Researching the Relationship Between Education and Crime Rates in the USA

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Abstract

The goal of this research is to examine the relationship between education and crime rates in the USA, using data and visualizations to aid in our analysis. We examine this relationship by looking at data from 690 individual counties across the USA and identifying any patterns or correlations. We look at multiple different types of educational attainment, such as the percentage of people with a High School diploma, the percentage of people with an associate's degree, the percentage of people with a bachelor's degree, and more. We calculate the correlation between these educational attainment levels and crime rates in each state using county level data and look for patterns. A strong negative correlation indicates that crime rates decrease as educational attainment increases, and a strong positive correlation implies the opposite. We found that educational attainment has a medium negative correlation to crime up to an associate's degree. Educational attainment past an associate's degree has little to no correlation with crime rates in many states, and in some, shows a medium positive correlation.

1. Introduction

Crime is one of the biggest problems in the world today. To reduce crime around the world, we must first understand what drives crime. Education may be related to crime because higher levels of education are linked to more job opportunities, leading to higher income, thus reducing the need for committing crime out of financial stress. In this study, we seek to find any potential relationships between educational attainment and crime rates in the USA. We are only looking at the USA because of the ease in accessing low level data. While the results of this study cannot be generalized to crime around the world, establishing correlation between educational attainment and crime rates can lay the groundwork for future studies into possible causality between educational attainment and crime rates in the USA, and internationally.

2. Data

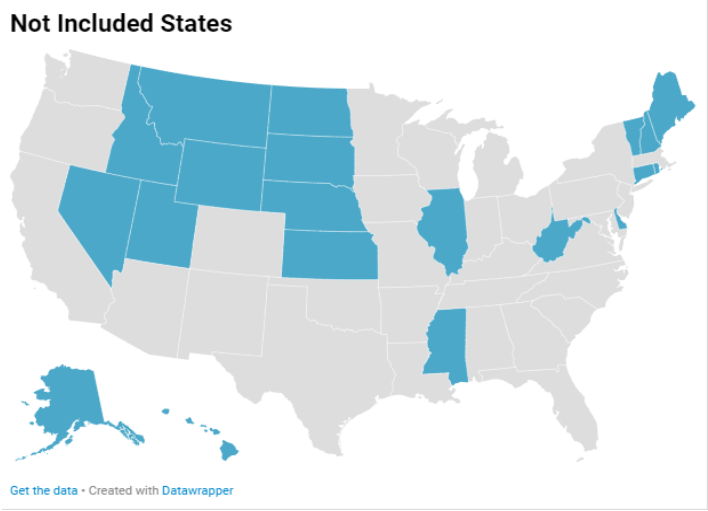
The crime rate data is from ICPSR (Inter-university Consortium for Political and Social Research) which was compiled from UCR (Uniform Crime Reporting Program), the FBI's crime data reporting program. Florida data was missing in the crime dataset from ICPSR, so it was pulled directly from the UCR website. The educational attainment dataset is from Census.gov, which got its data from the American Community Survey. In addition, the population dataset used to calculate crime rates is from Census.gov, which got its data from the American Community Survey. The final combined dataset with population, educational attainment, and crime data includes 690 counties from 30 states. Finally, all the datasets contain data from 2016, chosen due to its distance from the COVID-19 pandemic (which may have affected crime rates and educational attainment).

2.1. Data Preparation

To clean the crime data, all counties with a coverage indicator less than 50% were dropped (an indicator that estimates how much of the county was considered when gathering data). Then, unnecessary rows in the Florida crime dataset were dropped, after which it was combined with the rest of the crime data. After this, population data for each county was added, and crime rates for each county were calculated. While doing this, counties that did not exist in both datasets at once were dropped. Finally, the educational attainment dataset was merged with the population and crime datasets. Once again, counties that did not exist in both datasets were dropped. This resulted in a final dataset that contained crime rates, population, and educational attainment levels of each county.

2.2. Limitations of Data

The data gathered had several limitations, mainly due to issues when combining various datasets, and formatting differences between datasets. The crime dataset only includes violent crimes (Rape, Aggravated Assault, Murder, Robberies), and only includes arrests. Reported crime with no arrests and unreported crimes (which would be estimated) are not included in the crime dataset. In addition, the Florida crime dataset includes reported crime, not just arrests. Also, the educational attainment dataset only includes people over the ages of 25, while the crime dataset includes arrests of people of all ages. Finally, when combining the educational attainment dataset and the crime dataset, many states and counties could not be matched between the datasets, leading to certain states being excluded completely as show below, and many counties being dropped.



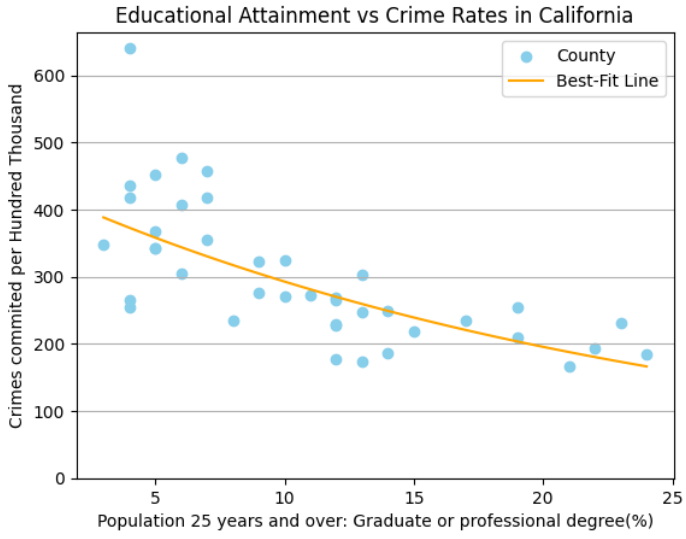
3. Data Visualization and Analysis

We look graphs of states and calculate Pearson correlation coefficients for each state, using counties as data points. By looking at these graphs and correlation coefficients, we can try to identify any positive or negative correlation.

3.1. Individual States

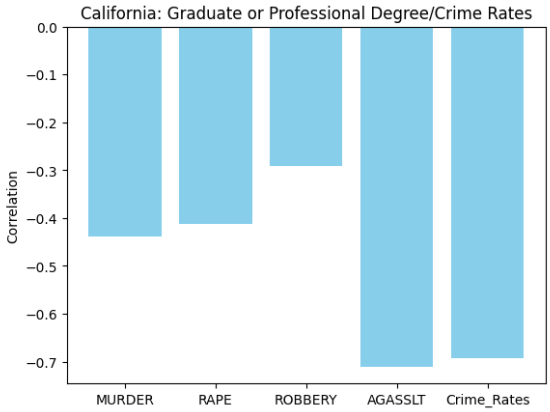
To begin, we look at individual states and their graphs. Although many graphs can be shown here due to the vast amount of data, we have chosen to only include the most significant and interesting ones.

3.1.1. California

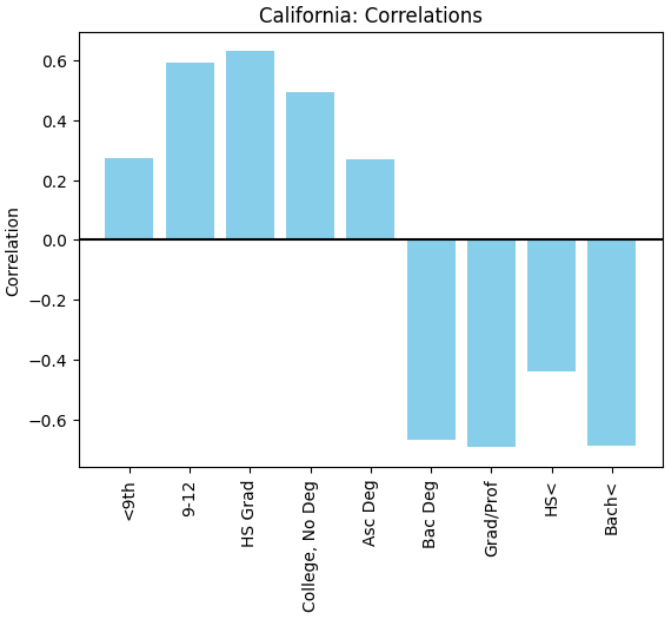


One state that shows an unnaturally strong negative correlation between crime rates and educational attainment is California. It has a Pearson correlation coefficient of -.69296 (rounded). This indicates a very strong negative correlation between crime rates and the percentage of people with a graduate or professional degree in California. Compared to the other states in our dataset, California shows a much stronger negative correlation between crime rates and percentage

of population with a graduate or professional degree, with the second strongest negative correlation shown in Iowa with a correlation coefficient of -0.454927.



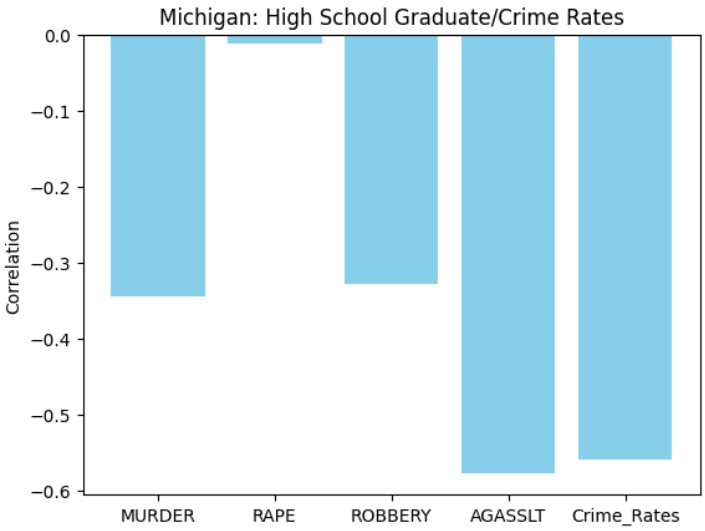
Another interesting pattern in California is that aggravated assault seems to have a much stronger negative correlation between crime rates and percentage of population with a graduate or professional degree. While interesting, it is hard to conclude why this may be. We might expect that the number of robberies decrease as educational attainment increases, mainly due to the financial benefits of higher education, yet counties in California show a relatively weak negative correlation between educational attainment and robberies. There is seemingly little reason for the pattern we see here, so we could conclude that either this is pure coincidence, or there is another variable that greatly effects crime rates. In either case, further analysis must be done to figure out why California shows this pattern.



Finally, California shows a different pattern in its correlations compared to most other states. As shown to the right, counties in California mostly have a medium/strong negative correlation between educational attainment and crime rates when comparing educational attainments higher than a Bachelor's Degree. However, most other states show a completely different pattern. While California shows a strong relationship between getting a bachelor's degree and crime rates, most states only show a strong negative correlation between crime rates and educational attainment up to a bachelor's degree.

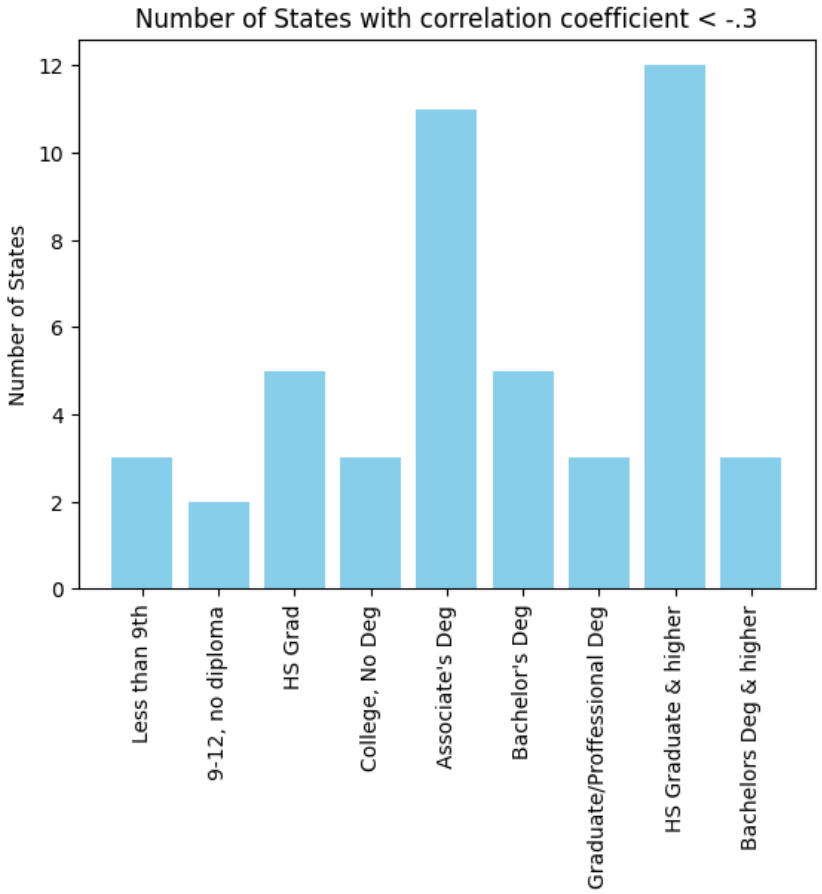
3.1.2. Michigan

Another state that shows an unusual pattern in its correlations is Michigan. Michigan shows a strong correlation between crime rates and high school graduation percentage, as well as between aggravated assaults and high school graduation percentage, while showing low to medium correlation between high school graduation percentage and murder, rape, and robbery. While interesting, it is again hard to conclude why aggravated assaults seem to decrease with higher percentages of educational attainment, while other violent crimes seem to not be impacted as much.



3.2. Analysis of all States

When looking at the correlation between crime rates and educational attainment across all 30 states in our dataset, we can start to see some clear patterns. When looking at the number of states with a negative correlation less than -.3 (or a medium negative correlation), we can see that certain levels of educational attainment are more strongly correlated than others.



We can see from the graph above that more states have a medium correlation between crime rates and educational attainment when the type of educational attainment is either an associate's degree or a high school graduates' degree and higher.

In addition, we can see that 63% of states have at least a negative correlation between crime rates and percent of people with an associate's degree. However, 37% of states

	HS Grad	Associate's Deg	Bachelor's Deg	Graduate/Proffessional Deg	HS Graduate & higher	Bachelors Deg & higher
Percent With Negative Correlation	70.0	63.0	50.0	33.0	73.0	37.0
Percent with Medium Negative Correlation (<-.3)	17.0	37.0	17.0	10.0	40.0	10.0

have a medium correlation between crime rates and the percentage of people with an associate's degree. This is in contrast to the percentage of states that have a medium negative correlation between crime rates and the percent of people with a bachelor's degree, which is only 17%. Also, we can see that the percentage of states with a negative correlation between crime rates and educational attainment seems to decline as we get to higher levels of education, starting at 70% for high school graduates, and ending at 33% for people with a graduate or professional degree. Finally, the percentage of people with a bachelor's degree has a correlation of 0.039795 with crime rates, with is essentially no correlation.

Thus, we can conclude that the percentage of people with an Associate's degree has a low to medium negative correlation with crime rates, and the percentage of people with a high school diploma and higher also has a low to medium negative correlation with crime rates (based on the individual states). Averaging between states, we see that the percentage of people with an associate's degree has a correlation of -0.150537 with crime rates, and the percentage of people with a high school diploma and higher has a correlation of -0.167834 with crime rates.

4. Conclusions

From this study, we can conclude that crime rates do have negative correlation with educational attainment, up to the level of a bachelor's degree. Past a bachelor's degree of educational attainment, there seems to be little to no correlation between educational attainment and crime rates. The percentage of people with an associate's degree has a medium negative correlation with crime rates in most of the states examined in this study, and a low negative correlation overall. The percentage of people with a high school diploma and higher also has a medium negative correlation with crime rates in most states examined in this study, and a low negative correlation overall. While we cannot make any sure statements about why there seems to be no correlation between crime rates and educational attainment after reaching the level of a bachelor's degree, we can say that there is probably some other variable that is affecting crime rates other than educational attainment, due to the low and medium negative correlations that we see in most states (and although educational attainment shows a low to medium negative correlation with crime rates, we cannot establish causality with the data we have in this study).

5. Limitations

There are a few limitations to this study. Most limitations about the data have been talked about in section 2.2, but there are some additional limitations to consider. The data is only from 2016, which is 8 years old. More recent data may contradict the findings of this study, and the COVID-19 pandemic may have significantly changed crime around the world in recent years, perhaps changing the relationship between crime and educational attainment. In addition, most of north-east United States is missing from this study due to issues when combining various different datasets, and each state included in this study does not have all of its counties. Finally, only violent crimes being considered may have impacted our findings further, and considering other types of crime can uncover different patterns.

6. Future Work

While we looked at violent crimes in the USA and their relationship with educational attainment, there are many other questions to be considered. Is there any change in the relationship we see between crime rates and educational attainment if we consider all types of crime? Or what differences might we see if we conduct this study in another country? And is there a way of established causality between educational attainment and crime rates?

We could look at trying to find relationships between crime and educational attainment across the whole world! Or even in major cities? Perhaps an uptick in crime in one city causes a nearby city to experience increased crime? We could ask why California and Michigan have such unique patterns in their relationship between crime and educational attainment! These are the questions we must answer to truly understand crime, and how educational attainment impact it.

7. Acknowledgements

I would like to thank everyone in the Renaissance EXL team for making this research project possible, and for inspiring me with new ideas and ways to look at questions in life. I would also like to thank Jon Stelman (Technical Product Manager at Renaissance Learning), and his continuous support with this project. This experience has taught me how to think about research questions, and has improved my understanding of research and computer science, and how they work together. Thank you again, to Jon, and to everyone else in the EXL program.

8. Sources

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Crime Rate Data