Racial Disparities in Income and Poverty in America

Aria Narang

ABSTRACT

Since the Great Recession in December 2007, there has been a growing rate of poverty in America, destroying families' homes and lives. However, although all racial identities were negatively affected during this recession, the income disparities between white and Black individuals, as well as the ratio between white individuals and other individuals of color, was the most apparent, and this gap has yet to recover. The results of this study show that there is a strong relationship between race and poverty and that a difference in education attainment might be the reason.
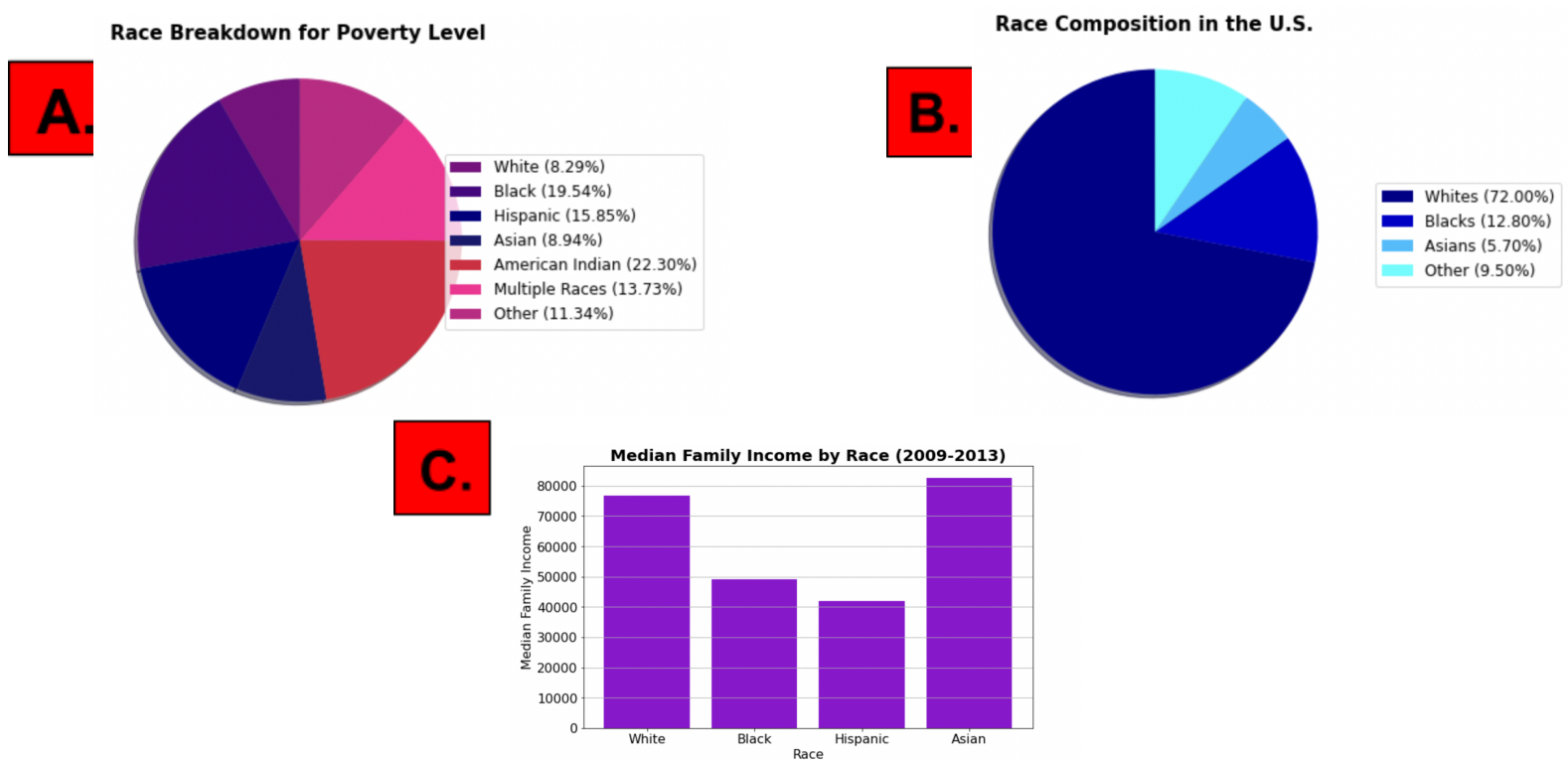
Introduction

At the end of 2007, the United States had its biggest economic downturn, leaving many out of jobs and incredibly financially burdened. Although this recession negatively impacted almost everyone, there were disparities observed, specifically racial ones. It has been noted that there was a great difference between how the recession impacted Black Americans, as opposed to white Americans, as well as other people of color, including Asians and Hispanics. Unfortunately, this gap between white individuals and people of color has not gone away since the Great Recession. Since 2007, there has still been a difference between how white Americans and people of color are affected by financial burdens in the United States. The difference that was present during the recession could have gone unnoticed due to the extreme financial pressures every individual was under. However, as the years proceeded, even in times of economic growth, the poverty level of people of color have exceeded that of white people. As we will see from the years of 2009-2012, there are many socioeconomic factors, such as median household income and education that might give some reason as to why there is such an imbalance in poverty level in America. By using methods such as hypothesis testing, regression analysis, and chi square analysis, we will be able to see what factors are contributing to this great disparity and based on these results, what can we do to improve it.

Research Question/Objective

The goal of this research paper is to understand the factors that affect the racial disparities in poverty and to try and come to a concise comprehension of the work that needs to be done to repair this damage.

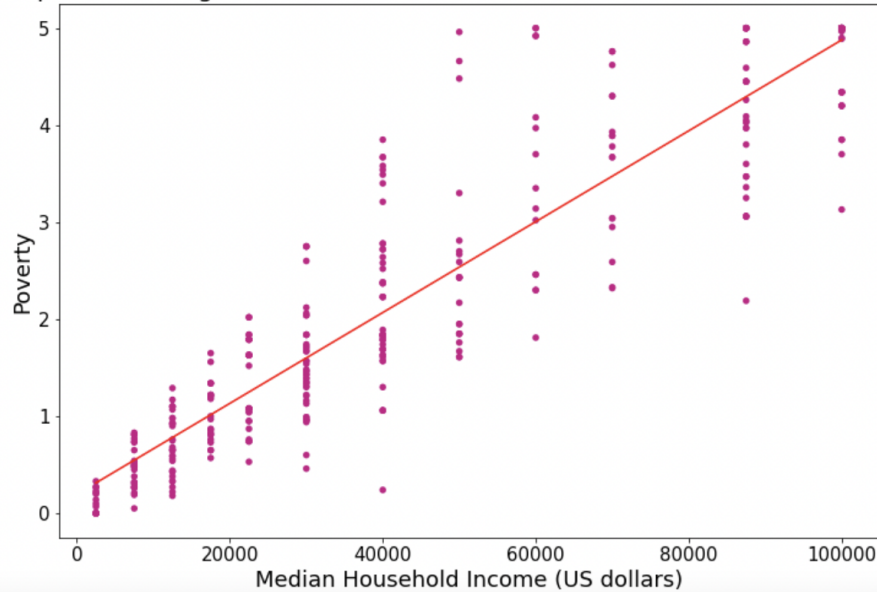**Figure 1: Visualizing Poverty Levels According to Race**

a. Figure A shows the poverty level in percent of prominent races in the United States. This data was collected by the KFF (Health Policy Analysis).

b. Figure B shows the general race composition in the United Stats so that other data that is shown in this research paper can be put into perspective. This data was collected by the U.S. Census.

c. Figure C shows the average median family income of some prominent races in the United States, showing the disparities between the four. This data was also collected by the U.S. Census.

Statistical Analysis

The statistical tests that will be conducted for the rest of this research will be using the data from a data set called NHANES. This data set contains information about individuals from different demographic backgrounds from the years 2009 to the year 2013. Poverty as a level of measurement will show up frequently in this research and therefore it is important to understand the scale that it is measured at. The poverty level in this data set goes from 0 to 5, with 0 being very poor and five being not poor. This is important information to know before analyzing the data and statistical tests that follow.

Relationship between Poverty and Household Income with Black Individuals
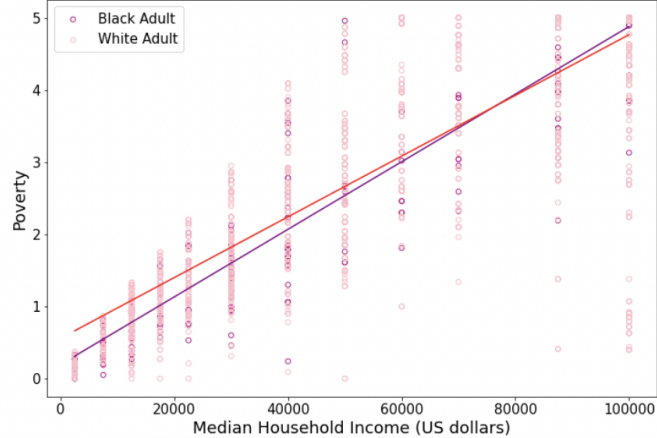
Graph 1: Simple Linear Regression Test- Black Adult Median Household Income vs. Poverty Level

A simple linear regression analysis was used to observe the relationship between poverty and median household income for Black individuals, and the resulting relationship is shown above. A significant regression equation was found (p<0.001): Poverty = Median Household Income * 4.682e- 05 + 0.1959. This equation means that as the poverty level increases (which, as I said before, means that someone is far from poor), the median household income increases as well. This proves that the lower someone's median household income is, the more likely they are to have a lower poverty level, which means they are more likely to be poor. The p-value of the slope is observed to be less than 0.0001 and is reported as 0.000, and the confidence interval is [0.083,0.309]. The correlation coefficient is 0.925 (p < 0.001), which means that the correlation is significant and positive. Therefore, as seen through the graph and the equation, there is a relatively strong, positive, and linear relationship between poverty and median household income.
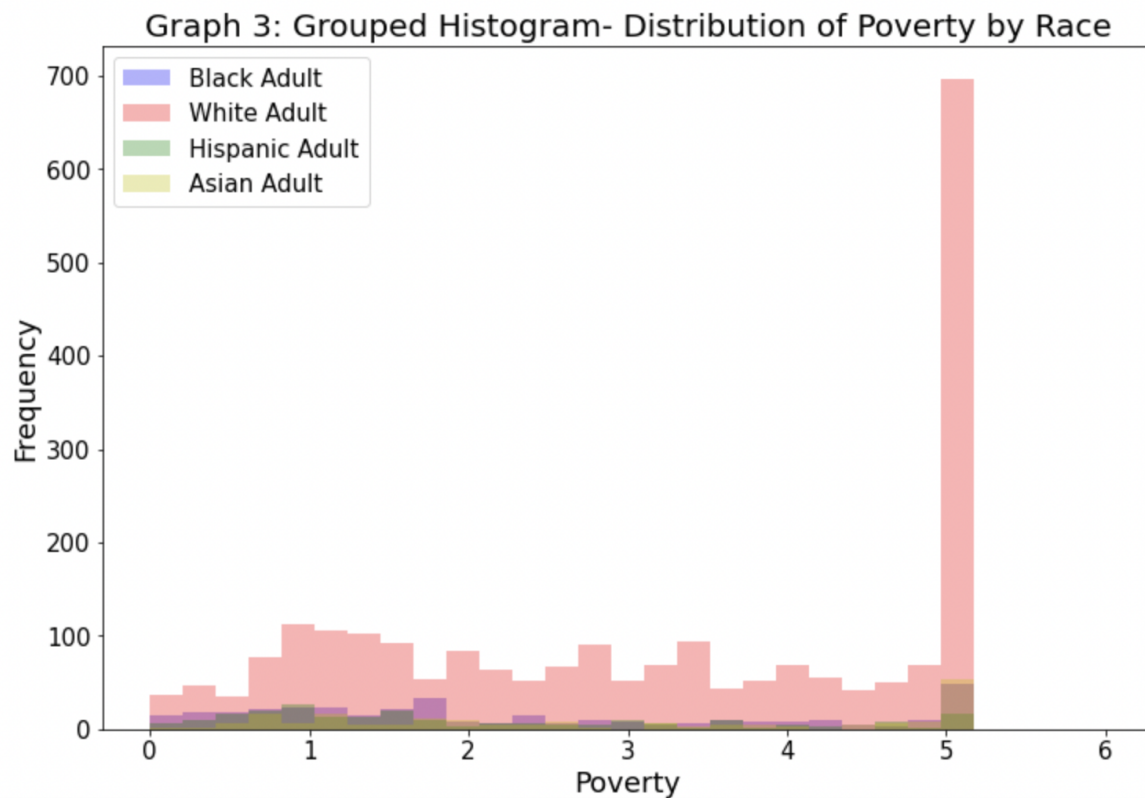
Relationship between Poverty and Household Income with Black Individuals and White Individuals

Graph 2: Simple Linear Regression Test- Comparison of Median HouseHold Income and Poverty between White and Black Individuals

Another simple linear regression analysis was conducted in order to compare this relationship between poverty and median household income to show that there is basically no difference between this relationship between white individuals and Black individuals. This test was conducted for context purposes, in order to show that the relationship between median household income and poverty stays relatively the same across races. A significant regression equation was found ($p < 0.001$): Poverty = Median Household Income * 4.208e- 05 + 0.5586. This equation indicates the same idea that the previous regression analysis test proved: the chances of being poor go up as the median income goes down. The p-value of the slope is observed to be less than 0.0001 and is reported as 0.000, and the confidence interval is [0.484,0.633]. The correlation coefficient is 0.851 ($p < 0.001$), which means that the correlation is significant and positive. Therefore, as seen through the graph and the equation, there is a relatively strong, positive, and linear relationship between poverty and median household income.
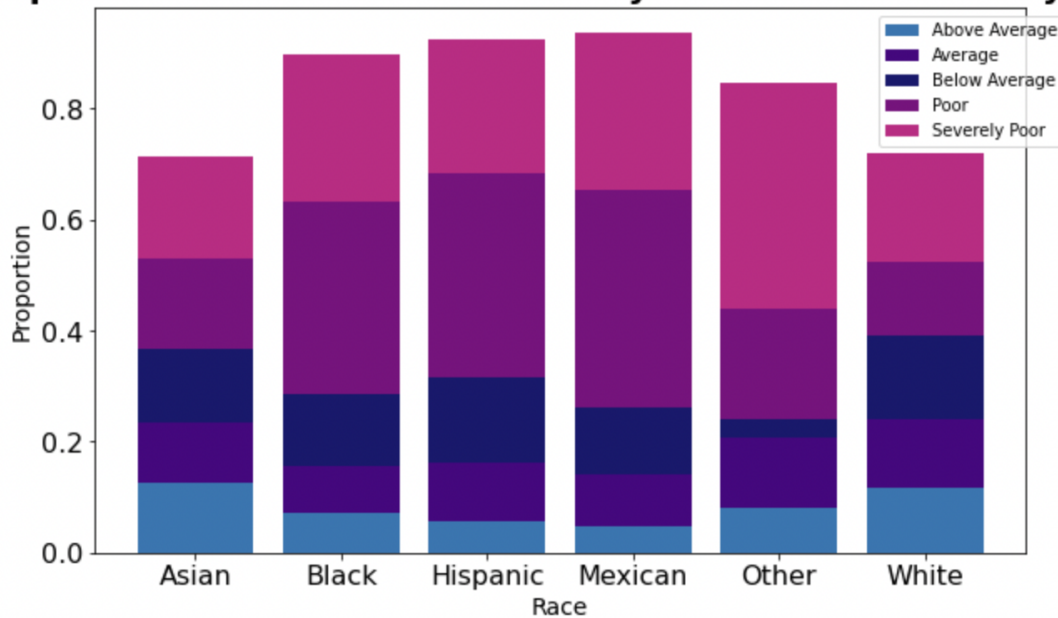
Distribution of Poverty in the United States by Race (Black, White, Hispanic, and Asian)

Although it is hard to identify specific trends with this grouped histogram, it is important to notice the spike at 5. As mentioned before, the poverty index used in the NHANES data set is on a scale from 0 to 5, 0 being very poor and 5 being far from poor. Given that there is a pink spike at 5, and pink represents white adults, it is clear that more white people evade poverty. However, we will be able to see more clearly if there really is a relationship later on when we do more statistical tests.
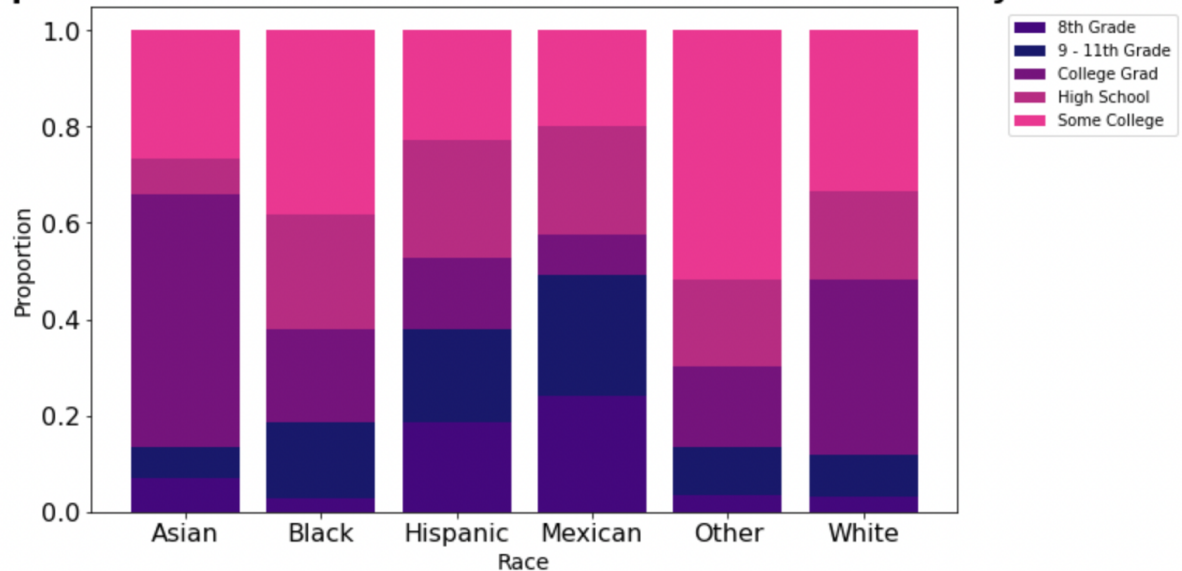
Chi-Square Test: Relationship between Poverty and Race

Graph 5: Stacked Bar Chart- Poverty level broken down by race

Although the grouped histogram above shows a spike in rich white people, it is just a diagram, and not an actual statistical test. Therefore, it is necessary to conduct a test in order to see if there really is an association between race and poverty. A chi-square test was used to see if this association exists. First, when comparing the proportions of severely poor white individuals and severely poor Black individuals, the proportion of white college graduates was reported as 0.195 with a sample size of 2992 and the proportion of Black college graduates was reported as 0.265 with a sample size of 396. The proportion difference was reported as 0.159 with a 95% confidence of [0.109, 0.208]. Lastly, there was an overall significant relationship between race and poverty with a $p < 0.0001$ and chi2 = 524.215. Therefore, poverty level is not the same for everyone and there is a significant difference of proportions between Black and white individuals, proving the previous grouped histogram after all.
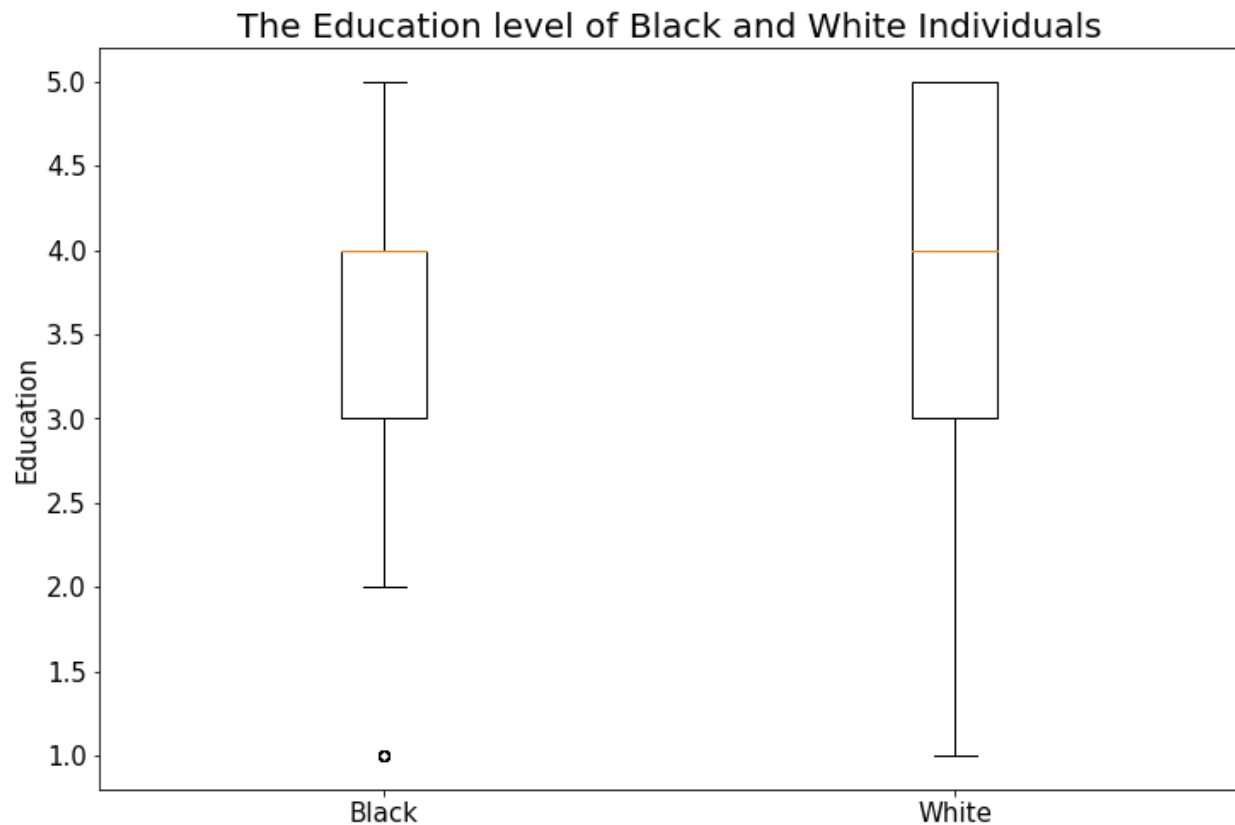
Chi-Square Test: Relationship between Education and Race

Graph 4: Stacked Bar Chart- Education level broken down by race

Since there seems to be a strong relationship between median income and poverty for both Black and white individuals, and some relationship between poverty and race, it makes sense to identify some other factors that might affect these relationships. One of those factors could be education, since education affects median income, and median income affects poverty. Therefore, a chi-square test was conducted to see if there is an association between race and education. First, when comparing the proportions of white and Black college graduates, the proportion of white college graduates was reported as 0.364 with a sample size of 2387 and the proportion of Black college graduates was reported as 0.191 with a sample size of 396. The proportion difference was reported as 0.173 with a 95% confidence of [0.129, 0.216]. Lastly, there was an overall significant relationship between race and education with a $p < 0.0001$ and chi2 = 540.521. Therefore, their education attainment is not the same for everyone and there is a significant difference of proportions between Black and white individuals.

Two Sample T-Test: Relationship between Education and Black and White Individuals

The Education level of Black and White Individuals

Now, we will perform a two sample t-test to compare two means, the average education of Black individuals and the average education white individuals. In order to do this test, each level of education was assigned a number between 1 through 5, 1 being 8th grade and 5 being a college graduate, hence the numbers on the y-axis. The average education level of Black individuals was reported as 3.55 with a standard deviation of 1.06 and the average education level of white individuals was reported as 3.91 with a standard deviation of 1.30. The average difference was reported as 0.361 with a 95% confidence interval of [0.248, 0.474.] Lastly, $p < 0.0001$, meaning that the test was significant. Therefore, there was a significant difference between the two means, meaning that on average, Black individuals have less access to higher education than white individuals.

Conclusion/Limitations

The dataset used, NHANES, most likely has some built in limitations. For example, the data was collected through surveys, meaning that a lot of individuals that were observed in the statistical analyses above may not have been indicative of the entire population. Therefore, there may have been sample sizes that could have been larger. Additionally, in the 2 sample t-test, education level, categorical data, was translated into numbers, quantitative data. This procedure could have

invoked some limitations as well, as categorical data is typically not looked at categorically. Moving towards our conclusion, the statistical analyses completed above, prove that there is a relationship between median income and poverty in both white and Black communities, that there is a relationship between poverty and race, and that there is a relationship between race and education. Although it is crucial to take the limitations above into account, these tests reveal that it is likely that different racial groups, specifically Black individuals, are not given equal access to education, and are therefore more likely to be poor.

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