DISTRICT OF COLUMBIA SENTENCING
Project Final Report

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Introduction

The District of Columbia has historically held one of America's most racially disparate criminal justice systems. With a highly disproportionate amount of young, black men making up D.C. 's incarcerated population, questions have been raised as to how justice impacts various demographics, particularly among people of different races and ages. In 2018, reforms were made to the Youth Rehabilitation Act and Incarceration Reduction Amendment Act with the hope that young adults can live a better life after prison while reducing recidivism.

Under the mentorship of Sandra Allain and Patrice Sulton, our team has analyzed how recent reforms to the Youth Rehabilitation Act have and will impact various age groups with regards to sentence lengths and amounts. We will also determine whether or not the types of crimes being committed by young D.C. residents have changed with reform. It is our hope that providing easily consumable analysis and data visualizations promote transparency in D.C.'s criminal justice system. This transparency will ensure that policymakers and advocacy groups find solutions that allow people to thrive.

Approach

Throughout the course of the semester, we have had several discussions with our sponsorship team and have conducted the research required to both understand the problem as well as generate an appropriate scope that can be covered given our data and time constraints. These discussions and investigations allowed us to iteratively define the scope of our problem: determining whether or not YRA reforms made significant changes to the ways that criminal justice is carried out in D.C. The Youth Rehabilitation Act allows judges to afford sentencing reductions and provides platforms of support to youth offenders with an aim of reducing

recidivism. Youth offenders are eligible for YRA considerations as long as they are under the age of 22 and sentenced as an adult for a crime other than murder.

We began our investigation by looking at Appendix D of the Voluntary Sentencing Guidelines Manual. A table provided in this appendix outlines the process with which prosecutors sentence convicted criminals. The aspects considered include the offense ranking group and the offender's criminal history score. Since this was our initial dataset given for analysis, we wanted to get some basic statistics on race and gender. The first step in our analysis was to clean the data. We were able to use Excel to remove null values and unnecessary text in cells where calculations would be needed. This data was then distributed for further analysis. After preliminary analysis, we decided it would be beneficial to consider historical data to observe the impacts of sentencing reforms so we began analyzing data from OpenDataDC. Datasets sourced here provided information about specific instances of felonies, arrests, marijuana arrests, etc. as well as sentencing information for all cases. It is important to note that juvenile information is not typically made public, and only occurs in instances where the offender is charged as an adult; this is an important distinction when considering the YRA guidelines highlighted above. We then conducted a more in-depth EDA on both the initial dataset provided and OpenDataDC data which led to several findings and the creation of several data visualizations.

In order to provide conclusive findings surrounding our problem, two different forms of hypothesis testing were used. The first is the difference in population proportions test which examines proportions of an existing feature within two independent populations. We also tested the difference in population means to examine differences in other crime statistics. This type of hypothesis testing looks at the average change across two populations. For each test, we looked

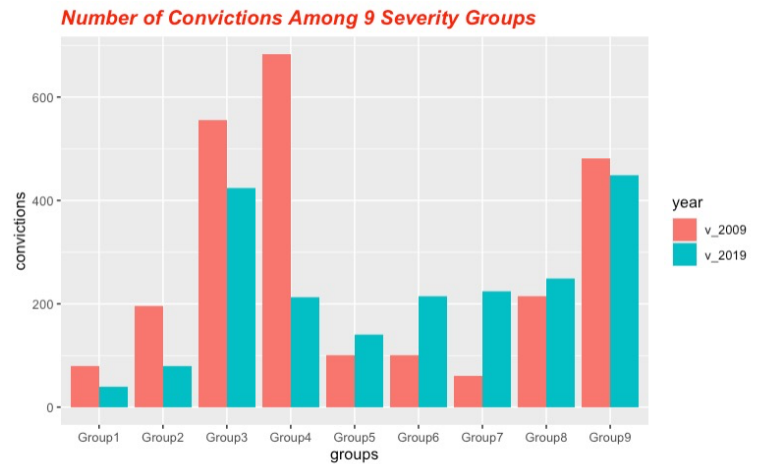at the populations of YRA-eligible offenders who have committed crimes before 2018 and after the 2018 reforms.

Data Visualization

Using R Studio and Python, we were able to generate meaningful visualizations based on the many data features we have collected. The first dataset provided by our sponsors has many sub datasets, containing all crime data from 2009, 2010-2014, 2015-2019, and 2019. However, our goal was to analyze sentencing trends that stand out before and after 2018, and find connections between race and specific criminal charges. We picked data from 2009 and 2019 to compare a ten-year difference. The first basic visualizations for crime distributions among genders showed us that there was no significant change in ten years:
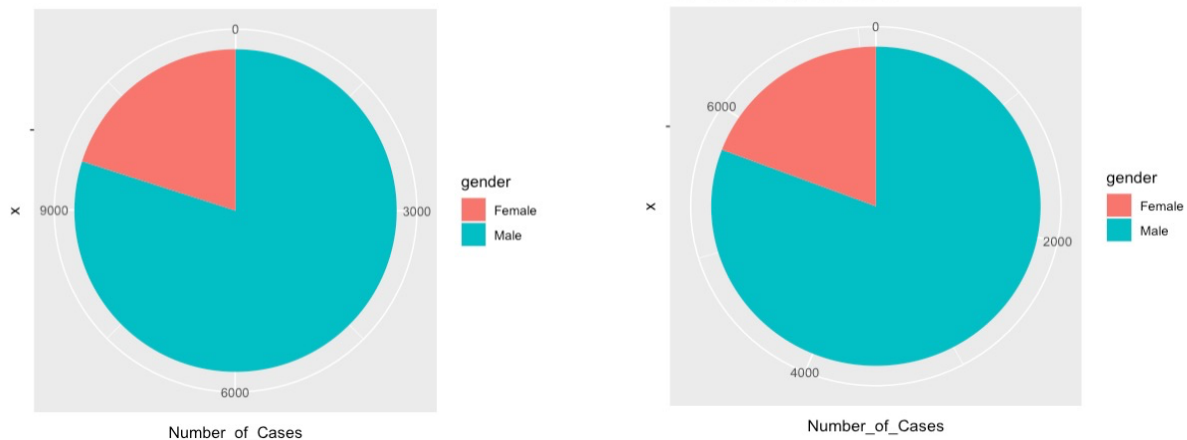

After reading the DC Sentencing Guidelines, we found that the most common crimes were divided into nine different severity groups. We filtered the common crimes for each severity group and then found the total number of convictions. The figures below shows the criminal history score based on the ranking group and the comparisons of the number of convictions for each severity group between 2009 and 2019.

APPENDIX A -- MASTER GRID
July 2018
Sentencing Ranges Listed In Months

Ranking Group / Most Common Offenses	Criminal History Score				
	0 to ½ A	¾ to 1¾ B	2 to 3¾ C	4 to 5¾ D	6 + E
Group 1 1st degree murder w/armed, 1st degree murder	360 - 720	360 - 720	360 - 720	360 - 720	360 +
Group 2 2nd degree murder w/armed, 2nd degree murder, 1st degree sex abuse, 1st degree sex abuse w/armed	144 - 288	156 - 300	168 - 312	180 - 324	192 +
Group 3 Voluntary manslaughter w/armed, 1st degree child sex abuse, Carjacking while armed, Assault with intent to kill w/armed, Armed burglary I	90 - 180	102 - 192	114 - 204	126 - 216	138 +
Group 4 Aggravated assault w/armed, Voluntary manslaughter	48 - 120	60 - 132	72 - 144	84 - 156	96 +
Group 5 Possession of firearm /CV, Armed robbery, Burglary I, Obstruction of justice, Assault with intent to kill	36 - 84	48 - 96	60 - 108	72 - 120	84 +
Group 6 ADW, Robbery, Aggravated assault, 2nd degree child sex abuse, Assault with intent to rob	18 - 60	24 - 66	30 - 72	36 - 78	42 +
Group 7 Burglary II, 3rd degree sex abuse, Negligent homicide, Attempt 2nd degree sex abuse	12 - 36	18 - 42	24 - 48	30 - 54	36 +
Group 8 Carrying a pistol (CPWL), UUV, Attempt robbery/burglary, Unlawful poss. of a firearm (prior fel.)[31], 1st degree theft, Assault w/significant bodily injury	6 - 24	10 - 28	14 - 32	18 - 36	22 +
Group 9 Escape/prison breach, BRA, Receiving stolen property, Forgery/uttering, Fraud	1 - 12	3 - 16	5 - 20	7 - 24	9 +

(Left margin labels: 3 Points* for Groups 1–5; 2 Points* for Groups 6–7; 1 Point* for Groups 8–9)

*Number of Convictions Among 9 Severity Groups*

We found many defects in the given datasets, for example, instead of giving the total number of convictions, the datasets only provided conviction percentiles for each crime. The sub-datasets with 4-year spans (2010-2014, 2015-2019) made it difficult to analyze the trends from 2009 to 2019. Thus, we chose an additional dataset, the Felony Crime dataset containing every single case from 2009 to 2018. We learned that this was much more helpful in discovering the trends over the years.

Our group was interested in the total number of convictions among genders, races, and age groups, so we used R Studio to group the crimes by each category. We created a new dataset by grouping all data by sentence year and gender to summarize the total number of cases for each combination of genders and sentence years. Then, we used the ggplot function to create graphs containing the trends. Similarly, we had the same approach for different races and age groups.

Total Number of Cases by Gender

Total Number of Cases by Race

Total Number of Cases by Age Groups
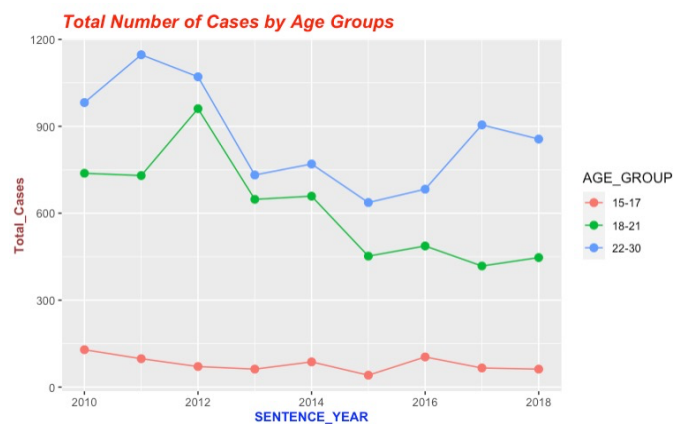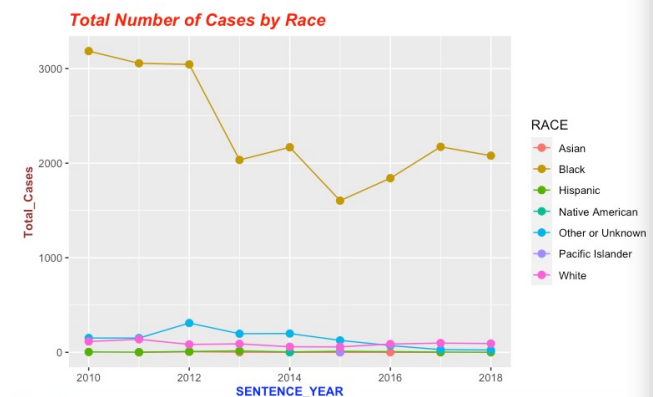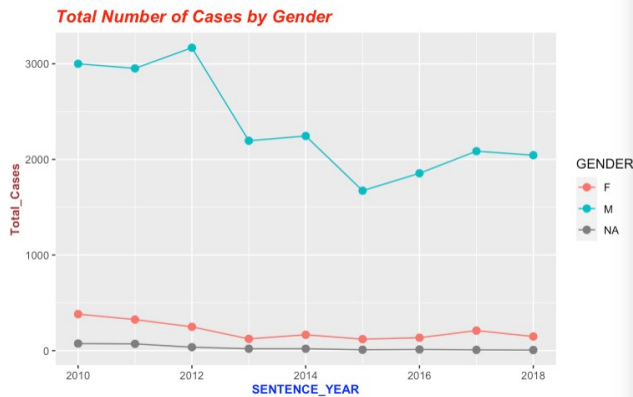
Using a similar approach, we wanted to find trends of the average sentence length by race, gender, and age group. The only difference is we summed all sentence lengths and divided by number of rows after grouping by race and sentence year. The figures below show the trends of average sentence lengths for different genders, races, and age groups from 2009 to 2019.

Mean Sentence Length by Gender

Mean Sentence Length by Race

Mean Sentence Length for Juniors
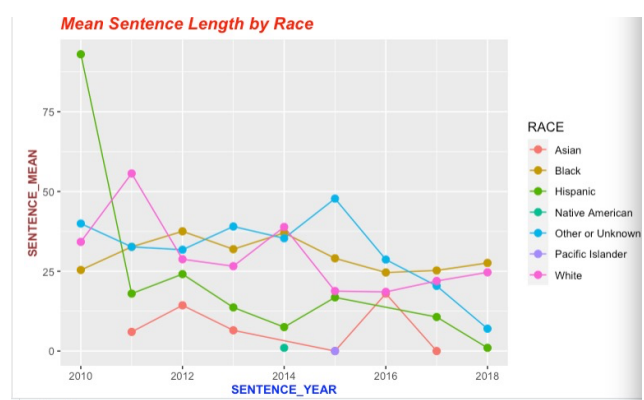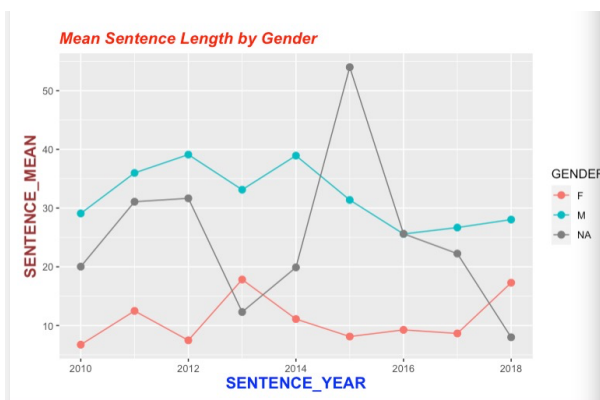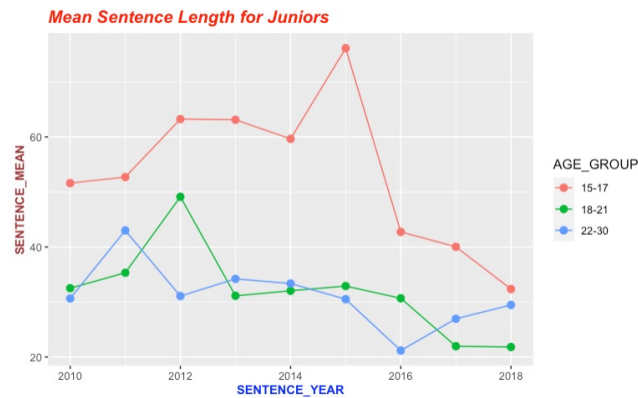
Results and Discussion

Overall, we were able to collect and visualize our findings in a meaningful way, showing trends before and after important sentencing reforms. One of our key findings included a decreasing trend of for all racial demographics. 92.2% of criminals that were sentenced between 2010-2018 were black, with a relatively longer sentence length among all races. Regarding age groups, the total cases of felonies in the 18-21 demographic is much higher than cases of teenager felonies in the 15-17 demographic. Similarly, the figures for both demographics have declined between 2010-2018. The largest proportion of felonies committed by the 15-21 demographic involved weapons in their convictions (37.8%). Finally, the statistics for crimes committed by gender show that the total cases for males are much higher with a longer sentence length than females in 2010-2018. Juvenile arrests also have decreased from an average of 3,130.5 cases annually before 2018 to an annual average of 2,087 after. Finally, we observed an 88% decrease in marijuana arrests for all demographics after the D.C. legalized marijuana in 2014.

By properly subsetting our data we were also able to address very specific questions regarding D.C.'s criminal justice system. After YRA reforms were passed in 2018, some

vocalized opinions of increased crime rates as a result of less accountability. Specifically, critics expressed concern over an increase in violent crime. For that reason, we began hypothesis testing by examining changes in the proportion of various felonies being committed by YRA-eligible offenders. Conducting differences in population proportion testing with populations of YRA-eligible offenders before and after 2018 provided us with several findings. Drug and violent felonies were committed at a lower proportion to a statistically significant degree, weapon felonies were committed at a higher proportion to a statistically significant degree, the proportion of juvenile arrests resulting in a felony decreased by a statistically significant amount. Difference in population means was also used to examine changes in other summary statistics in relation to 2018 reforms concluding that the mean sentence length given to YRA-eligible offenders decreased to a significant degree whereas no significant change was observed to the amount of car jackings committed by YRA-eligible offenders.

Conclusion and Future Work

One of our main goals was to gather the updated datasets after 2019 in order to perform hypothesis testing with higher accurate results. From our last check-in, we had a few tasks we wanted to finish up. We presented our preliminary website to our sponsors and showcased all of the work we had done the whole semester. We believed that an interactive website would be a great addition to our project to allow people to see our progress from start to finish. We also prepared all of our materials for The Learning Factory including a one-page summary, a video and a poster. From a broader perspective, we wanted to forecast potential implications and releases that have resulted from changes to the YRA. We hope that the various insights and conclusions we gathered provide a solid pick-up point for further analysis to be done. With the data that we have received, we were able to visualize recent trends, but larger populations and

historical data would be necessary to predict future trends. As a group, we are happy that we were able to produce quality work with the information available and using the data science techniques learned in class and will use in the future.

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