

Moreover, (Law, 2006), indicates that when people are treated fairly, they are more willing to accept a traffic citation, an order, or an arrest by the police.

Since racial profiling means more "stop and frisks" for people who are not white, the number of arrests for non-white individuals is going to be higher. (Tonry, 2010) connects high imprisonment rates (5 to 7 times higher than that of white people) for black people, to the higher arrests for violent and drug crimes. He links the arrests to the fact that police officers concentrate more on drugs black people sell and where they sell them.

During these stops of citizens, several of them have ended dead due to a confrontation with the police. Numerous cases have been all over the media these past few years. Motivated by the death of Breonna Tylor[9], Tamir Rice[10], George Floyd[11], Stephon Clark[12], and many others, black citizens have been protesting with the slogans 'Black Lives Matter' and 'I Can't Breathe'.

Polices' discriminatory behavior has been identified by several scholars as well. (Edwards, Lee, & Esposito, 2019) analysis shows that people of color face a higher likelihood of being killed by police than do white men and women, that risk peaks in young adulthood (between 20 to 35 years old), and that men of color face a nontrivial lifetime risk of being killed by police (with 1 in 1,000 chance of being killed by police over the life course). (Fagan & Campbell, 2020) show that black suspects are more than twice as likely to be killed by police than are persons of other ethnic groups; even when using deadly force, it is not necessary nor reasonable. According to (Bor, Venkataramani, Williams, & Tsai, 2018) Black Americans account for more than 40% of victims of all police killings nationwide. In addition, they found that these killings impact negatively the mental health of Black Americans. The impact of police brutality on the mental health of Black Americans is confirmed by (Das, Singh, Kulkarni, & Bruckner, 2021), who conclude that police killings of unarmed Blacks precede increased ED visits for depression.

To find if there is a racial bias in the law enforcement behavior, in this chapter of this research work, an analysis was conducted in order to estimate if race and gender of the victim have an impact on the homicides due to a confrontation with the police. In addition, two other variables were included : the political affiliation of the Governor of each State, and if the State was pro or against slavery during the Civil War.

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[9] Killed during a search warrant in her apartment. She and her boyfriend were sleeping when the police (in civil clothes) entered their home.
[10] A 12-year-old killed because he was playing with a toy gun in a park.
[11] Killed during arrest, allegedly he tried to use a counterfeit $20.
[12] Killed because an officer thought he was holding a gun.

II.2. DATA AND DESCRIPTIVE STATISTICS

DATA

The raw data for this analysis includes 1815 homicides committed by the police in 50 states in the United States, for the year 2019.

Some of the best-kept statistics on police killings are not listed by the government, but collected by activist groups and journalists. That being the case, the Fatal Encounters project database was used. This website documents all deaths that occur when the police are present or that are caused by the police in the United States of America. The database includes records of nearly 30,000 deaths from 2000 to 2021.

Regarding the unit of measure for the endogenous variable, was used the total number of individuals, in a logarithmic form, who died after a confrontation with the police, in 50 states of the United States.

Additionally, the gender and the race of the victims was taken from the same database, The Fatal Encounters project. For the variable "Gender", was used the percentage of the male victims, whereas, for the variable "Race" was used the percentage of the victims of the white race (because they are the majority in the U.S).

Data for the variable Republican or Democrat are from the Ballotpedia, the digital encyclopedia of American politics and elections. Since the variable "Republican or Democrat" is a dummy variable, it will take the value 0, when the state Governor is a Democrat, and it will take the value 1 if the state has a Republican Governor. The year of reference is 2019.

Information regarding the variable if a State was Pro-Slavery or Against-Slavery was collected through information on the website LearnCivilWarHistory.com. This is a dummy variable, where if the State was Pro-Slavery, it will take the value 1. If the State was not Pro-Slavery, or it did not exist at the time, it will take the value 0.

In the list of states who were Pro-Slavery are states belonging to the Confederate and Border states (states who were part of the Union & Pro-Slavery). Concerning states categorized as not Pro-Slavery, some States did not exist at the time, or were not American territory. An example of this is: the last State to officially be part of the U.S.A. is Hawaii in 1959, while the Civil War was from 1861 to 1865. In addition, a part of todays' U.S., was Indian territory since it had not yet been colonized entirely.

DESCRIPTIVE STATISTICS

Before starting with the econometric regression, it is always essential to explore the database. First, some descriptive statistics of the variables are shown in the table below.

Statistic	Mean	St. Dev.	Min	Median	Max
Homicides	36.300	40.829	0	26	219
REP	0.520	0.505	0	1	1
Slavery	0.300	0.463	0	0	1
Gender	0.908	0.066	0.750	0.910	1.000
Race	0.398	0.190	0.000	0.400	0.860

According to the mean, the average number of homicides is 36. From the median, we can conclude that there are more Republican-led states than with a Democratic Governor.
For the variable Race, the mean shows that most of the homicides were of non-white race, and the data for the variable Gender shows that around 90% of the victims were men.
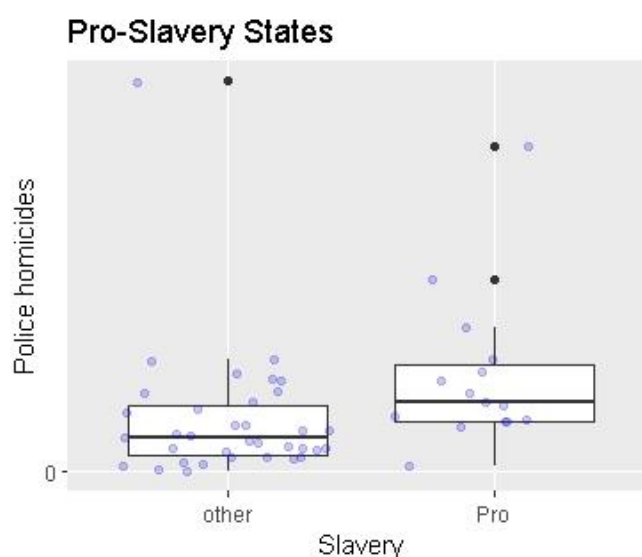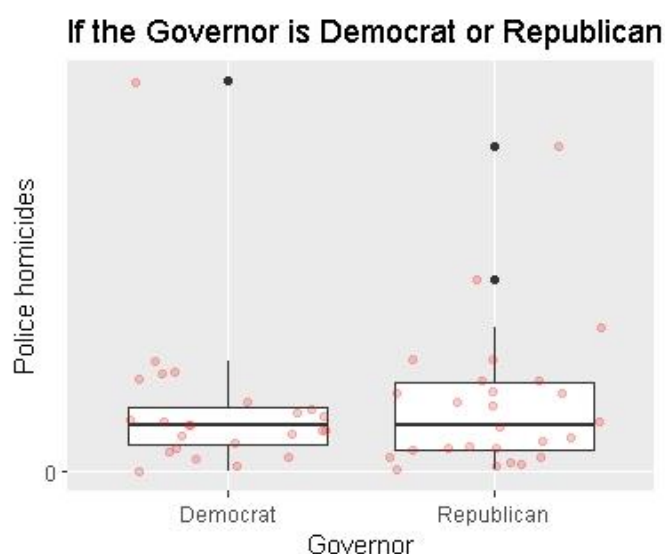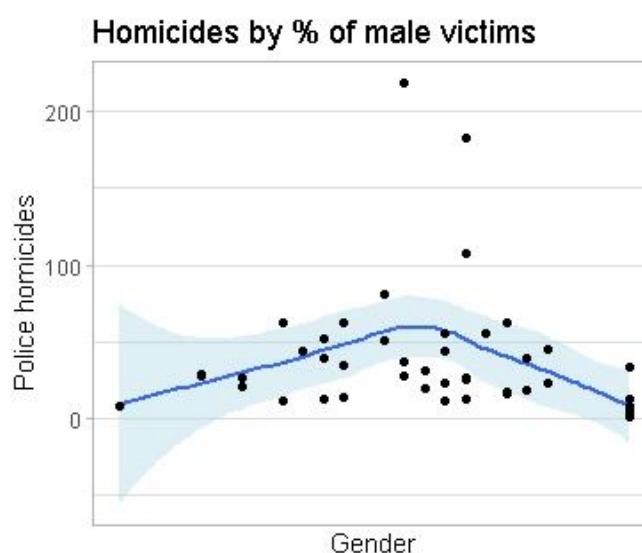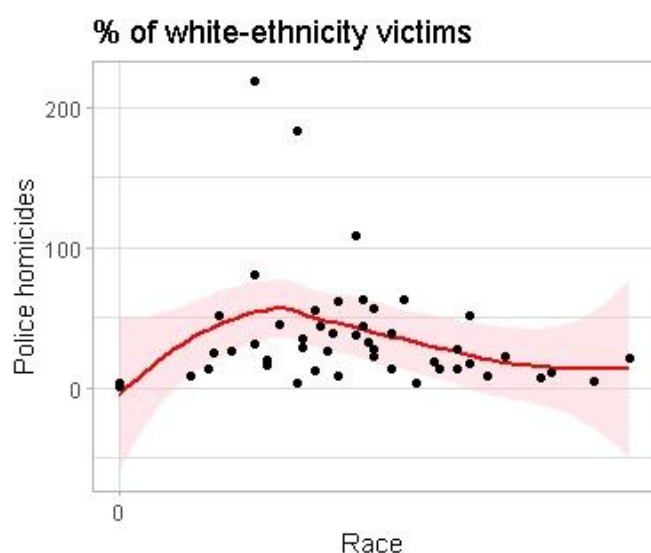
The first graph, on the left, represents the percentage of male victims as a function of homicides by a confrontation with the police. The second graph, on the right, represents the percentage of white individuals as a function of homicides by the police. The observations on both graphs seem scattered, with some outliers and extreme values. Additionally, the relationship between Police homicides & Gender, and Police homicides & Race appears to be weak, and it does not seem to be linear.

The third graph shows the relationship between Police homicides and percentage of male victims. According to the graph, the observations are not distributed equally. In fact, there is greater variability for Republican-led States than those led by a Democrat, as well as larger outliers. Even though the medians look the same in both boxplots, the Republican boxplot seems skewed to the right, and the values are concentrated in the third and fourth quartile.

The fourth graph represents Pro-Slavery States as a function of Police homicides. Both boxplots appear skewed to the right, and their medians are not the same. The data in the boxplot other, seem to be more concentrated, whereas for the boxplot Pro there are more outliers. In fact, the median of Police homicides in Pro-Slavery States seems to be higher.

Next, the correlation matrix reveals if there is potential collinearity between the variables. According to the correlation matrix, there is no linear correlation between the variables Gender & REP and REP & Homicides. The variables Race & REP, Slavery & REP and Slavery & Homicides are positively correlated, even though the correlation is weak. And the other variables are weakly negatively correlated, with the highest correlation between Gender & Slavery (with a correlation of –0.3).

II.3. METHODOLOGY

With the purpose of explaining the relationship of homicides by the police in the United States and race, sex, and whether the political and demographic characteristics of the states in the United States explain the number of homicides resulting from a confrontation with the police, cross-sectional data was used to assess which factors had an impact, and whether this impact was significant.

The specification of the theoretical model is as follows:

$$\text{Homicides} = \beta_0 + \beta_1 \text{Gender}_i + \beta_2 \text{Race}_i + \beta_3 \text{REP}_i + \beta_4 \text{Slavery}_i + \varepsilon_i$$

Where *Homicides* is the number of deaths resulting from a confrontation with the police, per state. *Gender$_i$* stands for the percentage of male victims. *Race$_i$* represents the percentage of victims of white race. *REP$_i$* is a dummy variable (1 if the Governor is Republican and 0 if the Governor is Democrat). *Slavery$_i$* is a dummy variable and represents if the states were Pro Slavery during the Civil War (1 if yes and 0 if not).

II.3.1 SELECTION OF THE MODEL

Regarding the linearity of the data, since the variables *REP* and *Slavery* are dummy variables, they meet the assumption of linearity by definition. As for the variable *Race*, whose graph shows a non-linear relationship, the residual plots were checked **(Appendix 3)**, which indicate that indeed the relationship is not linear. The same situation is with the variable *Gender*, which according to the residual plots is not linear **(Appendix 4)**.

Since two of the independent variables follow a distribution other than the normal distribution, was decided to analyze the data using a Poisson model. In addition, the endogenous variable is countable one, therefore doing a Poisson regression **(Appendix 5)** seems the most appropriate.

After checking the mean and the variance, the results show that the variance is much greater than the mean (1666.99>36.3), which suggests that there is over-dispersion in the model. According to the regression, based on the fact that the Residual Deviance is greater than the degrees of freedom, then over-dispersion exists (as showed by variance > mean). This means that the estimates are correct, but the standard errors are wrong and unaccounted for by the model. The Null deviance shows how well the variable Homicides is predicted by a model that contains only the intercept. Additionally, we can see that the addition of 4 independent variables decreased the deviance to 1314 from 1534.3. Which means that the model is not a good fit.

A plausibility for the cause of this over-dispersion can be because an important independent variable has not been included in the model. Therefore, the problem may be an be due to an under-specified model. It must be considered that the size of population varies between States, which may impact the homicides by the police. Besides, the US constitution allows each state to create or enforce laws, in this sense each state has a certain degree of sovereignty.

In this situation, it was preferable to do a Negative binomial regression which can be used for over-dispersed count data. The results showed that the overdispersion is reduced, the rate of the Residual deviance to degrees of freedom is 1 to 1.2.

Moreover, the Akaike Information Criterion values show that the Negative binomial model is a better fit, with an AIC of 452, whereas the AIC for the Poisson model is 1568. We get the same results with the Bayesian Information Criterion as well, thus the Negative binominal model is preferred.

```
             Model       AIC       BIC
           poisson 1568.7306 1578.1897
 negative-binomial  452.6629  452.6629
```

To compare both models, a likelihood ratio test was used, to test the null hypothesis that $\theta = \infty$. According to the results, the negative binomial model, estimating the dispersion parameter, is more appropriate than the Poisson model.

```
'log Lik.' 3.908521e-245 (df=6)
```

In addition, a rootogram **(Appendix 6)** shows that the difference between expected and observed counts is better via a Negative binomial than a Poisson model (even though we have underfitting of the model – probably due to the small sample of the data).

Therefore, the equation corresponding to the final estimate is as follows:

$$\log(\text{Homicides }_i) = \beta_0 + \beta_1 \text{ Gender}_i + \beta_2 \text{ Race}_i + \beta_3 \text{ REP}_i + \beta_4 \text{ Slavery}_i + \varepsilon_i$$

In the regression, we see that 1 observation is deleted due to missingness. This is because for the reference year, in Rhode Island, there were no deaths recorded due to a confrontation with the police.

```
Call:
glm.nb(formula = Homicides ~ Gender + Race + Slavery + REP, data = Police,
    init.theta = 1.54341897, link = log)

Deviance Residuals:
    Min      1Q   Median      3Q      Max
-2.4713  -0.8874  -0.3565   0.2621   2.7883

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   7.8493     1.8443   4.256 2.08e-05 ***
Gender       -4.2778     1.9319  -2.214   0.0268 *
Race         -1.3416     0.6659  -2.015   0.0439 *
Slavery       0.5466     0.2773   1.971   0.0487 *
REP          -0.1345     0.2474  -0.544   0.5866
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for Negative Binomial(1.5434) family taken to be 1)

    Null deviance: 65.637  on 48  degrees of freedom
Residual deviance: 53.277  on 44  degrees of freedom
  (1 observation deleted due to missingness)
AIC: 452.66

Number of Fisher Scoring iterations: 1


            Theta:  1.543
        Std. Err.:  0.305

 2 x log-likelihood:  -440.663
```

In order to interpret the results, were exponentiated the coefficients to get the incidence rate ratios. This implies:

$$\text{Homicides} = \exp(\beta_0 + \beta_1 \text{ Gender }_i + \beta_2 \text{ Race }_i + \beta_3 \text{ REP }_i + \beta_4 \text{ Slavery }_i) = \exp(\beta_0) * \exp(\beta_1 \text{ Gender }_i) * \exp(\beta_2 \text{ Race }_i) * \exp(\beta_3 \text{ REP }_i) * \exp(\beta_4 \text{ Slavery }_i)$$

```
MODEL INFO:
Observations: 49 (1 missing obs. deleted)
Dependent Variable: Homicides
Type: Generalized linear model
  Family: Negative Binomial(1.5434)
  Link function: log

MODEL FIT:
χ²() = , p =
Pseudo-R² (Cragg-Uhler) = 0.20
Pseudo-R² (McFadden) = 0.02
AIC = 452.66, BIC = 464.01

Standard errors: MLE
------------------------------------------------------------
                  exp(Est.)    2.5%    97.5%   z val.      p
----------------- ---------- ------- --------- -------- ------
(Intercept)         2564.07   69.03  95237.65     4.26   0.00
Gender                 0.01    0.00      0.61    -2.21   0.03
Race                   0.26    0.07      0.96    -2.01   0.04
Slavery                1.73    1.00      2.97     1.97   0.05
REP                    0.87    0.54      1.42    -0.54   0.59
------------------------------------------------------------
```

II.4.   PRESENTATION OF RESULTS

a. Gender

Regarding the variable of the sex of the victims, the regression shows that it is significant at the 10% level and negative. This variable includes the percentage of male victims. According to the results, the difference in the logs of expected counts is expected to be 4.28 % lower for males compared to females, while holding the other variables constant in the model. In terms of incidence rate ratio, males compared to females, while holding the other variable constant in the model, are expected to have a rate of 0.01 times greater to be killed by a police officer.

b. Race

From the results of our regression, we see that the coefficient of the variable associated with the race of the victim is significant at the 10% level and negative. This makes sense since the variable references the percentage of the victims corresponding to the white race. We can then interpret it like this: holding all other variables constant, the difference in the logs of expected counts is expected to be 1.34 % lower for white individuals compared to other races. Relating the IRR, individuals of white race compared to other race, are expected to have a rate of 0.26 times greater to be killed by a police officer, while holding the other variable constant in the model.

c. REP

Concerning the variable if the State had a Republican or a Democrat Governor, the results show that it is not significant, and it is negative. Therefore, holding all other variables constant, showing that the difference in the logs of expected counts is expected to be 0.13 unit lower for States with a Republican Governor, compared to States with a Democrat Governor.

As for the IRR, individuals belonging to a Republican-led State compared to Democrat-led States, are expected to have a rate of 0.87 times greater to be killed by a police officer, while holding the other variable constant in the model.

d. Slavery

Pertaining to the variable if the State was Pro-Slavery during the Civil War, the results show that it is significant and positive. Thus, we can interpret it like this: the difference in the logs of expected counts is expected to be 0.55 unit higher for States who were Pro-Slavery, while holding the other variables constant in the model. The incidence rate ratio shows that individuals in a State who was Pro-Slavery, are expected to have a rate of 1.73 times greater to be killed by a police officer, while holding the other variable constant in the model.

III. COURTS

III.1. INTRODUCTION

In order to protect the peace and safety of its citizens, the government uses different punishments toward those who disrupt it. These punishments vary from simple fines to capital punishment. While the law says that an accused citizen is innocent until proven guilty, the fact of the matter is that criminal trials do not favor the defendant.

The justice system is biased towards poor people due to the fact that it is quite expensive to hire a good lawyer. Beside the lawyer, must be hired investigators and other experts in order to prove the innocence. Meaning that richer individuals are the ones who can afford better legal help.

In addition, the legal system is biased towards black citizens. Several studies conclude that African American defendants receive harsher sentences than white defendants (Albonetti, 1997), (Demuth & Steffensmeier, 2004), (Lizotte, 1978), (Mitchell, 2005). Concerning the age of the defendants in sentencing, according to (Chiricos & Bales, 1991), (Spohn, DeLone, & Spears, A tale of two counties: Unemployment and sentence severity, 1998), (Spohn & Holleran, 2000), (Steffensmeier, Ulmer, & Kramer, 1998) young African American offenders receive harsher sentences than young whites.

The only information concerning wrongful convictions is taken from exonerations. According to the National Registry of Exonerations, currently there are 2,783 exonerations since 1989. Comparing this number to the millions of individuals that are in prison, it does not seem an enormous problem. But it must be taken into account that not all crimes are the same, therefore innocence is harder to be proven for certain crimes. We have several factors that can impact a wrongful conviction, from a mistaken identity to police misconduct. Consequently, it is easier to prove innocence when DNA is found in a rape case, but how can we prove it for crimes like robbery. How can we be sure that individuals do not lie or mistake defendants identity?

Moreover, different punishments have different consequences. Being sentenced to 5 years in prison is not the same as being sentenced to death. According to (Gross, O'Brien, Hu, & Kennedy, 2013) among those sentenced to death, at least 4.1% are innocent. Since 1973, more than 170 people who had been wrongly convicted and sentenced to death in the U.S. have been exonerated. (Death Penalty Information Center, 2021)

Hence, in this part of this research an empirical analysis was conducted on the exonerations. The goal was to analyze the race, age, crime and sentence of the exonerees, and to see the difference between individuals belonging to different races and ages.

III.2. DATA AND DESCRIPTIVE STATISTICS

The raw data used are comprised of 2671 exonerations, from individuals that were exonerated from 1989 until 2019. The source for the data was the website the national Registry of exonerations, which is a project of the University of California, University of Michigan Law School & Michigan State University College of Law.

The dataset included information regarding the name of the individual, race, age when the exoneree was accused, county and state of where the individual was convicted, the crime and the sentence they were convicted of, and the year of conviction and exoneration. In addition, the dataset included information of the reason the individuals were exonerated (if it was a false confession, DNA proved their innocence, mistaken witness Identification, or if it was misconduct from the police, the prosecutor, or the forensic analyst etc.) In the study were not considered the cases of individuals that were exonerated after less than a year of their conviction.

The response variable in this analysis, is the years an individual spent in jail until he was exonerated of the crime. This variable was developed based on the year of conviction and exoneration in the database and is expressed as a number.

Regarding the predictors, was used the age when the exoneree was accused, the race, the crime, and the sentence they were convicted of.

The variable *Age* is a categorical variable, and takes the value (**1**) if the individual was between 21 and 30 (reference category), (**2**) if the individual was 20 and less, (**3**) if the individual was between 31 and 40, and finally the value (**4**) if the individual was older than 40.

The variable *Race* is a categorical variable and takes the values: (**1**) for people belonging to Black race (reference category), (**2**) for individuals belonging to White race and (**3**) for individuals that belong to another race than White or Black (Asian, Hispanic, Native American).

The variable *Sentence* is a categorical variable and takes the values: (**1**) if the individual was convicted of more than 9 years (from 9 years until life sentence)(reference category), (**2**) if the individual was sentenced to death, and (**3**) if the individual was convicted for less than 9 years. Finally, the variable *Crime* is a dummy variable, that takes the value (**1**) if the individual was convicted of murder (it includes murder, manslaughter, accessory to murder and attempted murder. It takes the value (**0**) if the individual was sentenced for a crime other than murder (reference category). The crimes other than murder includes crime such as child sex abuse, drug possession or sale, etc.

DESCRIPTIVE STATISTICS

First, we show the difference in age, conviction in years and the crime convicted for, based on the race of the exonerated individuals: **(1)** represents Whites, **(2)** represents Black and **(3)** represents other races.

In the table we can see that for White race, the age of conviction is dispersed, with the majority 34.5% during their 20s.
Concerning the sentencing time, the majority (64.4%) were sentenced for more than 9 years.
In the matter of the crime, 59% were accused of crimes other than murder.

Regarding Black individuals, the year of their conviction was the highest during their 20s, precisely from the age 21to 30, with 42%.
As for their sentencing, 68% of them were sentenced for more than 9 years.
Regarding the nature of the crime, there is not a great difference, but in favor of crimes other than murder.

With respect to other races, the results show that most of the individuals were convicted during their 20s (41.8%), for more than 9 years (62.3%) and for crimes other than murder (55.3%).

Additionally, we can see in the table that the highest number of wrongly convicted remains to the individuals belonging the Black race with n=1337.

	Race			
	1 n = 963	2 n = 1337	3 n = 371	P-Value
Age				<.001
21 to 30	332 (34.5%)	566 (42.3%)	155 (41.8%)	
less than 20 y/o	151 (15.7%)	416 (31.1%)	105 (28.3%)	
31 to 40 y/o	264 (27.4%)	239 (17.9%)	60 (16.2%)	
more than 40 y/o	216 (22.4%)	116 (8.7%)	51 (13.7%)	
Sentence				0.009
more than 9 years	620 (64.4%)	921 (68.9%)	231 (62.3%)	
Death	46 (4.8%)	72 (5.4%)	14 (3.8%)	
less than 9 years	297 (30.8%)	344 (25.7%)	126 (34%)	
Crime				0.009
other	574 (59.6%)	711 (53.2%)	205 (55.3%)	
Murder	389 (40.4%)	626 (46.8%)	166 (44.7%)	

In the graph below is represented the relationship between the age of the individuals when accused and the years until exoneration, based on the race of the individuals. The medians for the Blacks, for all ages, are higher than those of other races, which means there is a difference between the races. Additionally, the data seems to be skewed to the right for all age groups. Furthermore, most of the outliers are for the Whites.
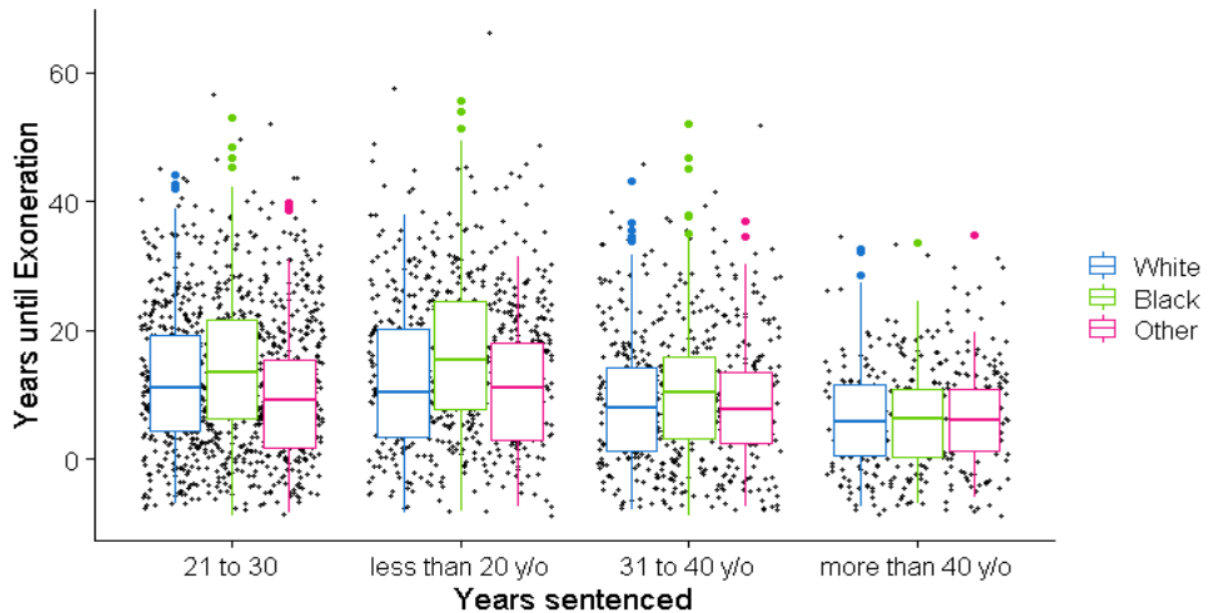
In the correlogram below we see that the variables are not strongly correlated. Variable Race is not correlated at all with the variable Crime. As for the highest correlation, we see it between Crime & Sentence and Years & Sentence, which indicates a negative weak correlation.
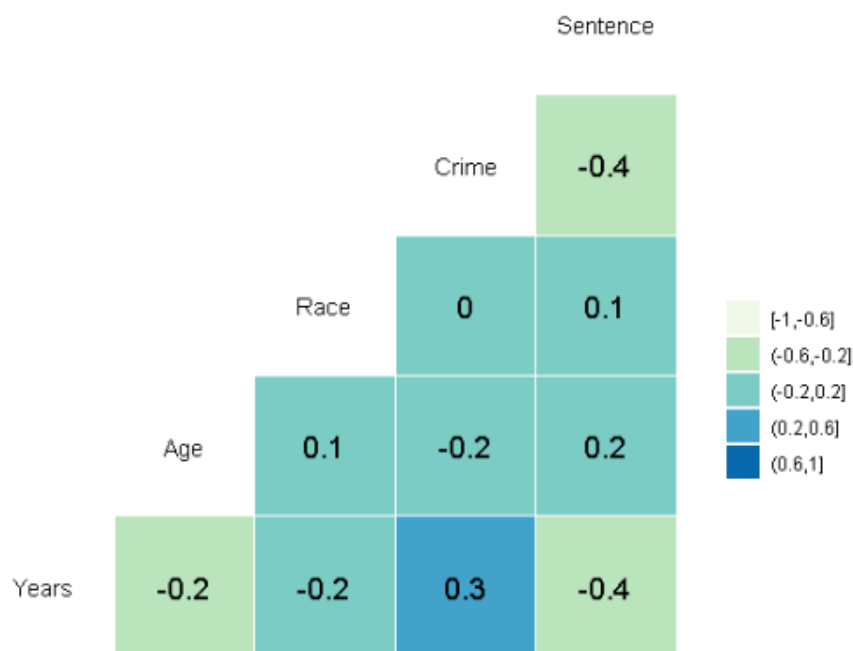
III.3. METHODOLOGY

In order to assess the relationship between the years an individual spent in jail until he was exonerated, and the characteristics of these said individuals, we analyzed crossed sectional data.

The specification of the theoretical model is as follows:

$$\text{Years} = \beta_0 + \beta_1\,\text{Race}_i + \beta_2\,\text{Age}_i + \beta_3\,\text{Sentence}_i + \beta_4\,\text{Crime}_i + \varepsilon_i$$

where *Race*$_i$ represents the race of the individuals : Black, White, and other races; *Age*$_i$ is the age of the individuals, precisely 4 different age groups (21 to 30, less than 21, 31 to 40, and more than 40), *Sentence*$_i$ signifies the sentence that the individuals were punished: to more than 9 years, death, and less than 9 years. Finally, the variable *Crime*$_i$ represents the nature of the crime that individuals were convicted (either for murder or a crime other than murder).

III.3.1 SELECTION OF THE MODEL

In order to analyze the data, survival analysis was used. This allowed for a modelling of the relationship between risk factors and the individuals time of exoneration.

In the graph below is represented the plot for Kaplan Meier Analysis, where instead of the probability of survival years, is considered the probability of years until exoneration. We can see that the curves for the Whites and other races appear to overlap. Whereas the curve for Black individuals is higher, meaning that the individuals belonging to Black ethnicity have a higher rate of being exonerated later, thus, staying in the jail longer.
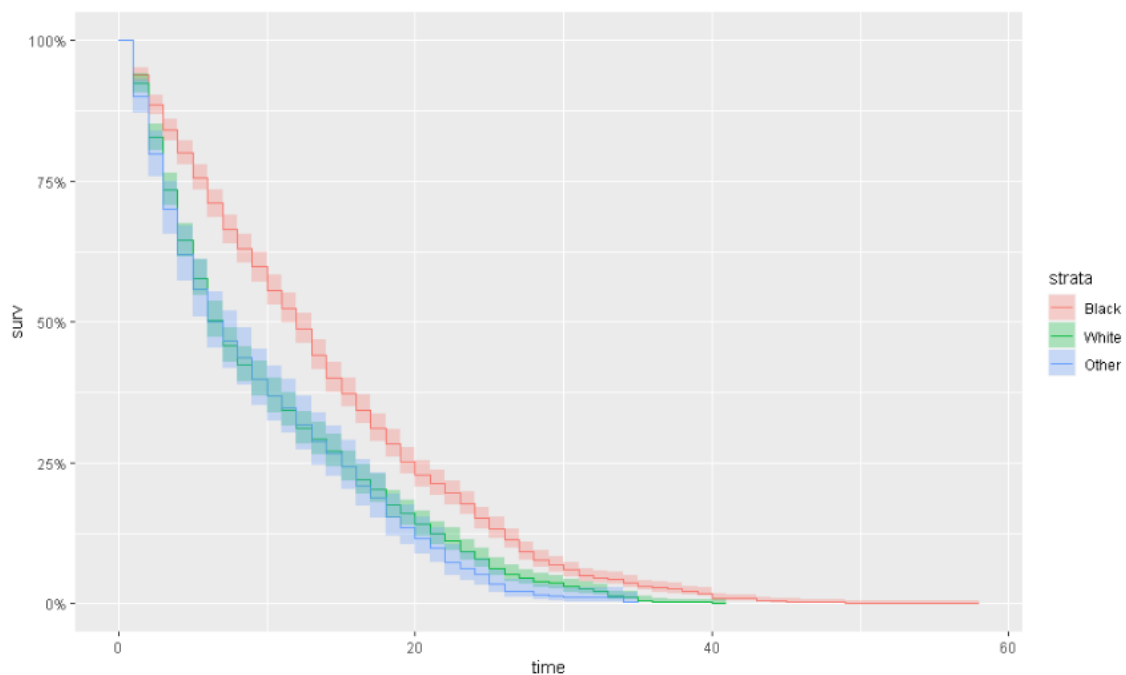
Following, we will fit a multivariate Cox Proportional Hazards Model, with the intention of quantifying the effect that different variables have. The Cox regression model seems to be appropriate since beside analyzing the survival probability, it takes into account the effect of several risk factors on survival time.

Therefore, the final estimation equation will look like this:

$$h(t|X_i) = h_0(t) \exp(\beta_1 \text{Race}_{i1} + \beta_2 \text{Age}_{i2} + \beta_3 \text{Sentence}_{i3} + \beta_4 \text{Crime}_{i4})$$

The resulting estimation is the one representing the econometric analysis of the model:

```
Call:
coxph(formula = Surv(time, event) ~ Race. + Age. + Sentence. +
    Crime.)

  n= 2671, number of events= 2671

                              coef exp(coef) se(coef)       z Pr(>|z|)
Race.White                 0.27023   1.31027  0.04423   6.109 1.00e-09 ***
Race.Other                 0.49075   1.63354  0.05951   8.247  < 2e-16 ***
Age.less than 20 y/o      -0.16067   0.85157  0.05025  -3.198 0.001385 **
Age.31 to 40 y/o           0.23361   1.26316  0.05295   4.412 1.02e-05 ***
Age.more than 40 y/o       0.53568   1.70861  0.06324   8.471  < 2e-16 ***
Sentence.Death            -0.14798   0.86245  0.09299  -1.591 0.111530
Sentence.less than 9 years 0.98578   2.67989  0.05299  18.604  < 2e-16 ***
Crime.Murder              -0.17936   0.83580  0.04774  -3.757 0.000172 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

                           exp(coef) exp(-coef) lower .95 upper .95
Race.White                    1.3103     0.7632    1.2015    1.4289
Race.Other                    1.6335     0.6122    1.4537    1.8356
Age.less than 20 y/o          0.8516     1.1743    0.7717    0.9397
Age.31 to 40 y/o              1.2632     0.7917    1.1386    1.4013
Age.more than 40 y/o          1.7086     0.5853    1.5094    1.9341
Sentence.Death                0.8624     1.1595    0.7187    1.0349
Sentence.less than 9 years    2.6799     0.3731    2.4155    2.9732
Crime.Murder                  0.8358     1.1965    0.7611    0.9178

Concordance= 0.688  (se = 0.005 )
Likelihood ratio test= 819.8  on 8 df,   p=<2e-16
Wald test            = 913  on 8 df,   p=<2e-16
Score (logrank) test = 999.6  on 8 df,   p=<2e-16
```

The concordance signifies the likelihood of correctly choosing the observation with higher risk of an event happening. Since the concordance in our model is higher than 0. 5 (0.688), it means that the model is a good one.

The likelihood ratio test, Wald test and Score (logrank) test show the global statistical significance of the model. The P-values (0.0000000000000002) for the three tests indicate that the model is significant, and the hypothesis that all the betas are zero is rejected.

III.4. PRESENTATION OF RESULTS

Before we begin with the interpretation of the results, it must be clarified the approach that is used in order to interpret the output of the regression. Since this is a survival analysis, it analyses the risk of the covariates in the survival of a person. In our model, we took into account the years an individual spent in prison until they were exonerated. Therefore, we must be prudent with the results, as the interpretation will present the opposite of the result. So, instead of reading a result as a high survival rate, it must be read as a high possibility of staying in prison longer (for example: lower HR means higher survival, therefore longer time spent in prison until exoneration).

a. Race

The variable Race represents the race of the individuals. Since it is a categorical variable, the output of the regression shows the values for two races, with black race being the reference category.

Output for Race.White (individuals belonging to the white race) shows that the P-value is (1.00e-09) meaning that the coefficient is highly significant. The coefficient for the hazard ratio (1.31) indicates that Whites are associated with a higher hazard, therefore, 31% higher possibility of being exonerated earlier, compared to Blacks. Additionally, the value for the hazard ratio is close to the confidence intervals (1.20 – 1.42), showing that the estimate is reliable.

Results for the variable Race.Other (individuals belonging to a race other than white or black) indicates that it is significant (<2e-16). The HR (exp(coef)=1.24) shows that individuals belonging to a race other than White/Black have a hazard ratio 1.63 relative to Blacks, therefore their hazard is 63% higher of being exonerated earlier than Blacks. In addition, the value for the hazard ratio is close to the confidence intervals (1.45 – 1.83), showing that the estimate is reliable.

b. Age

Designating the age of the individuals in the time they were accused, this covariate takes the values 0, 1, 2, 3 and 4, with the age between 21 to 30 being the reference category.

Regarding the covariate Age less than 20 years old, the P-value indicates that it is significant (0.001). Being less than 20 years old is associated with a lower hazard compared to those of age between 21-30, meaning longer wait until exoneration. Furthermore, the value for the

hazard ratio is close to the confidence intervals (0.77 – 0.93), implying that the estimate is reliable.

As for the variable Age 31 to 40 years old, the P-value shows that it is significant. Being between 31 to 40 years old is associated to a higher hazard ratio, compared to the reference group, meaning higher possibility of getting exonerated earlier. Also, the value for the hazard ratio is close to the confidence intervals (1.13 – 1.40), indicating that the estimate is reliable.

Concerning the covariate Age more than 40 years old, the P-value reveals that the coefficient is significant. Individuals older than 40 years old have a hazard ratio 1.70 relative to those between the age 21-30, meaning a higher possibility of getting exonerated earlier. In addition, the value for the hazard ratio is close to the confidence intervals (1.50 – 1.93), showing that the estimate is reliable.

c. Sentence

Representing the sentenced that the accused were convicted, as a categorical variable takes the values 0, 1 and 2, with the reference group being Sentenced with more than 9 years.

The covariate death sentence is not significant, shown by the P-value = 0.11. The hazard ratio is 0.86, meaning that individuals being sentenced to death have a higher chance of getting exonerated later compared to the reference category. Furthermore, the value for the hazard ratio is close to the confidence intervals (0.71 – 1.03), indicating that the estimate is reliable.

Regarding the Sentence less than 9 years, according to the P-value (<2e-16), it is highly significant at the 1% level. The hazard ratio shows a higher risk for this covariate compared to the reference group, thus, getting exonerated faster. Also, the value for the hazard ratio is close to the confidence intervals (2.41 – 2.97), indicating that the estimate is reliable.

d. Crime

This variable stands for the nature of crime that the individuals were accused of. It is coded as a dummy variable, taking 0 for crimes other than murder (reference category), and 1 for crimes related to murder.

According to the results, the P-value is highly significant (0.0001). Individuals sentenced for a crime related to murder have 27% lower hazard ratio compared to those sentenced for a crime other than murder, meaning longer stay in prison until exoneration. Their hazard is 27% lower than Moreover, the value for the hazard ratio is close to the confidence intervals (0.76 – 0.91), showing that the estimate is reliable.

IV.   CORRECTION SYSTEM

IV.1.   INTRODUCTION

For early sociologist Emile Durkheim, the birth of the prison and the replacement of capital punishments with the deprivation of liberty reflected new values of individualism generated by the transition from primitive, homogenous, highly religious societies toward increasingly diverse, democratic, and industrialized societies. Whereas for Georg Rusche and Otto Kirchheimer, the prison represented a new method of extracting the labor power of criminals, more appropriate to the needs of industrialization and nascent capitalism. (Rubin, 2019)

Literature says that the problem of the institution of prisons lies in the fact that it has been created in that way that it does not provide a safe environment neither for the incarcerated, but neither for those who guard them. In addition, a large number of prisoners are there because they did not have access to mental health help, and unfortunately this help has not been given to them in prisons either. In fact, the most dangerous inmates are often sent to high security prisons or sent to confinement. And consequently, this only makes their situation worse. According to a study by (Mosteller) mental health support in prisons was found to reduce misconduct incidents by 22 percent.

Nevertheless, the number of incarcerated individuals has decreased these last few years, so far, the budget that prisons receive has not diminished. Yet, this budget does not seem to be used towards the education, adequate treatment, nor the overall improvement with a regard to their rehabilitation. According to (Tenneriello, 2020) the U.S spends over $70,000 per year on each state prisoner, but the current system generates trauma and recidivism. Consider how much education, job training and medical and mental health care that money could buy.

Due to having the highest number of imprisonments in the world, one would think that the crime rate in the U.S. would also be the highest in the world. Which, according to (Hartney, 2006), it is not true. For some crimes, the US has higher crime rates than other countries, but not at levels that explain the high rates—and costs—of its current use of incarceration. Comparing the incarceration rates with other nations we can see the enormous difference. The US incarcerates at a rate 4 to 7 times higher than other western nations such as the United Kingdom, France, Italy, and Germany and up to 32 times higher than nations with the lowest rates such as Nepal, Nigeria, and India (Hartney, 2006).

Perhaps the greatest level of racial disparity within the criminal justice system is embodied by the disproportionate representation of African Americans residing in this country's prisons and jails. For every 100,000 African Americans, 4,347 are under correctional control as compared to 678 per 100,000 whites (Glaze, 2011). An additional way of considering racial and ethnic differences in the U.S. incarceration level is by looking at the imprisonment rate, which calculates the number of prisoners per 100,000 people. As a matter of fact, the imprisonment rates for the black ethnicity, the difference with white people just in 2016 was 5.1 to 1[13]. Even though the difference has decreased, since in 2000 it was 8.3 to 1, the discrepancy is still present among jail, probation, and parole populations.

Regarding the gender of the prisoners, the prison system is overwhelmed by males, with around 90%. Even though the number of female prisoners has been increasing these last decades, the gap is nonetheless quite large between female and male in the prison population.

The imprisonment rate is the highest in the world for females as well. The US has 183,400 women in prison—at least 3 times more than any other nation (Hartney, 2006). Additionally, the rate of black women prisoners is still higher than that of white women.

Another factor towards incarceration of Black individuals is also due to the fact that they cannot afford bail or a good lawyer. This situation has a double effect, because when prisoners get out of the prison, they have difficulties finding a job. Therefore, effecting their inability to provide for themselves and increasing the possibility of recidivism.

Contemporary analysis concerning racial disparity in sentencing outcomes has progressed to examine race as an independent variable while examining the interaction between race and additional variables as opposed to investigating racial disparity as a group outcome (Kansal, 2005). Such research does not assume that racial bias universally impacts minority defendants but concerns itself with the circumstances in which racial bias is most prevalent (Kansal, 2005). Therefore, in this chapter was analyzed the percentage of inmates pertaining to Black or African American race as the response variable. The goal was to see the impact of the gender and total number of inmates in the response variable, as well as the impact of the fact if the State is Democrat or Republican led and if it was Pro-Slavery during the Civil war. Additionally, were incorporated two control variables: Poverty and Crime.

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[13] According to the Council on Criminal Justice., Trends in Correctional Control by Race and Sex, 2019.

IV.2. DATA AND DESCRIPTIVE STATISTICS

DATA

The data for the dependent variable were taken from a rapport by U.S. Department of Justice called Prisoners in 2019, published in October 2020. This rapport comprises the difference in the number of prisoners and their characteristics like gender, race, age etc.

Concerning the unit of measure for the endogenous variable, was used the percentage of prisoners belonging to Black/African American race, in 50 states of the United States, for the year 2019.

Additionally, the gender and the total number of the inmates were taken from the same rapport. The unit of measure for the variable male is the percentage of the male prisoners, whereas, for the variable inmate is the total number of inmates for each state. It must be mentioned that this variable is transformed in the logarithmic form.

Data for the variable Republican or Democrat are from the Ballotpedia, the digital encyclopedia of American politics and elections. Since the variable "Republican or Democrat" is a dummy variable, it will take the value 0, when the state Governor is a Democrat, and it will take the value 1 if the state has a Republican Governor. The year of reference is 2019.

Information regarding the variable if a State was Pro-Slavery or Against-Slavery was collected through information on the website LearnCivilWarHistory.com. This is a dummy variable, where if the State was Pro-Slavery, it will take the value 1. If the State was not Pro-Slavery, or it did not exist at the time, it will take the value 0. In the list of States who were Pro-Slavery are States belonging to the Confederate and Border States (States who were part of the Union & Pro-Slavery). Concerning States categorized as not Pro-Slavery, some States did not exist at the time, or were not American territory.

In order to consider possible explanations other than race for the outcome, two control variables were incorporated, Poverty rate and Crime rate.

The variable Poverty represents the percentage of people experiencing poverty for each state, for the year 2019. It was extracted from the KFF (Kaiser Family Foundation) website, and it was based on the data taken from the U.S. Census Bureau.

Finally, the data regarding the variable Crime was taken from the website Statista. It represents the reported violent crime rate in the U.S, per 100 000 of the population, for the year 2019.

DESCRIPTIVE STATISTICS

In the table below are shown some descriptive statistics displaying information regarding the data of the model. We can see the spread of the data via the standard deviation. According to which, there is a larger variation for the variable inmate , crime, and poverty.

From the output, we can assume that the average percentage of black inmates is 31.8%, the average percentage of male convicts is 91.5% . In addition, the median shows that there are more Republican-led states then with a Democrat Governor.

The minimum and the maximum show that the data of the total number of inmates are spread out, as well as the data for the variables crime and poverty.

| Statistic	Mean	St. Dev.	Min	Median	Max
minority	0.318	0.202	0.020	0.300	0.710
male	0.915	0.028	0.850	0.920	0.960
Slavery	0.300	0.463	0	0	1
REP	0.520	0.505	0	1	1
inmate	25,113.780	29,971.940	1,608	18,601.5	158,429
crime	365.482	151.501	115.200	349.650	867.100
poverty	12.158	2.638	7.500	11.500	19.600

Next, on the descriptive statistics, I represented the relationship between the response and predict variables.

The first graph illustrates the relationship between the percentage of male prisoners and the response variable – the percentage of prisoners belonging to Black/African American race.

The relationship seems to be non-linear, due to the curve in the middle of the graph (I will check the linearity in the next section). Additionally, the relationship seems to be positive, even though the data are scattered, thus the relationship seems to be weak. There does not appear to be any outliers.
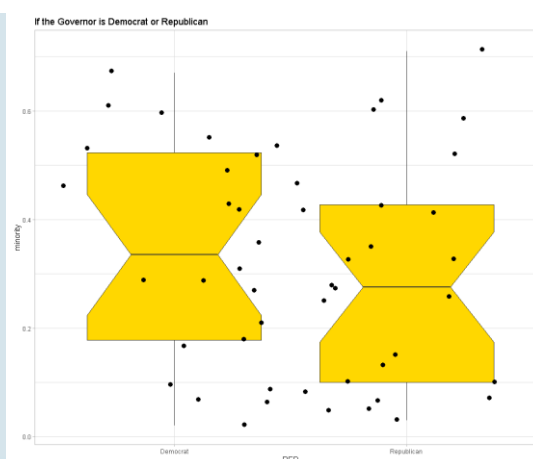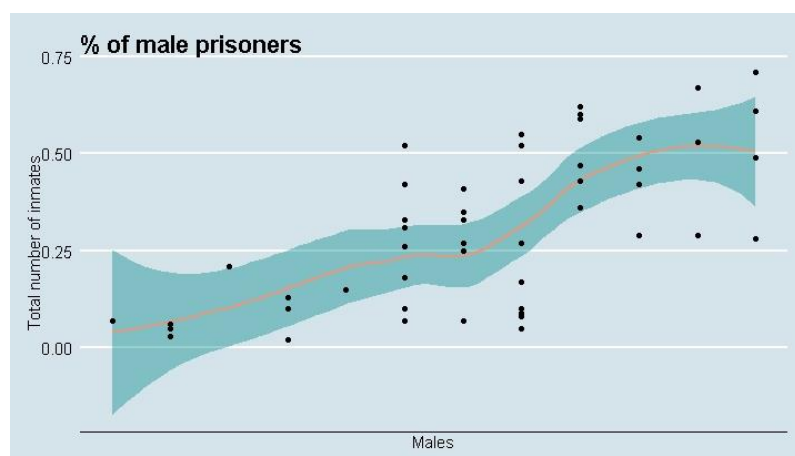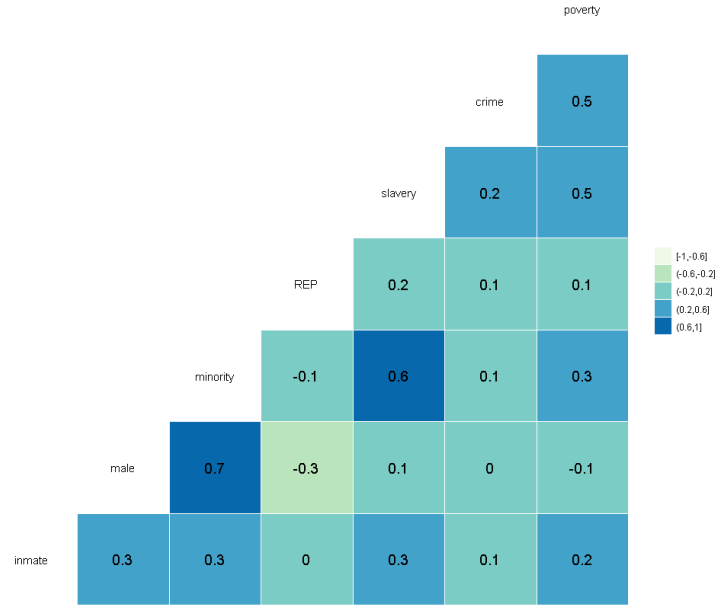
In the second graph, is showed the relationship between the fact if the State is led by a Democrat or a Republican and the percentage of prisoners belonging to Black/African American race. According to the boxplots, the observations are quite scattered. The median of the boxplot representing the Democrat – led states seems to be higher than that of the Republican – led states, and the boxplot for the Republican states seems to be skewed to the right.
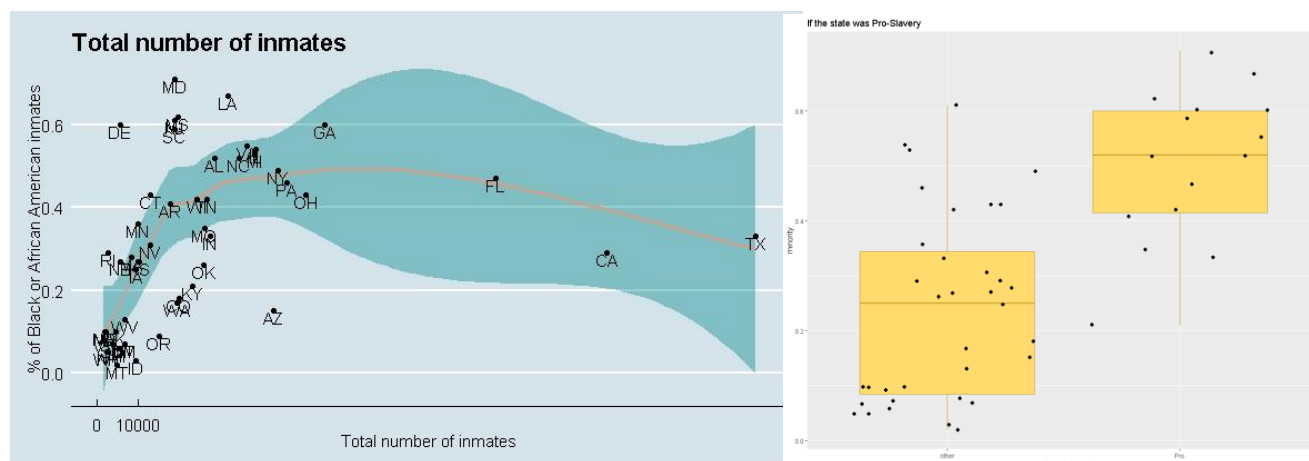
The third graph demonstrates the relationship between the percentage of prisoners belonging to Black/African American race and the total number of incarcerated individuals, for each U.S state. First of all, we see that the relationship is not linear, due to the bell-shaped curve. In addition, the observations seem to be clustered , with some extreme values (Florida, California and Texas).

The last graph is that of the relationship between the fact if the state was Pro-Slavery during the Civil War and the percentage of prisoners belonging to Black/African American ethnicity. In the first glance we can see that the boxplot representing the Pro-slavery states is higher, suggesting a difference between the groups. The data seems more scattered for the group 'other' in comparison with the group 'Pro'.

Following, in the graph below, the correlation matrix, shows that there is no correlation between the variables Crime & Male and REP & Inmates, which means that these variables are independent. Besides Poverty & Male, REP & Minority and REP & Male, which are negatively correlated (though the correlation is weak), the other variables in the matrix are positively correlated. Regarding the strength of the relationship, we can see that the highest correlation is between Minority & Male (with a correlation of 0.7), and Slavery & Minority(with a correlation of 0.6).

	poverty	crime	slavery	REP	minority	male
crime	0.5					
slavery	0.5	0.2				
REP	0.1	0.1	0.2			
minority	0.3	0.1	0.6	-0.1		
male	-0.1	0	0.1	-0.3	0.7	
inmate	0.2	0.1	0.3	0	0.3	0.3

Legend:
[-1,-0.6]
(-0.6,-0.2]
(-0.2,0.2]
(0.2,0.6]
(0.6,1]

IV.3. METHODOLOGY

With the purpose of explaining the relationship between the percentage of individuals belonging to the black or African American ethnicity in the prison system, and demographic, economic and political predictors, cross-sectional data was used to assess which of these factors had an impact, and if this impact was important.

The specification of the theoretical model is as follows:

$$\text{Minority} = \beta_0 + \beta_1\,\text{male}_i + \beta_2\,\text{inmate}_i + \beta_3\,\text{REP}_i + \beta_4\,\text{slavery}_i + \beta_5\,\text{poverty}_i + \beta_6\,\text{crime}_i + \varepsilon_i$$

Where *Minority* is the percentage of black or African American inmates, per state, *male$_i$* stands for the percentage of male inmates, *inmate$_i$* represents the total number of incarcerated individuals, *REP$_i$* is a dummy variable (1 if the Governor is Republican and 0 if the Governor is Democrat), *slavery$_i$* is a dummy variable and represents if the states were Pro Slavery during the Civil War (1 if yes and 0 if not). In addition, two control variables were incorporated in the model: *poverty$_i$* which represents the percentage of people experiencing poverty for each state and *crime$_i$* which represents the reported violent crime rate.

IV.3.1 SELECTION OF THE MODEL

Regarding the linearity of the data, since the variables REP and Slavery are dummy variables, they meet the assumption of linearity by definition. As for the variable inmate, whose graph

shows a non-linear relationship, the residual plots **(Appendix 7)**, reveal that the relationship is not linear, in fact showing a pattern, meaning that the residuals are not random but with a decreasing trend. This is also validated by Shapiro test **(Appendix 8)**.

The same situation is not with the variable male **(Appendix 9),** which, according to the residual plots is linear, where the residuals seem to be around the horizontal like, with a couple of outliners. In addition, the QQ plot appears to be skewed to the right. The linearity of this variable is validated by Shapiro test **(Appendix 10)**.

Since the above-mentioned variable seems to be non-linear, logarithmic transformation was applied for the predictive variable *Inmate*.

In addition, the control variables Crime and Poverty were included in the form of an interaction effect **(Appendix 11)**, since separately they did not have an effect. Unfortunately, the output was not significant, therefore, they were not included them in the final regression.

Hence, the equation corresponding to the final estimation is as follows:

$$\text{Minority} = \beta_0 + \beta_1 \, \text{male}_i + \beta_2 \, \log(\text{inmate}_i) + \beta_3 \, \text{REP}_i + \beta_4 \, \text{slavery}_i + \varepsilon_i$$

The following estimation is the one representing the econometric analysis of the model.

```
Call:
lm(formula = minority ~ male + log(inmate) + REP + slavery, data = prison)

Residuals:
     Min       1Q   Median       3Q      Max
-0.19863 -0.09673  0.03376  0.07184  0.15841

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -3.62378    0.50868  -7.124 6.68e-09 ***
male         3.87842    0.58235   6.660 3.26e-08 ***
log(inmate)  0.03581    0.01553   2.306   0.0258 *
REP         -0.01898    0.03072  -0.618   0.5399
slavery      0.20466    0.03549   5.767 6.92e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1009 on 45 degrees of freedom
Multiple R-squared: 0.7704,    Adjusted R-squared:  0.75
F-statistic: 37.76 on 4 and 45 DF,  p-value: 7.646e-14
```

Regarding the goodness of fit of the model, the coefficient of determination shows that 77% of the variance of the dependent variable is explained by the independent variables. Additionally, this is validated by the adjusted R-squared (75% of the variability in the outcome).

IV.4.   PRESENTATION OF RESULTS

a.   Male

I assumed that the percentage of male prisoners is going to impact positively the response variable, since according to the U.S. Bureau of Justice Statistics, in 2018, Black males accounted for 34% of the total male prison population, white males 29%, and Hispanic males 24%. This assumption is justified by the results, who show that the percentage of males in the prison system increases the percentage of black prisoners. Furthermore, the result is positive and significant at the 1% level. Which means, holding all other variables constant, an increase of 1% in the percentage of male inmates, will increase the percentage of Black inmates by 3%.

b.   log(Inmate)

According to the above-mentioned literature, the rate of black prisoners is higher than that of other races. This is supported by the regression output. The variable inmate, which is expressed in a logarithmic form and represents the total number of prisoners, is significant at the 10% level and positive. We can interpret it like this: holding all other variables constant, an increase of 1 % on the number of total prisoners, will increase the percentage of the Black inmates by 0.03%.

c.   REP

The hypothesis for this variable was that it was going to impact the response variable positively, due to the fact that Republican ideology prefers to be tougher on crime. But the results show the opposite. Indeed, the output for this variable, shows that it is not significant. Since the result is negative, it means that the percentage of Black inmates is higher in the states run by a Democrat. According to the coefficient, the difference is 0.018%, in favor for Democrat – led states. A reason for this result has been given by (Gunderson, 2021), who says that Democrat governors have more incentive to carry out policies that are more punishing towards criminals. In addition, he shows that Democrat governors who barely win their election, spend, and incarcerate more than Republican governors.

d.   Slavery

As for the variable if the State was Pro-Slavery during the Civil War, the results show that it is significant and positive. The P-value indicates that it is significant at the 1% level. Since it is a dummy variable, it means that in the States that were Pro-Slavery, the percentage of the Black prisoners is higher, in comparison to the group of reference. In fact, according to the value of the regression, the percentage of Black inmates in the states who used to be Pro-Slavery is around 0.2% higher than that of a state who was not Pro-Slavery during the Civil War.

V.   CONCLUSION

We have tried via this research to offer some insight into the three branches of Criminal Justice in the USA, and analyze a problem from each branch separately, in order to see if signs of racial bias emerged.

Based on the estimates illustrated on the regression concerning Police homicides, males and non-white individuals had a higher rate of getting killed by the Police. Additionally, there was a positive relationship between states who were Pro-Slavery and the number of individuals killed by the Police.

According to the Survival Analysis, the output showed that Black individuals had a higher rate of waiting longer until exoneration compared to White and other races. This was concluded by the Kaplan Meier curves as well as the regression via Cox Proportional Hazards Model. Individuals arrested between the ages 21-30, as well as younger than 21, had the highest rate of waiting longer until exoneration. Being sentenced for more than 9 years, as well as being accused of crimes related to murder meant longer waiting times until exoneration.

Regarding the prison population, a Critical Race Theory [14] approach was applied, where the response variable used was the percentage of Black prisoners. According to the output, the percentage of male prisoners had a positive impact on the response variable. Moreover, the output showed that states that were Pro-Slavery had a positive impact on the percentage of Black prisoners.

Despite the numerous rapports from governmental organizations that were encountered during my research, which explain that the gap in prison population has started to decrease, the question remains: Why this difference in the first place? Is it something that makes non-white individuals more violent and with a tendency for crime? Or do white people feel guilty, for all the suffering they have caused towards the Black population during Slavery. Has this guild been transformed to fear, and furthermore, is this fear the cause of all the homicides and incarcerating, which clearly are not in the favor of Black people? (Delgado & Stefancic, 2012) say that a suitable approach in studying the criminal justice system is to identify the primary

---

[14] Critical Race Theory (CRT) - examines racial discriminatory practices throughout society by acknowledging race as a primary observational tool. (Richard Delgado, Jean Stefancic, Critical Race Theory: An Introduction, 2012.

interest of white people. Whereas (Marable, 1983) insists that the criminal justice system is organized to maintain white dominance.

(D'Souza, 1995) proclaims an end to race and racism and acknowledges a new post-racial era in the United States. For a lot of Americans, the election of Barack Obama as President and of Kamala Harris as Vice-President is the best statement that there is no more racism present in the U.S., but unfortunately the data says otherwise. As (Parker, 2010) declares: many whites deny the structural existence of racism, but still maintain negative stereotypes of African Americans.

Limitations and future research

Overall, I am satisfied with this research and its result. However, I am aware that it has certain limitations. It is possible that important social, economic, or institutional variables were omitted. Generally, it is difficult to statistically prove the existence of discrimination, therefore difficult to know which variables to include and if included variables are properly measured. Additionally, using more complex econometric models would probably offer a more insightful result into the problems that were studied.

Nevertheless, the main limitation was that the subject is enormous, so to conduct a significant research needs time and work. I investigated a small part of each branch, which means that in order to understand the big picture on the state of the criminal justice system it needs a more profound, time-consuming research.

This research vas done in a more general approach, maybe a more productive research would be on studying each small problem separately. As an example of this would be the bias in sentencing if the victim was white in comparison if the victim belonged to another race.

According to (Wagner & Kopf, 2015) in 2010 there were 161 counties spread across 31 states where the incarcerated Black population outnumbers the number of free Blacks. Therefore, studying the situation in counties maybe would offer a more constructive outcome.

Furthermore, I focused on Black minority, but it would be interesting to do the same analysis, in the context of other races. An interesting analysis would be on the fact if there was a bias toward Asian people in the criminal justice system during and after the Covid situation.

LIST OF APPENDIXES

Appendix 1 – Data Sources

Chapter 2 – Police Homicides

Number of homicides, race, gender of the victim:
https://docs.google.com/spreadsheets/d/1dKmaV_JiWcG8XBoRgP8b4e9Eopkp
gt7FL7nyspvzAsE/edit
If the Governor was Republican or Democrat:
https://ballotpedia.org/List_of_governors_of_the_American_states
If the state was Pro-Slavery:
http://www.nellaware.com/blog/free-and-slave-states-map-state-territory-and-
city-populations.html

Chapter 3 – Exonerations

https://www.law.umich.edu/special/exoneration/Pages/detaillist.aspx?View={faf
6eddb-5a68-4f8f-8a52-2c61f5bf9ea7}&SortField=Sentence&SortDir=Desc

Chapter 4 – Black prisoners

Percentage of black prisoners, total number of inmates, gender:
https://www.bjs.gov/content/pub/pdf/p19.pdf
If the Governor was Republican or Democrat:
https://ballotpedia.org/List_of_governors_of_the_American_states
If the state was Pro-Slavery:
http://www.nellaware.com/blog/free-and-slave-states-map-state-territory-and-
city-populations.html
Crime:
https://www.statista.com/statistics/200445/reported-violent-crime-rate-in-the-us-
states/
Poverty:
https://www.kff.org/other/state-indicator/poverty-rate-by-
age/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%
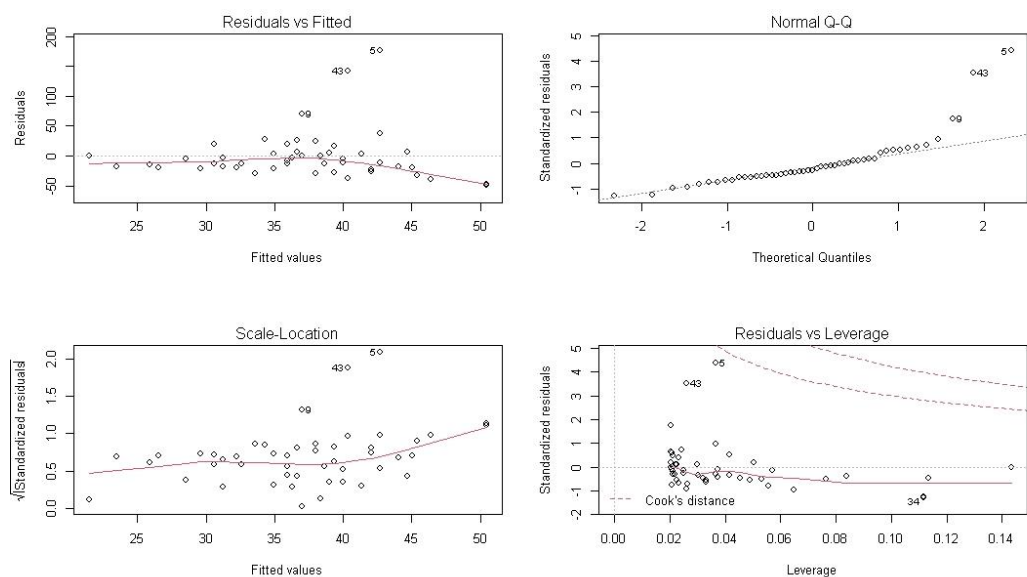22sort%22:%22asc%22%7D

Appendix 2 – Visual representation of how the Criminal justice system works

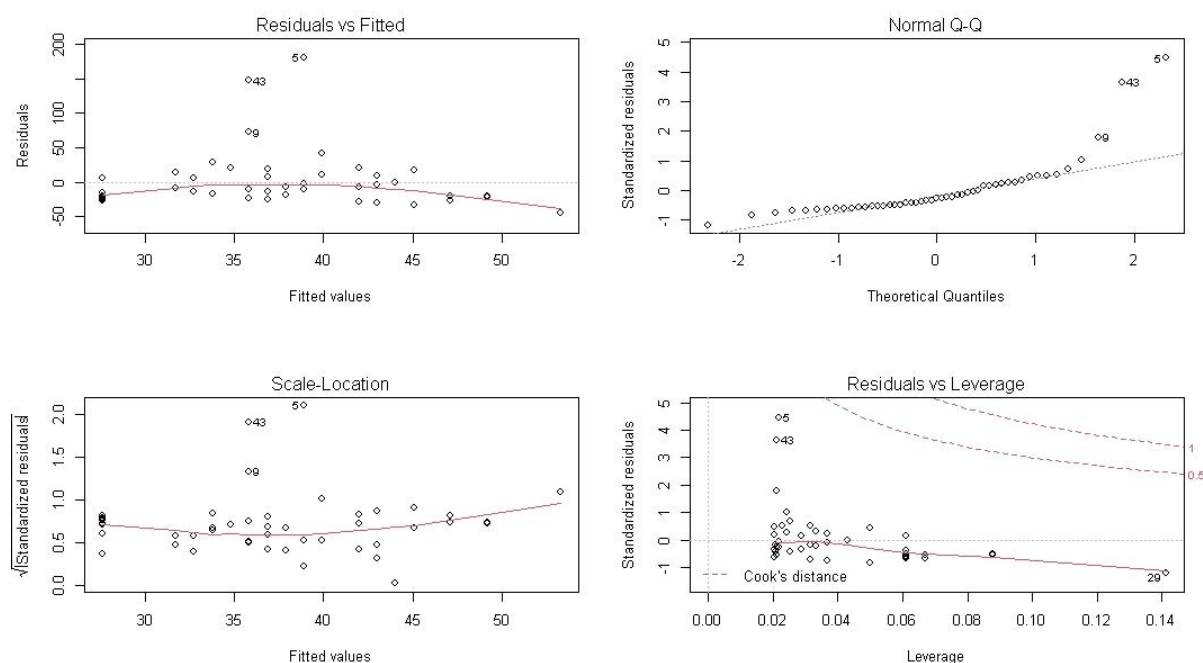**What is the sequence of events in the criminal justice system?**

Source: https://www.bjs.gov/content/justsys.cfm
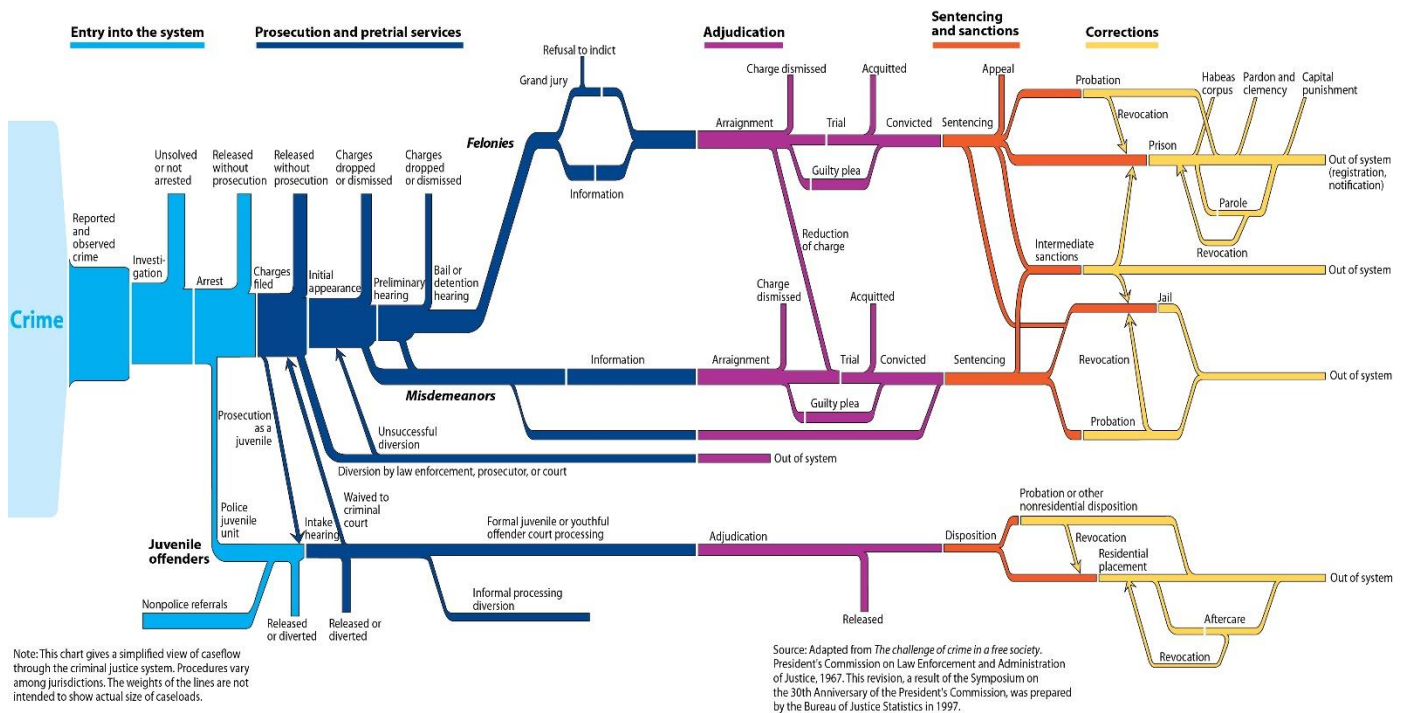
Appendix 3 – Residual plots for the variable Race

Appendix 4 – Residual plots for the variable Gender

Appendix 5 – Regression of the Poisson model

```
Deviance Residuals:
   Min     1Q   Median     3Q     Max
-9.296  -3.700  -1.986   1.505  20.446

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  6.00665    0.37699  15.933  < 2e-16 ***
Gender      -2.45546    0.39571  -6.205 5.47e-10 ***
Race        -0.95291    0.14349  -6.641 3.12e-11 ***
Slavery      0.45482    0.05122   8.880  < 2e-16 ***
REP          0.02567    0.05015   0.512    0.609
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 1534.3  on 48  degrees of freedom
Residual deviance: 1314.0  on 44  degrees of freedom
  (1 observation deleted due to missingness)
AIC: 1568.7

Number of Fisher Scoring iterations: 6
```
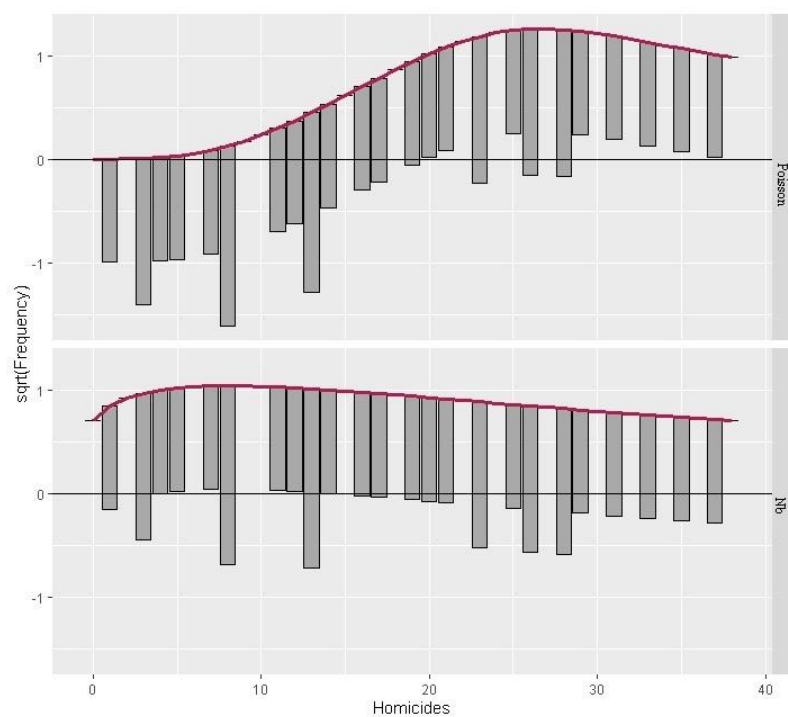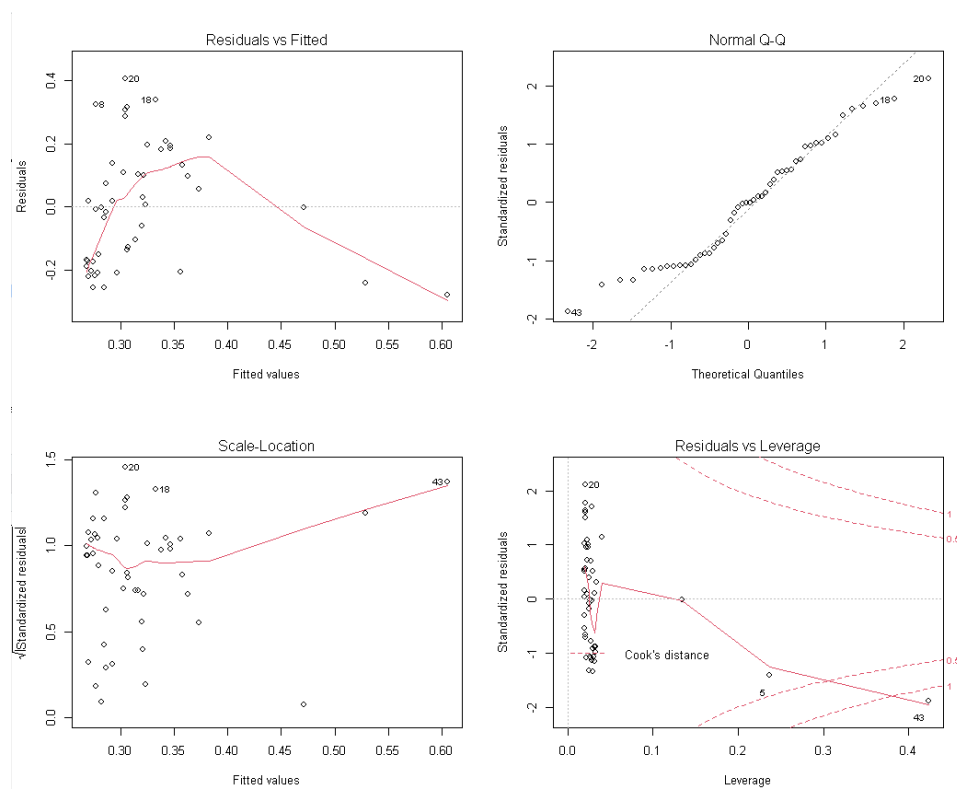
Appendix 6 – Rootogram of the Poisson and Negative binomial models

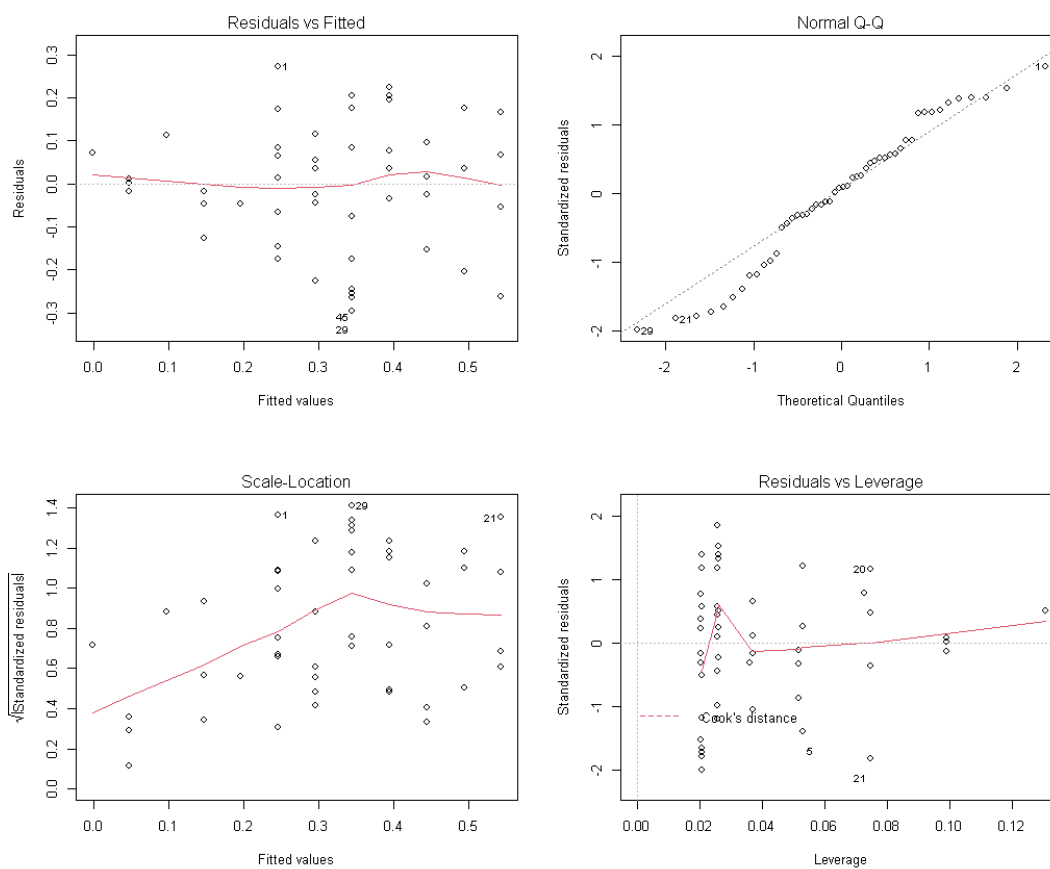## Appendix 7 – Residual plots for the variable Inmate

Appendix 8 – Shapiro test for the variable inmate

```
        Shapiro-Wilk normality test

data: residuals(mod1)
W = 0.93829, p-value = 0.01154
```

Appendix 9 – Residual plots for the variable Male

Appendix 10 – Shapiro test for the variable male

```
        Shapiro-Wilk normality test

data: residuals(mod2)
W = 0.9656, p-value = 0.1524
```

Appendix 11 – Regression with the interaction effects

```
Residuals:
     Min        1Q    Median       3Q       Max
-0.20702  -0.08851   0.02317   0.06911   0.17473

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)   -3.971e+00  5.793e-01  -6.855 2.34e-08 ***
male           4.077e+00  6.166e-01   6.612 5.23e-08 ***
log(inmate)    2.780e-02  1.705e-02   1.631    0.110
REP           -2.376e-02  3.155e-02  -0.753    0.456
slavery        1.941e-01  3.859e-02   5.029 9.69e-06 ***
poverty        2.133e-02  1.514e-02   1.409    0.166
crime          4.870e-04  4.366e-04   1.115    0.271
poverty:crime -4.087e-05  3.278e-05  -1.247    0.219
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1021 on 42 degrees of freedom
Multiple R-squared: 0.7809,    Adjusted R-squared: 0.7444
F-statistic: 21.38 on 7 and 42 DF,  p-value: 5.89e-12
```

Appendix 12 – Chapter 2, Code R

```r
                            #### CHAPTER 2 ####
#DESCRIPTIVE STATISTICS
stargazer(Police, omit.summary.stat = c("N", "p25", "p75"), median = TRUE, type = "text")
#GRAPHS
hom <- ggplot(Police) +
  aes(x = Gender, y = Homicides, label = State) + geom_smooth(fill="lightblue") + geom_point() +
  geom_text(aes(label=ifelse(Gender>20000 | Homicides>18000, as.character(State),'')),hjust=0.5,vjust=1) +

  theme_light() +
  ggtitle("Homicides by % of male victims") +
  xlab("Gender") +
  ylab("Police homicides") +
  scale_x_continuous(breaks = seq(0, 60000, 10000))
rac <- ggplot(Police) +
  aes(x = Race, y = Homicides, label = State) + geom_smooth(colour= "red", fill= "pink") + geom_point() +

  geom_text(aes(label=ifelse(Race>20000 | Homicides>18000, as.character(State),'')),hjust=0.5,vjust=1) +

  theme_light() +
  ggtitle(" % of white-ethnicity victims") +
  xlab("Race") +
  ylab("Police homicides") +
  scale_x_continuous(breaks = seq(0, 60000, 10000))
pol <- ggplot(Police) +
  geom_boxplot(aes(x = as.factor(REP), y = Homicides)) +
  geom_jitter(aes(x = as.factor(REP), y = Homicides), col = "red", alpha = 0.2) +
  ggtitle("If the Governor is Democrat or Republican") +
  xlab("Governor") +
  ylab("Police homicides") +
  scale_x_discrete(labels = c("Democrat", "Republican")) +
  scale_y_continuous(breaks = seq(0, 60000, 10000))
sla <- ggplot(Police) +
  geom_boxplot(aes(x = as.factor(Slavery), y = Homicides)) +
  geom_jitter(aes(x = as.factor(Slavery), y = Homicides), col = "blue", alpha = 0.2) +
  ggtitle("Pro-Slavery States") +
  xlab("Slavery") +
  ylab("Police homicides") +
  scale_x_discrete(labels = c("other", "Pro")) +
  scale_y_continuous(breaks = seq(0, 60000, 10000))
plot_grid(rac, hom, pol, sla)
#CORRELOGRAM
ggcorr(Police, nbreaks=8, palette='RdGy', label=TRUE, label_size=5, label_color='white')
#RESIDUAL PLOTS TO LOOK FOR LINEARITY FOR RACE AND GENDER
mod1 <- lm(formula = Homicides ~ Race, data = Police)
summary(mod1)
mod2 <- lm(formula = Homicides ~ Gender, data = Police)
summary(mod2)
par(mfrow=c(2,2))
plot(mod1)
par(mfrow=c(2,2))
plot(mod2)
#MEAN & VARIANCE
mean(Police$Homicides)
var(Police$Homicides)
#POISSON
Poisson <- glm(formula = Homicides ~ Gender + Race + Slavery + REP, data = Police, family = poisson)

summary(Poisson)
#LIKELIHOOD RATIO TEST
pchisq(2 * (logLik(Negative_binomial) - logLik(Poisson)), df = 1, lower.tail = FALSE)
#ROOTOGRAM
root11 <- rootogram(Poisson, style = "hanging", plot = FALSE)
root22 <- rootogram(Negative_binomial, style = "hanging", plot = FALSE)
autoplot(c(root11, root22))
#NEGATIVE BINOMIAL
Negative_binomial <- glm.nb(Homicides ~ Gender + Race + Slavery + REP, data = Police)
summary(Negative_binomial)
summ(Negative_binomial, exp = T)
```

Appendix 13 – Chapter 3, Code R

```
● ● ●
                              #### CHAPTER 3 ####
#DESCRIPTIVE STATISTICS
mydata %>%
  group_by(Race) %>%
  table1(Age.,Sentence.,Crime.)
#DEFINE THE VARIABLES
Crime. <- factor(Crime, labels = c("other", "Murder"))
Race. <- factor(Race, labels=c("Black", "White", "Other"))
Age. <- factor(Age, labels=c("21 to 30", "less than 20 y/o", "31 to 40 y/o", "more than 40 y/o"))
Sentence. <- factor(Sentence, labels=c("more than 9 years", "Death", "less than 9 years"))
time <- Years
group <- Race.
#GRAPH
ggplot(mydata, aes(x = Age., y = jitter(Years, 50))) + geom_jitter(alpha = .8, color = "black", size=0.7) +

  scale_color_manual(name = "Black", "White", "Other", values = c("dodgerblue3", "chartreuse3", "deeppink2",
"violet")) +
  geom_boxplot(aes(color = Race.)) + labs(y = "Years until Exoneration", x = "Years sentenced") +
  scale_color_manual(name = "", values = c("dodgerblue3", "chartreuse3", "deeppink2", "violet")) +
theme_cowplot()
#CORRELOGRAM
ggcorr(mydata[, 2:7], nbreaks=5, palette='GnBu', label=TRUE, label_size=5, label_color='black')
#KAPLAN-MEIER
Kaplan-Meier <- survfit(Surv(time, event) ~ Race., data=mydata)
autoplot(Kaplan-Meier)
#COX REGRESSION
coxph1 <- coxph(Surv(time,event) ~ Race. + Age. + Sentence. + Crime.)
```

Appendix 14 – Chapter 4, Code R

```
● ● ●
                              #### CHAPTER 4 ####
#DESCRIPTIVE STATISTICS
stargazer(prison, omit.summary.stat = c("N", "p25", "p75"), median = TRUE, type = "text")
#GRAPHS
man1 <- ggplot(prison) +
  aes(x = male, y = minority, label = state) + geom_smooth(colour= "darksalmon", fill= "darkcyan") +
geom_point() +
  geom_text(aes(label=ifelse(male>200 | minority>18000, as.character(state),'')),hjust=0.5,vjust=1) +
theme_economist() +
  ggtitle("% of male prisoners") +
  xlab("Males") +
  ylab("Total number of inmates") +
  scale_x_continuous(breaks = seq(0, 50000, 10000))
plot_grid(man1)
inm <- ggplot(prison) +
  aes(x = inmate, y = minority, label = state) + geom_smooth(colour= "darksalmon", fill= "darkcyan") +
geom_point() +
  geom_text(aes(label=ifelse(inmate>200 | minority>18000, as.character(state),'')),hjust=0.5,vjust=1) +

  theme_economist() +
  ggtitle("Total number of inmates") +
  xlab("Total number of inmates") +
  ylab("% of Black or African American inmates") +
  scale_x_continuous(breaks = seq(0, 10000, 10000))
plot_grid(inm)
z <- ggplot(prison, aes(x = as.factor(slavery), y = minority))
z + geom_boxplot(fill = "#FFDB6D", color = "#C4961A") +
  geom_jitter(aes(x = as.factor(slavery), y = minority), size=2) +
  ggtitle("If the state was Pro-Slavery")+
  scale_x_discrete(labels = c("other", "Pro"))
#CORRELATION
ggcorr(prison[, 2:8], nbreaks=5, palette='GnBu', label=TRUE, label_size=5, label_color='black')
#CHECKING RESIDUALS
res1 <- lm(minority~inmate, data=prison)
summary(res1)
res2 <- lm(minority~male, data=prison)
summary(res2)
par(mfrow=c(2,2))
plot(res1)
par(mfrow=c(2,2))
plot(res2)
shapiro.test (residuals(res1))
shapiro.test (residuals(res2))
#REGRESSIONS
modelreg1 <- lm(minority ~ male + log(inmate) + REP + slavery + poverty*crime, data = prison)
modelreg2 <- lm(minority ~ male + log(inmate) + REP + slavery, data = prison)
```

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