Is Education a Good Way to Prevent Crime?

Research Question

Education is consider by many as one of the most effective way to reduce crime, and some also say that the effort and expenditure to increase education strong outweighed the social benefit. Whether youngster perform better at school leads to less criminal activities in the future, and what makes education such a influential factor for crime? In this report, the purpose of this report is to offers a statistical analysis reference on using education to reduce crime rate. We aims to examine whether a better education environment will reduce crime rate by analysing the GCSE scores and crime rate in London boroughs, and if so, does the negative effect of education apply for all types of Crime?

Literature Review

The reason why education are associated with reducing crime, we offers a brief explanation for the social benefit perspective. Education as an investment with guaranteed results, offering a brighter future for everyone(Gaywood, 2021). However, on a sociological perspective, Lochner(2004) emphasizes education as a human capital investment that potentially increases employment(Hjalmarsson, 2012). As for crime, Lochner(2004) define it as a negative externality with enormous social costs, thus, when education potentially reducing crime in one area, the social cost removed due to the reduction of crime are added to the social benefits carried out by education.

But what makes education such a influential factor to crime? The explanation could the increase in opportunity cost, education increases the the returns to legitimate work, and it also leads to raise in skill levels and wages, those changes simultaneously increases the opportunity cost for illegal behaviour(Machin, 2010). From this perspective, education provides more job opportunities and increases their quality of life, thus reduce the possibility of people participate in crime for the seek of money or just try to survive.

Meanwhile, the idea that education keeps teenagers in school could also be the reason why education could reduce crime. As more time spent in school leads to limited time available for youngster to participate in illegal activities, and there is greater chance that teenagers stayed in school before the age of 18 will not commit crime in the future. According Brain Bell's article(2018), crime rate peeks at 18, this again confirms that high school is an extremely important period of time for youngsters.

On the crime side, the negative effect of education may not apply for all type of crime, there are evidence that education in some way could increase crime rate. Levitt and Lochner(2001) stated that males with high scores in mechanical related test are more likely to be offensive, which proves that education could also have a positive influence on crime(Machin, 2010). This also supports the debate on education could reduce crime, as the a better education environment may lead to a positive effect on crime.

Expectation on education reducing crime is to increases the opportunity cost and reduce the possibility of youngsters participate in illegal activities, and it also brings the benefit for a more productive economy. On the other hand, a better education environment could also develop skills and knowledge capable for illegal activities. However, statistical proves are needed for both argument.

Data

Research and statistics states that 18 is peek age for criminal activities, so keeping youngster in high school away from "street" could potentially reduce crime rate. And in this report, since the result in GCSE directly decides whether a student is going to high school or not, we will examine the research topic using the dataset of GCSE scores as the index to define the education level in one area.

Since the population for each boroughs are different, compare to number of recorded crime cases, rates are more suitable to represent the crime level in one area. Thus, the index for crime selected for this research is the rate of offences per thousand population, together with the crime rate for each specific crime type, further analysis can be made to better answer the research question. Both dataset are gathered from London Datastore at *data.london.gov.uk*, numbers are specific to all 32 boroughs in London, we will use the data in 2016-17 for both dataset ensure we have the latest result.

Methodology

Linear regression are selected for this report to examine the impact education could have on crime rates, and to explain the relationship between education and crime, we will assume there is a linear relationship between two variables. This line is the presentation of an equation between variables shown below, it means that the changes in one of the variable will leads to a oscillation in another.

$Y = mX + c$

Where as Y being all types of crime rate, X being the GCSE scores in London Boroughs, two constant numerical values m and c represent the relationship between two variables. Together the formula present a straight line on the plot figure for budget and proportions in different years. In order to determine whether there is a line that can represent the relationship between GCSE scores and crime rates, all variables will be put into regression models, and both numerical results and visualised results will be presented to answer the research question.

Data

The major approach we adopt for this research is to examine the correlation between variables, to be more specific is to put data into a linear regression model using python. But before the calculation in the regression model, we can use the correlation matrix to give a brief presentation of the relationship between variables. Figure 1 represents the correlation coefficients between variables, the lighter the colour is, the stronger the correlation is between two variables. When looking at the second row for GCSE scores, we can see that the box for total crime rate has a colour represents the correlation coefficient about 0.8, and similar colour also appeared in

the box for most specific type of crime rate, apart from the sexual offences rate and robbery rate. This means that there is a great chance that change in GCSE scores will lead to a change in crime rates.
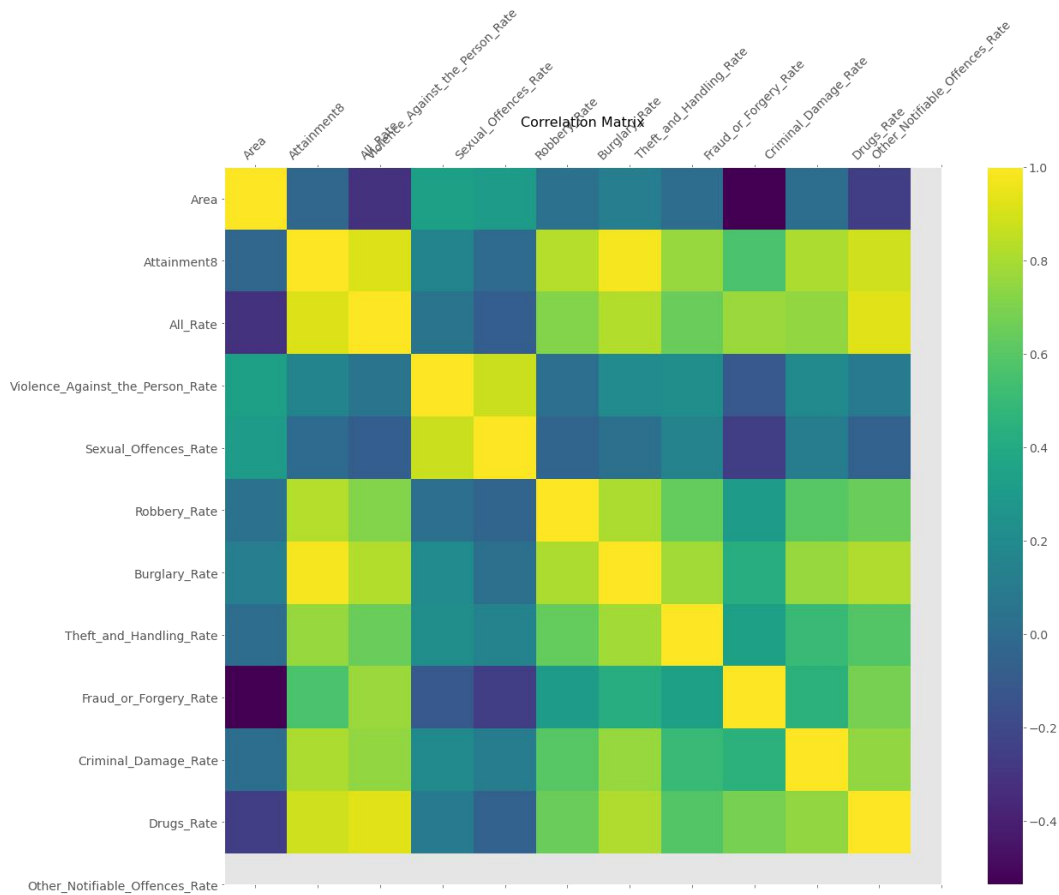

Figure 1: Correlation Matrix

Would the increase in GCSE score in one area lead to a reduction in crime rate? We can use a scatter plot with trend line to see the true relationship behind the correlation coefficient. Figure 2 shows the scatter plots for the total crime rate and all 9 specific type of crime rate, we can see trend lines with different gradients appear in the plots shown below. On the plot between GCSE score and total crime rate, we can see the trend line have a slight downward trend, which means that areas with higher GCSE score are likely to have a lower crime rate. When comes to specific crime types, surprisingly 5 out of 9 crime types have a upward trend line, which means that better performance in average GCSE scores will increase the crime rate in those specific types of criminal activity.
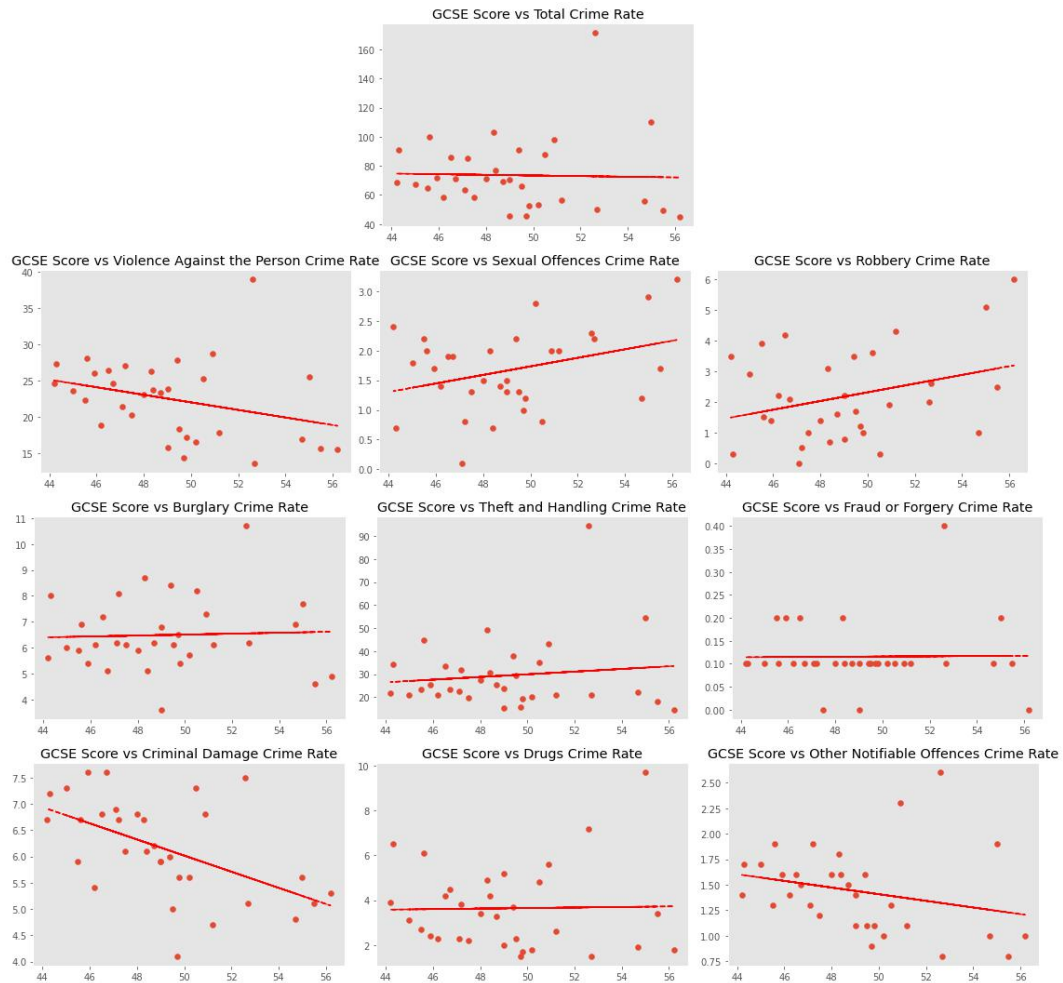
Figure 2: Scatter Plots

In order to see if the relationships shown above are true, let's now put data into a linear regression model. Figure 3 is the statistical return from the regression model, and as result, we received a R-squared value of 0.658, this means that 65.8% of the data are explained in this linear regression model. Then, let's move on to the P-value for each variables, none of the variables have a P-value below 0.05, and this number for the total crime rate is 0.111, this number is relatively low compare to others, which indicate a greater chance that changes in the predictor's value are related to changes in the response variable(Minitab, 2013).

OLS Regression Results

Dep. Variable:	Attainment8	R-squared:	0.658
Model:	OLS	Adj. R-squared:	0.495
Method:	Least Squares	F-statistic:	4.035
Date:	Sun, 16 Jan 2022	Prob (F-statistic):	0.00342
Time:	23:00:54	Log-Likelihood:	-65.470
No. Observations:	32	AIC:	152.9
Df Residuals:	21	BIC:	169.1
Df Model:	10		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	56.6789	4.690	12.084	0.000	46.925	66.433
All_Rate	-1.1588	0.697	-1.664	0.111	-2.607	0.290
Violence_Against_the_Person_Rate	1.0253	0.956	1.072	0.296	-0.963	3.014
Sexual_Offences_Rate	-0.7171	1.712	-0.419	0.679	-4.276	2.842
Robbery_Rate	0.7708	0.811	0.950	0.353	-0.917	2.458
Burglary_Rate	1.1461	0.934	1.227	0.233	-0.796	3.088
Theft_and_Handling_Rate	1.4797	0.743	1.990	0.060	-0.066	3.026
Fraud_or_Forgery_Rate	-14.3596	10.695	-1.343	0.194	-36.602	7.883
Criminal_Damage_Rate	0.7108	1.192	0.596	0.557	-1.769	3.191
Drugs_Rate	1.3226	0.775	1.707	0.102	-0.288	2.934
Other_Notifiable_Offences_Rate	-3.0126	3.064	-0.983	0.337	-9.384	3.359

Omnibus:	1.353	Durbin-Watson:	1.761
Prob(Omnibus):	0.508	Jarque-Bera (JB):	0.958
Skew:	0.047	Prob(JB):	0.619
Kurtosis:	2.158	Cond. No.	2.31e+03

Figure 3: OLS Regression Results

Together with the statistical return from the linear regression model we created, we can also have the regression plot between GCSE score and crime rates. If we look at the plot on the top left of the regression plot, we can see the presentation of residual versus fitted value of the presented variable. As the results illustrate, apart from the plot for fraud or forgery rate showing no systematic patterns of residual due to the similarity of data across London boroughs, all other 9 plots have a presentation of residual bounce randomly around the 0 line, which again indicates linear relationship between variables.
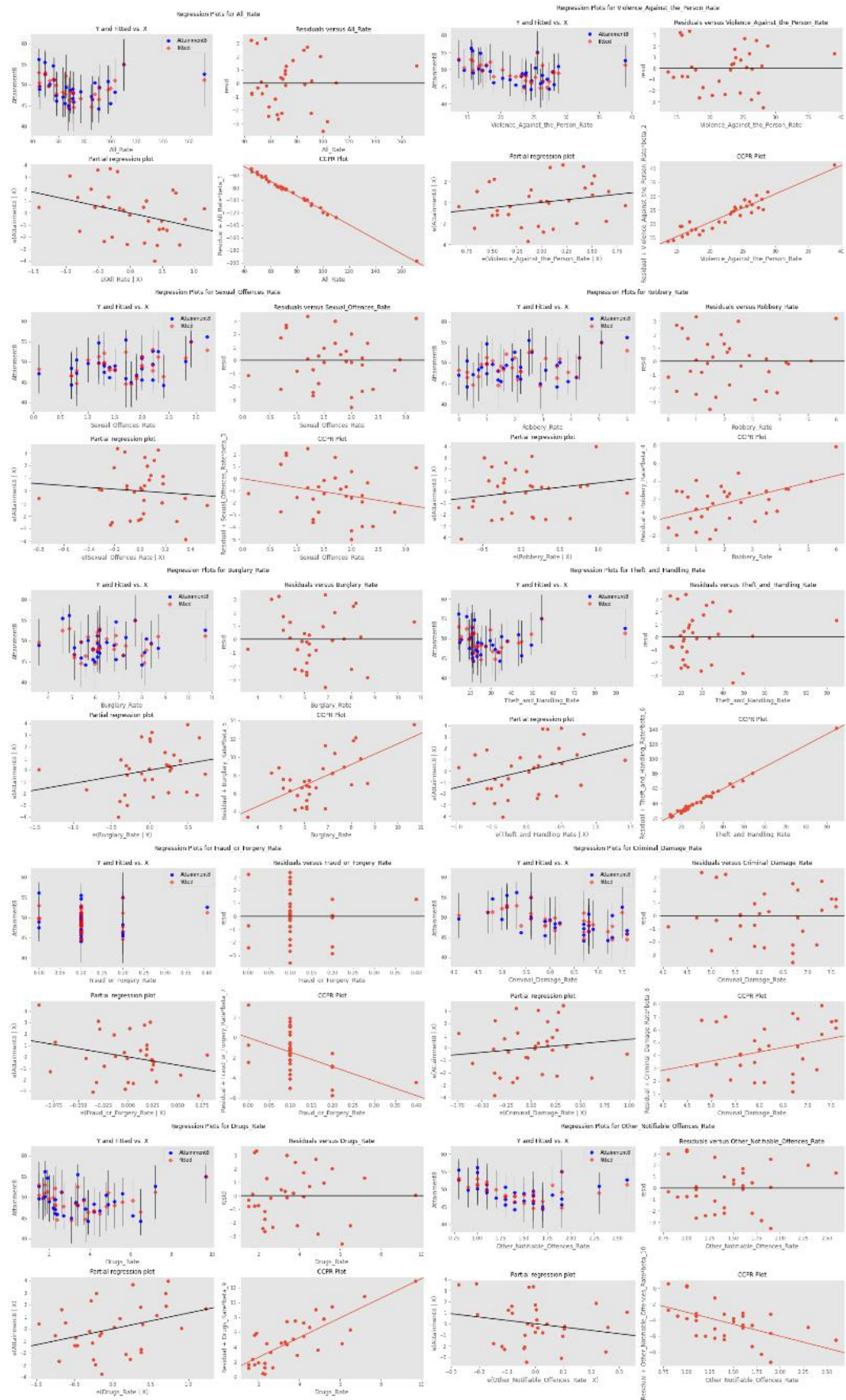
Figure 4: Regression Plots

Discussion

The regression results shown above demonstrate that there is a linear relationship between GCSE score and crime rates, together with the trend line showing a negative linear relationship between two variables, it is likely that the research question is answered. However, the impact of education on crime is an universal issue, but this report only included the data across London boroughs, the limitation in data sample size also limits the recognition of this report. Moreover, since there are only 32 London boroughs, considering the randomness of data, and the not accurate enough data for certain crime rate, the result of this report can not fully represent the impact of education on crime rate in London. Meanwhile, due to limited time and resources, GCSE score was selected as the index to represent the education level in one area, but it is very hard to determine whether GCSE score could do so. Therefore, for whom reading this report, it is necessary for you to be aware of the limitation and uncertainty of the conclusion of this report.

Conclusion

In conclusion, combining the result presented in the data section, it is likely that there is a linear relationship between education level and crime rate in London. But, the impact education could have on crime rate may not always be negative, when comes to certain types of crime, 5 out of 9 different crime types have a positive relationship shown on scatter plots, which proves the debate that education may not always have a negative impact on crime rate. However, the positive impact education could have on crime rate does not change the result showing the negative linear relationship between education and crime rate. Thus, according to the data in London boroughs, we can conclude that education is able to reduce crime rate in one area, but, it could also boost the appearance of certain types of criminal activity.

Student Number: 16018826
Word Count: 1685

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