The Poverty Trap: Socioeconomic Status and its Impact on Racialized Incarceration, Violent Crime, and Police Killings

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Abstract:

Rates of incarceration, crime, and death at the hands of the police in the United States have been in contention over the years. It is widely known that we as a country incarcerate five to seven times the amount of prisoners that other countries do. Our goal is to prove that there is a correlation between socioeconomic status and its impact on crime rate, incarceration rates, and police killings, and to suggest possible methods to aid in lowering these rates. Through the use of linear regression and k-means clustering, we were able to analyze data found in different datasets, and this will hopefully prove helpful for the making of policy and programs that can aid those below the poverty level. Previous government programs have proved helpful to prevent and rehabilitate ex-offenders, but many cities simply do not have the funds to support these programs, in which case it is our opinion that the federal government should step in to fund these programs.

Introduction:

Commonly, victims of crime, incarceration, drug use and police killings who make the news are often of lower economic status, or are a person of color. According to a survey by the Los Angeles Times, those who are poor are often seen as less capable than their affluent counterparts, and almost 40% of respondents said that those who receive welfare would rather stay on that than earn their own income. [5] This hints that those who responded as such believe that the poor are lazy and unwilling to work for their money. A Pew Research study took this even further, showing that 53% of Americans who make $50,000 or more annually hold the opinion that the poor "have it easy because they can get government benefits without doing anything in return". [4] Overall, 47% of Americans surveyed believe that the lives of poor people are difficult because government programs don't do enough, but this percent is mostly due to the fact that 65% of people who make under $20,000 annually hold this belief, compared to 37% who make $50,000 or more. [5]

In addition to their opinions on the poor themselves, according to a survey by NPR, the Kaiser Family Foundation, and Harvard University's Kennedy School of Government, Americans are divided on why poverty is a problem. According to the survey, about half the public says the poor are not taking enough steps to get out of poverty, and the other half says that there are circumstances beyond their control causing people to be poor. [6] Understanding how economic status affects so many other areas, this data can be used to inform public policy and government levels for setting the poverty level. We hope that our analysis will influence more people to support public spending up front in a child's life to help combat the hardships that the poor face, not only in relation to levels of crime, incarceration, and police killings, but in all areas of their lives. The resultant data from our project is also expected to support improved programs at schools to provide not only quality education, but other services that lower socioeconomic status children need to lower the prevalence of negative outcomes. It is well

documented that it is difficult for children raised in poverty to break the cycle of poverty as they grow up.

The question we plan to answer is: how does socioeconomic status affect incarceration rates, crime rates and police killings? A prevailing sentiment is that people of color are more likely to be affected by many of society's ills. While we do explore this a bit in terms of how race factors into economic status and things such violence and incarceration, we focus on economic status as the influencing factor. While there is plenty of data on the opinion of poverty and those suffering from it, as well as on the factors of violent crime, incarceration, and police violence on people of color, there's less data on these factors and their intersections with the poor. We intend to bring this problem further into the public eye, especially considering today's political climate surrounding the economy.

We obtained three publicly available datasets which we will use to perform our analysis. Our first dataset is one containing statistics on police killings in 2015, compiled from entries in the Guardian's database. The income data in this is wide, including county, household, and personal income, as well as the race of the victim. Our second dataset is from the FBI Department of Justice and contains information on violent crime rates by state in 2015, and we compared the poverty rate of these states with this data. Our third dataset is Survey of Inmates in State Correctional Facilities from the Department of Justice. This has many variables useful for comparison, but most importantly contains information about a prisoner's race and economic status before entering, as well as their previous incarcerations.

In investigating how income affects negative factors, we find it necessary to begin with the factors that send people into poverty in the first place. Things like education and a surge in low-income jobs are a large factor in holding many individuals and families in low economic standing. In Figure 1, you can see that after the 2008 recession, jobs in all industries decreased, but low-wage jobs suffered the smallest hit. [1] In addition to this, two years after the recession when jobs began to return, low-wage industries had the largest increase, leading to a net gain of over 1.8 million jobs in 6 years, while other industries saw net losses close to a million.

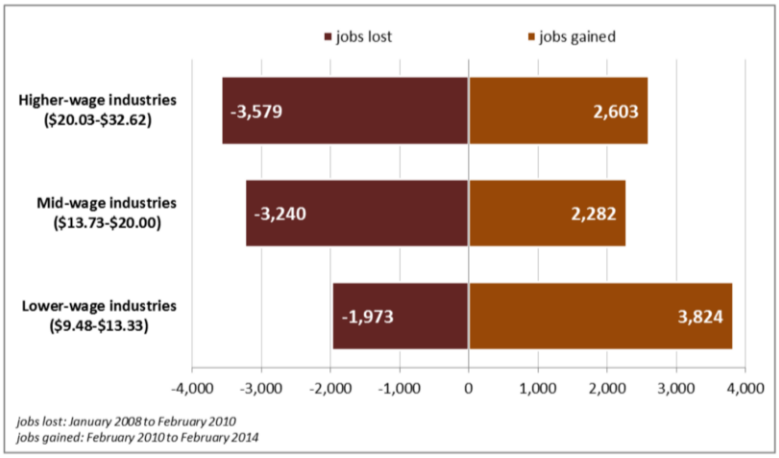

Figure 1: Jobs lost and gained between 2010 and 2014

Even though the amount of low-income jobs have increased, Figure 2 illustrates that the wages for those jobs have fallen 5% from what they were in 1980. [1] Middle wage jobs have only seen a very modest increase of 6%, but with a decreasing amount of jobs that fall under that category, the size of the middle class is subsequently falling. However, the very large increase in wages for high-paying jobs creates a further gap between high- and low-income earnings and individuals, making it even harder for those working in low or middle wage jobs to move up the ladder so to speak. We believe that an increase in minimum wages would offer a way to reduce the gap, bringing more people above the poverty level and help to diminish the impact income

has on the three negative factors mentioned in this paper, namely violent crime, police killings and incarceration.

Another factor that comes into a person's socioeconomic status is education. We gathered data from the US Census Bureau on how many people who were over the age of 25 in each state had at least a Bachelor's Degree. [13] We then compared this data to the poverty levels in each state which we also gathered from the US Census Bureau, [13] and came to the conclusion that states with higher levels of poverty have lower levels of higher education. This is not surprising, as people with low-income jobs cannot afford higher education as easily. If they do attend college, they'll likely need to use loans, and although universities have gotten more expensive, thus requiring more loans, middle-wage jobs have not increased payment accordingly. Middle-wage jobs are likely the types of jobs that recent graduates will have, so paying back loans can be a struggle, and have the potential to keep the person constantly in debt and in low economic standing.

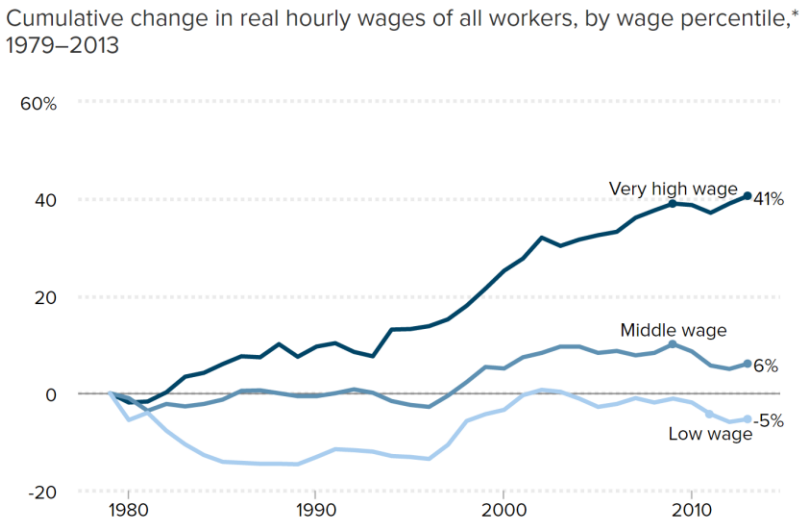

Figure 2: Cumulative change in real hourly wages 1979-2013

Current Approaches:

As background research, we looked at various research using income or socioeconomic indicators as the dependent variable and incarceration, crime rates and police killings as the independent variables.

In recent times, it has been well-documented that people of color are more likely to be assaulted by police regardless of if they're armed or not. While multiple sets of data have been released on the topic, many of them have been from police departments themselves and could have an inherent bias. In the PLOS journal [11], we discovered an article where the author took an unbiased dataset with the help of USPSD and evaluated it to prove this statement. In his evaluations, he found that there is, in fact, a significant trend of black and Hispanic Americans being shot by police more often than white Americans, both armed and unarmed. Unarmed black Americans are 3.49 times more likely to be shot, while unarmed Hispanic Americans are 1.67 times more likely. Armed black Americans are 2.94 times more likely, and armed Hispanic Americans are 1.57 times more likely. [11] The author also found that an unarmed black American is equally likely to be shot by a police officer as an armed white American.

Most notably in regards to our data, the author found that the lower the median income and greater disparities in income in a county, the more elevated the ratio of police shootings against black vs. white Americans, armed and unarmed.

Proving causation is a tougher task than showing a correlation. However, it is has been shown that poorer cities have higher crime rates. According to this study, what the 10 most dangerous cities have in common is that they all have a lower median income than the average

income for the country, and they all have poverty rates above 20%. [3] Many of these cities have claimed bankruptcy which have caused public service shortages and population drains.

Our hypothesis is that people in lower socioeconomic standing are more likely to be incarcerated. A previous study using the Bureau of Justice Statistics supports this hypothesis. [9] The study found the median income of those incarcerated was $19,185, adjusted for inflation, which is 41% lower than the median income of their non-incarcerated peers. Those who have been previously incarcerated also have to deal with companies legally being able to deny you a job because of your criminal record, leading the ex-offender further into poverty and more likely to fall victim to the criminal justice system again. Not only do those who have been incarcerated have the lowest median income, but they also overwhelmingly fall into the lowest bracket of income distribution. [9]

In another study we looked at, education is also a large factor in incarceration. As of 2008, 37% of black men who dropped out of high school are incarcerated, along with almost 15% of white men who dropped out of high school. [16] 68% of black men who were born between 1975 and 1979 and dropped out of college have been incarcerated at least once. [16]

Data Sources:

We chose three datasets. Our first one is from the Guardian database, *the Counted* and census data from the American Community Survey. [8] *The Counted* is a continuously updated database of Americans killed by police since January 1, 2015. [12] There is a lack of data on police killings since the current program, run by the FBI, for police departments to report "justifiable homicides"[1] is voluntary. *The Counted* collects their data using the traditional reports as well as witness statements and by monitoring other groups such as regional news outlets, research groups and open source reporting projects. The full dataset from the Guardian is not publically available. The dataset we obtained is a subset of *The Counted* containing 467 reported deaths and also includes demographic and economic information on the neighborhoods where the deaths occurred.

Our second dataset is from the FBI Uniform Crime Reporting (UCR) Program on Crime in the US, specifically violent crime in 2015, which is defined as four offenses: murder and nonnegligent manslaughter, rape, robbery, and aggravated assault. [2] The dataset contains information on violent crime rate, poverty rate, and education level by state.

Our third dataset is from the Survey of Inmates in State and Federal Correctional Facilities (SISCF) of the Bureau of Justice Statistics. [14] We obtained the data through the National Archive of Criminal Justice Data. [15] Data were collected through personal interviews with a nationally representative sample of inmates in state prisons. Approximately 15,000 inmates in both state and federal prisons provided information about their current offense and sentence, criminal history, family background and personal characteristics, prior drug and alcohol use and treatment programs, gun possession and use, and prison activities, programs, and services. We are most interested in their income prior to incarceration.

Data Cleaning and Data Structure:

Our data presented the unique problem of including far more variables than we needed. In fact it seemed common for our data sets to include several thousand variables. We found that, when collecting data from government resources, it is common for information to be stored as SAS data files. The SAS software license is expensive, so we had to take our data and reform it

[1] FBI defines "justifiable homicides" as "the killing of a felon in the line of duty".

into a legible format. In order to do this we created a R-script that could read in the data appropriately. After opening the file using the script, we stored everything into a data frame which is a data structure native to R and used for storing information as a table with the first row being column headers. At this point the data was in an acceptable format that we could use, so we output the data frame into a CSV file. The other files were already in acceptable formats and there was no need to translate them, we simply converted them into CSV files.

The next step in this process was to analyze each of the data sets and determine what variables were relevant, which variables were incomplete, and which variables seemed important to the data but weren't worth including. As we sorted through each of our files, we discovered the common theme that researchers must've shared: too many variables is superior to too few variables. There were quite literally thousands of data points that were filtered out and removed. We had to take the time to remove data that included personally identifiable information, data that was incoherent or missing, and data that is interesting but irrelevant such as 'income while incarcerated'. This process severely trimmed the size of each file, allowing us to more easily load and work with our data. In example, the dataset we had found on drugs in prison, without trimming, was roughly 2.7 GBs as a CSV file due to the sheer size of the dataset; although not used thoroughly for our tests, we quickly saw the value in obtaining a clean dataset when we realized that after cleaning that same file it shrunk significantly in file size. As far as data structures relate to file size, using CSVs was a potential problem just because technically the file type requires N-1 commas where N is the number of cells in the table. That being said, finding a better solution doesn't seem like an obvious problem to solve other than zipping the CSVs together, which would severely reduce the overall file size due to the repetitive nature of the commas as well as the rest of the digits from 0 to 9. Compressing these files would certainly help with the mobility issues involved with our file type of choice, but it wouldn't help us read the files into our spreadsheet software for editing. With these things in mind it becomes much more evident that our data types were adequate choices for the task at hand.

Our Approach:

Our main indicator of socioeconomic status was income, but we also considered the poverty rate and education level as an indicator of an individual's status. After some exploratory data analysis by plotting some of the data we noticed there was a linear relationship between some of the variables. All of the datasets we chose were structured by state. We were interested in making some comparisons across the data we selected.

We decided to utilize linear regression and k-means clustering to answer the question proposed. We used these two methods on all of the datasets and compared the results to draw some conclusions.

For the police killings dataset we performed a scatterplot and linear regression of a few income characteristics such as personal income, median household income, and the ratio of median household income to county income. We also implemented a K-Means clustering of median household income by area of the country.

For the UCR violent crime dataset we performed a scatterplot and linear regression of crime rate and average poverty rate, using average poverty as an indicator of socioeconomic status. A K-Means clustering of average poverty rate by state was also performed.

For the SISFC prison dataset we constructed a bar chart of the distribution of reported monthly income earnings one month prior to incarceration and percentages for each income

bracket. We also created a K-means clustering of reported monthly income earnings one month prior to incarceration by area of country the inmate resided.

Results and Discussion:

Police Killings Dataset Analysis

Figure 3 plots the percent of residents that identify as white versus the ratio of household income divided by county income in. This was chosen because it tells us how the person's earnings compares to where they are living. If the ratio is greater than 1, it means the person was earning more than the county average. If the ratio is less than 1, it means the person was earning less than the county average. A linear regression of race, segmented to the percentage of residents who identify as white versus household income shows there is a fairly even distribution of income levels from poverty through middle income and very few at the upper income levels. It depicts that as income goes up less people are killed by the police in confrontations.

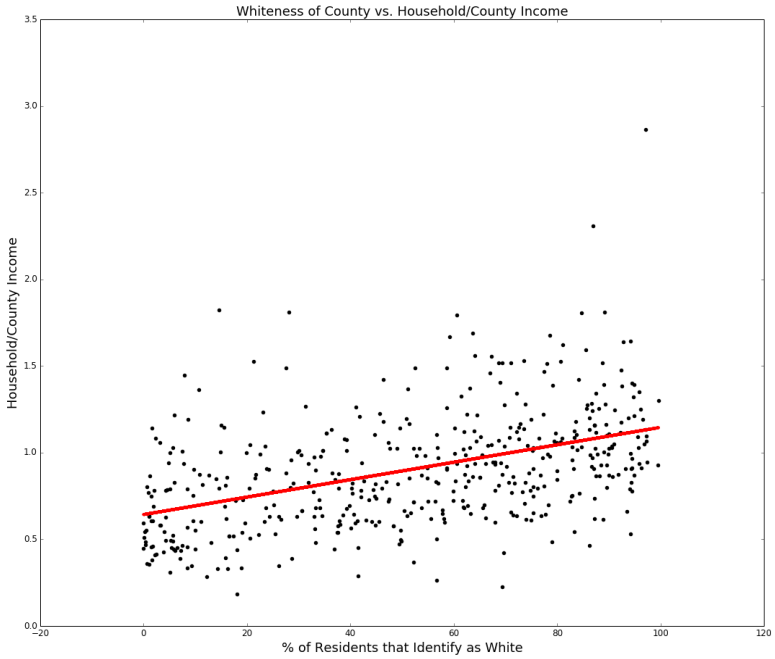

Figure 3: Whiteness of County vs Household/County Income

Figure 4 plots percentage of residents that identify as white, but now isolating just their average income by county. In this case the data indicates that even as the whiteness of the county increases, the average county income experiences a decreasing trend. When viewing the graph it doesn't appear as though the graph indicates a significant negative trend so much as it indicates that there doesn't exist a major difference in the average county income between mostly white and mostly minority populated counties. There are a number of causes for this, but it appears that the correlation is somewhat negligible.

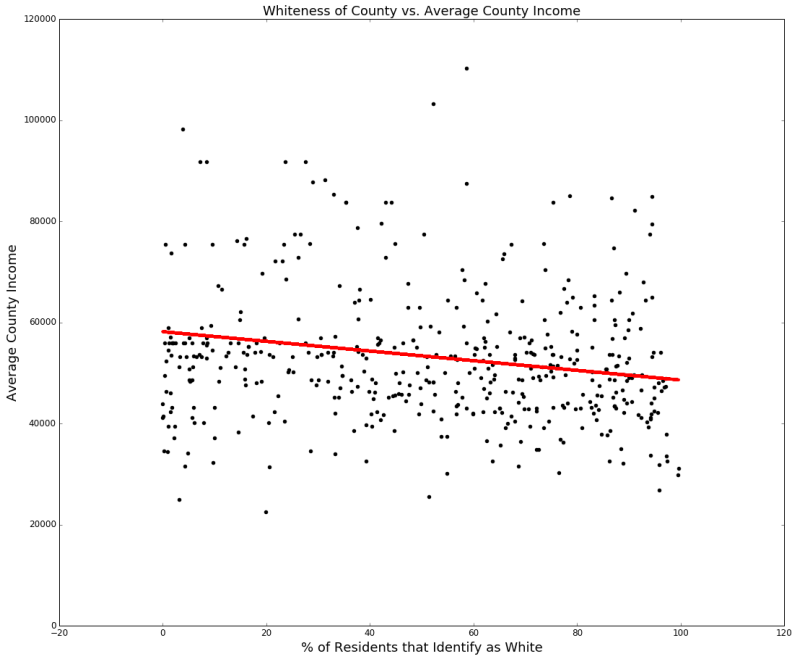

Figure 4: Whiteness of County vs Average County Income

The k-means clustering plot in Figure 5 shows four main clusters. While this was not as successful as we had hoped, there appears to be some grouping. After comparing the results to the dataset, the red dots from cluster 1 most likely correspond to states in the Western region of the US, the green dots from cluster 2 correspond to the South, the blue dots from cluster 3 correspond to the Midwest and the purple dots from cluster 4 correspond to the Northeast. There were more reported deaths for the South and West regions which could have possibly made the groupings less clear. The graph also indicates that a lower poverty rate is associated with a medium to high income. The green dots of Cluster 2 indicate the cluster of mostly middle income and an associated middle income. The blue and purple dots of Clusters 3 & 4 essentially form a third cluster that represents a higher poverty rate and lower income. This is what is expected, and the statistical means of computing the data supports this hypothesis. The graph also serves another purpose in illustrating what areas will typically not experience poverty. From the graph we can see that every area with 50000 income or more generally has a low rate of poverty, less than 20%. We cannot say the inverse that everyone else is likely to experience higher, because the group in the under 50000 income range is much more diverse, experiencing poverty of between 5% and 80%.

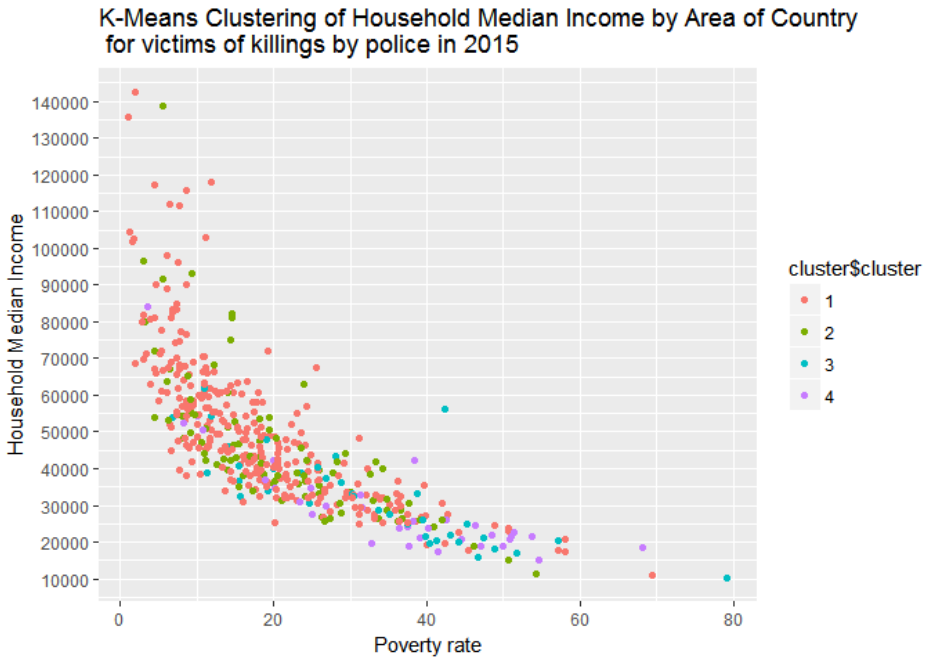

Figure 5: K-means clustering of Household Median Income by Area of Country

UCR Violent Crime Dataset Analysis

We performed an analysis on the relationship between poverty and crime rates for each state in the U.S., including D.C., using k-means clustering and linear regression algorithms. (See figure 6 and 7). From the k-means clustering, it can be noted that there are approximately three main sections, or groupings, that any state falls under, with slight variations, of course. There is the lower-left portion of the graph, where there are states with low crime rates and low poverty rates. Although there are some outliers, such as Maine, with low crime rates and relatively higher poverty rates, or vice versa, the majority of the blue grouping, as can be seen in the k-means clustering graph above, has a relatively low poverty rate associated with a low crime rate. Towards the red grouping in the middle between the blue and green groupings, lies states that experience higher crime rates than the blue grouping, with similarly higher poverty rates. Once again, not all states in the red grouping have correlating crime and poverty rates, but the far

majority of the group represents a correlation between crime and poverty rates. The final, green grouping, represents the group of states with high crime and poverty rates.

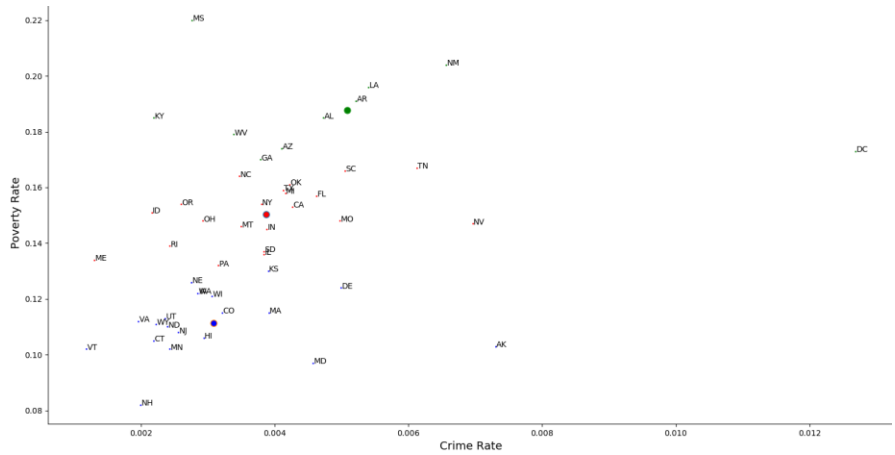

Figure 6: Crime rate vs Poverty Rate

It should be mentioned that D.C. is the most noticeable outlier, having the highest crime rate among all states. Figure 7 shows the trend of Poverty Rates vs. Violent Crime without considering D.C. and its' linear regression is slightly less steep. But, considering that D.C. is more city than state, it makes sense for it to have a higher crime than the rest as historically, urban areas/cities face higher crime rates than rural or suburban areas. This is based off of the fact that there is a denser population in these areas, which leads to an increase in the number of crimes. Even with such a ridiculously high crime rate, D.C. has a relatively high poverty rate to stand by it. As said before, causations are quite hard to prove, but a relevant correlation can be noticed between crime and poverty rates. The data shows that states with higher populations of individuals under the poverty level have higher levels of violent crime, and those with low poverty rates have lower levels of violent crime. It follows that those who suffer from poverty are more likely to be victims of violent crime.

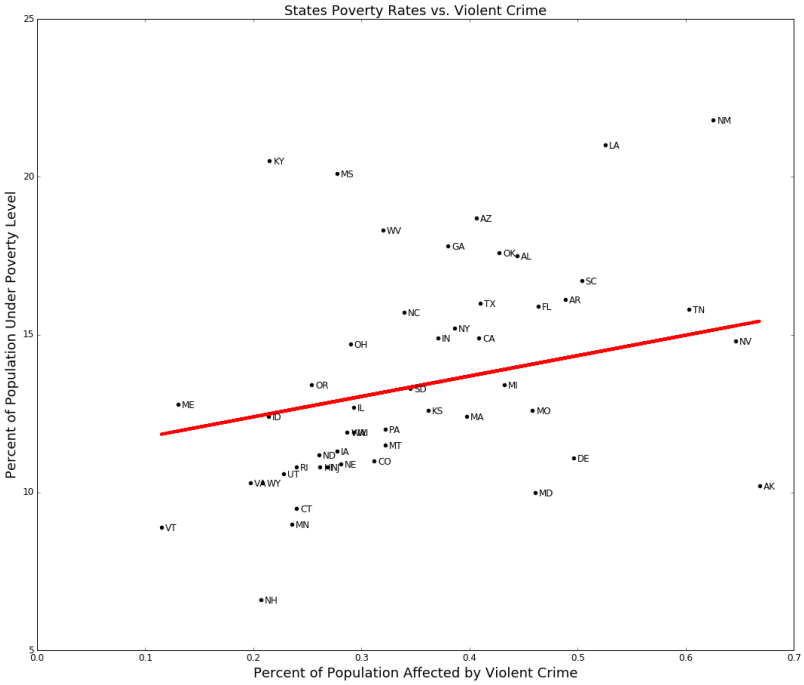

Figure 7: State Poverty Rates vs. Violent Crime

Another factor that comes into a person's socioeconomic status is education. We gathered data from the US Census Bureau on how many people who were over the age of 25 in each state had at least a Bachelor's Degree. [13] We then compared this data to the poverty levels in each state which we also gathered from the US Census Bureau, and came to the conclusion that states with higher levels of poverty have lower levels of higher education. Education level versus poverty level was analyzed as shown in Figure 8. As we expected, the poverty level was negatively correlated with education level. This is not surprising, as people with low-income jobs cannot afford higher education as easily. If they do attend college, they will likely need to use loans, and although universities have gotten more expensive, thus requiring more loans, middle-wage jobs have not increased payment accordingly. Middle-wage jobs are likely the types of jobs that recent graduates will have, so paying back loans can be a struggle, and have the potential to keep the person constantly in debt and in low economic standing.

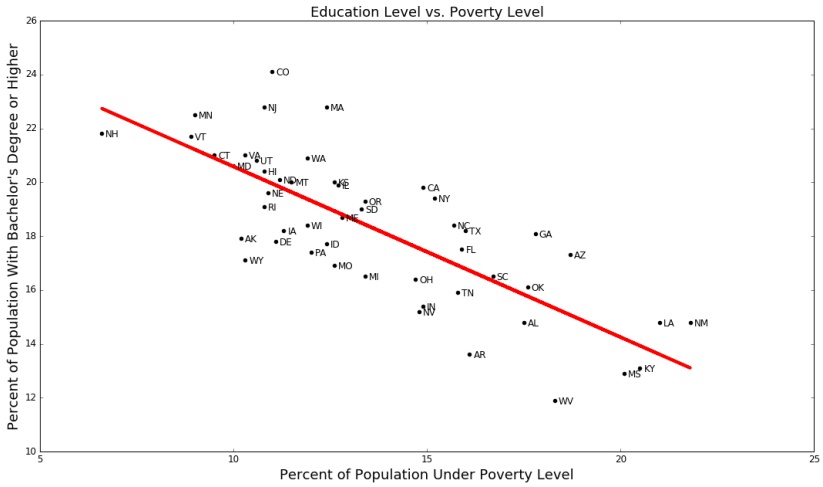

Figure 8: Education Level vs Poverty Level

Less than 10 percent of residents were under the poverty level in New Hampshire, Vermont and Minnesota, three of the most highly educated states in America. In contrast, Mississippi, Kentucky, Louisiana and New Mexico were clustered with the lowest levels of college-educated residents and were associated with the highest poverty levels of greater than 20 percent. The conclusion that can be drawn from this is that as an individual's level of education increases, their chance of falling into poverty decreases.

SISFC prison dataset analysis

The SISFC prison data set, shown in Figure 9, reveals a fairly standard normal distribution for income range plotted against number of people in the various income brackets. The highest number of respondents left the reported income one month prior to incarceration as blank. There were items such as no income, don't know and refused. Many times, no matter what level of income, people are

Figure 9: Reported Monthly Income 1 Month before Incarceration

reluctant to share this information. This may be because we considered income from all sources. In 2004 the U.S. Census Bureau reported an average yearly income at the poverty level for an individual was $9,310/year or $775/month. If the person was a member of a family unit, each additional person added $3,180/month. [7] We do not have the size of the family unit so it is difficult to determine the real number of people that are self-reporting at the poverty level. However, after a person self-reports at $5,000 - $7,499 the number of respondents goes from a high of 1300 to under 800 respondents that were incarcerated.

Figure 10: K-means clustering of Income Prior to incarceration by State of Residence

The k-means clustering of income prior to incarceration by state of residence for the SISFC prison data set shows the inmates clustered by the four areas of the country in different income brackets.[2] After inspecting the results of the graph and comparing to the actual data, it is concluded that the red clusters most likely represent the South, the green most likely represent the Midwest, the blue most likely represents the Northeast and the purple the West. This implies the dataset does not cluster according to how we wanted. We included the results anyway to be consistent with the other datasets and as an example of how the approach we were using for the other datasets did not fit for this one.

Conclusions:

We set out proposing a causal relationship between low income/poverty and higher rates of incarceration, death by police officer, and crime in general. We also were hoping to show a correlation between minority status and the crime rate in the area, incarceration rate, and deaths by police. When we consider the first portion of our thesis, we actually found a strong correlation in the evidence for our argument that shows that, across most every state in the nation, as the poverty rate increases, so does the crime rate. This shows us that there is a link between violent crimes and poverty, and it even helps correlate the victims of crime as people who are experiencing poverty. When analyzing the k-means clustering of the UCR Violent Crimes Dataset, even excluding the outlier Washington D.C., we see a strong positive correlation between poverty rates and violent crime rates within the states. This means that in general, violent crime as a function of poverty increases as poverty increases. Our thesis has further support from the bar chart showing monthly household income prior to incarceration. This data, if we assume a 1 person household, actually shows a vast majority of people incarcerated are above the poverty line; however, the moment we assume a household size of 2 or more with the

[2] See Appendix Table 1 for the income brackets.

same income, the number of people incarcerated in poverty rapidly increases, meaning the average US household of 2.57 people in 2004 would show us that roughly half of the people who disclosed their income while incarcerated were technically at or below the poverty threshold. Again we can see here that the data supports the idea of poverty having a direct and detrimental impact on the likelihood of being incarcerated just like it shows the relation between poverty and the chance of being the victim of a crime. Finally, we support our claim that death by police is related to poverty when we examine poverty rates and income among those killed by the police. While the dataset we have used supports this, we should be careful in extrapolating our results to future police killings in the US, since the data we selected is only for one year and does not include all cases of police killings. Ideally, our data sets would back up our secondary conjecture, but we cannot say that they fully have. We all agree that while there is a direct correlation between poverty and low-income there is no evidential proof that it is a direct cause. When we analyzed the relationship between the percentage of whites in a county versus the income in the county, we found contradictory results. First, the percentage of white residents in a county had a proportional and positive relationship to the household income/county income, but the average income in the county decreases as the 'whiteness' increases, an inverse relationship. This gives inconclusive results and we cannot draw any conclusions from it since the average household appears to be doing better than the county average, but the more white people there were the less money the county earned. This conclusion we draw from this is that the average non-white household must be making less than the average white household in mostly white areas, but in less white areas the minority people must make more than in other areas as the average income is greater in those areas.

Future Work:

We recommend as future work a more comprehensive definition of socioeconomic status broken down by region of the country and a plot showing the distribution of incomes for each state. With a more detailed breakout of even the datasets provides, would provide helpful information to those specific states.

The government, especially at the national level is trying to collect more data, however, even these studies point to requiring more scientific study is required. [10] Specific policy changes and their effect on these negative outcomes would help reduce the numbers of people involved in crime, being incarcerated and even killed in police confrontations.

There are many corporations that have independently tried to address the issue of poverty and its impact on our society. However, we believe that the government should implement more of its resources to try to help people below the poverty levels such as ex-convicted felons and victims of drug abuse in addition to those in generational poverty. By providing assistance to these groups we are able to level the economic imbalance experienced by the disadvantaged.

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Appendix

Table 1: Percent of participants in each income bracket for 2004 SISFC prison dataset

Income range	All participants	Participants who answered question
No income	1.97	2.37
1-199	3.43	4.13
200-399	6.67	8.04
400-599	8.35	10.06
600-799	6.59	7.94
800-899	7.08	8.54
1000-1199	7.96	9.59
1200-1499	8.99	10.83
1500-1999	7.48	9.02
2000-2499	7.13	8.59
2500-4999	8.4	10.12
5000-7499	3.74	4.51
7500+	5.2	6.27
Don't Know	3.39	
Refused	1.32	
Blank	12.31	