

The Rich Get Richer:
An analysis of equity in high school graduation rates

Student researcher:

Emily Melvin

General Douglas MacArthur High School
3369 Old Jerusalem Road
Levittown, NY 11756

Supervising Advisors:

Mr. David Friedman and
Mr. Jason VanEron

Section I

When I was in 8th grade my cousin and many of my friends decided to attend private high schools, instead of public schools. I began wondering if the school that you attend influences the education that you receive. I especially wanted to know what factors influenced the education that *I* received.

My interest in equity continued to grow as I noticed disparities in schools. Time after time the districts of the upper-middle class and wealthy would take home the prize from math and science competitions as my school rode slumped and glum faced in the bus back to school.

When I entered my school's science research program in 9th grade I convinced my teachers that studying equity in education was important. I started out by collecting and comparing data from all of a county's public high schools. By using various statistical and GIS methods I noticed that there was a correlation between school's socio-economic status (SES) and percentage of students that graduated with a Regents diploma. This discovery made me feel as though my project could really impact people and I became even more curious about equity in education. I began testing out other socio-economic factors to see which played a bigger role in impacting graduation rates, and overtime my project evolved and expanded to include data from all 685 public school districts, with a graduating class, in New York State.

My research was conducted at General Douglas MacArthur High School in Levittown, New York.

My project was heavy on statistics and there was no one in my school that knew the statistics that I needed to use for my project, so I had to read textbooks and software manuals to figure out how to perform the statistical tests. For my project that I submitted to Intel I used stepwise linear regressions.

I hadn't been that interested in the sciences before my project, but my project taught me that the field of science is more than just a lab coat and goggles. I now understand that the sciences encompass many broad areas of study and there is a fascinating aspect in it for everyone, even if you aren't normally interested by the sciences.

Choose a topic that you enjoy. When I decided to do a science research project I was encouraged to conduct a study in the hard sciences, because both my teachers had a background in that type of science and it would be easier to find a mentor. The idea that it would be slightly easier made me really consider doing a hard science project, but I knew that it wouldn't interest me as much as my social science project did. Even though it was a lot of work, I absolutely loved my project and found it enjoyable to read articles relating to my research and to find out the results of my project. Despite not having a mentor my project was easier in the sense that I enjoyed working on it and didn't find it laborious.

Section II

Introduction:

Equity in education is and has been an area of debate for many years. One can look back at Supreme Court cases such as *Brown vs. Board of Education of Topeka, Kansas* or in any local newspaper that reports school district achievement. Equity has been defined as the state of being just, impartial, and fair and is therefore often examined in school data in order to make sure all students are given equal opportunities. This study examines the effect of the percent minority, the percent eligible for free lunch, and the expenditures per pupil on the percent of high school students that graduate with a Regents diploma, in New York State. If New York State's educational system is equitable it can be inferred that each student would have an equal chance of graduating with a Regents diploma. After examining New York State, in its entirety, Nassau and Suffolk County, the two counties that make up "Political Long Island," a region that is often regarded as having a lack of equity will be looked at. Political Long Island is generally considered to be Nassau and Suffolk County, since Kings and Queens Counties are boroughs of New York City.

According to Forman (2005), "On Long Island, poverty, race, income, family structure, and school quality are so closely linked that race is taken to be a proxy for school district quality, districts with the highest graduation rates have the lowest poverty rates and minority populations; those with high poverty rates and minority populations have low graduation rates." Michael Cohen, a Long Island Superintendent of schools agrees and stated, "Long Island is the capital of educational apartheid in America...Rather than breaking down barriers, our educational system sustains them" (Marcus, 2007). Is this perception of inequity a reality? If so, Long Island's racial

demography and economic levels should be a good representation of whether or not educational equity exists.

Methodology:

To test the effect of students' socio-economic status (SES) on graduation rates data was collected from the New York State Department of Education website on all public school districts, with a graduating class, in New York State. The percent minority, percent in each of the three minority subgroups, (Black, Hispanic, and Asian), the percent eligible for free lunch, and the expenditures per pupil were collected. The percent graduating with a Regents diploma was also determined by using the number of students who received a Regents diploma and the number of 12th graders in the district. School districts were used instead of individual schools, since some schools have extremely low graduating classes because they are located in areas that are sparsely populated. An Anderson Darling test was then used to test the normality of the data and all of the data was found to be normal. Twenty-four stepwise regressions were then conducted between the SES indicators and the percentage of students that graduated with a Regents diploma. Stepwise Regressions were performed for each indicator of SES for the State as a whole, Political Long Island, and Nassau and Suffolk counties. For each regression the response was the percent graduating with a Regents diploma. While, the socio-economic status indicators, percent minority, percent Black, percent Hispanic, percent Asian, percent receiving free lunch, and the expenditures per pupil were the predictors. These stepwise regressions were produced on Minitab V. XIV.

Results:

The r- value, know as Pearson's correlation, that was produced by the stepwise regressions was examined. The R-Sq value determines how much of the percentage of variance

in diploma rates is explained or predicted by the independent variable. The larger the R-Sq value the better the model fits the data and the R-Sq(adj) is an R-Sq that has been adjusted for the number of terms in the model and was the value that was examined in this project. The Minitab outputs can be seen in the following tables:

Table 1.

New York State:		N=685	
Socio-economic status indicators			
	R-Sq(adj) value	P-Value	
Percent Minority	.2630	0.000	
Percent Black	.2681	0.000	
Percent Hispanic	.1897	0.000	
Percent Asian	.0000	0.736	
Percent Eligible for Free Lunch	.4948	0.000	
Expenditure per pupil	.0000	0.391	

Table 2.

Nassau County:		N=44	
Socio-economic status indicators			
	R-Sq(adj) value	P-Value	
Percent Minority	.6253	0.000	
Percent Black	.5963	0.000	
Percent Hispanic	.5565	0.000	
Percent Asian	.1070	0.017	
Percent Eligible for Free Lunch	.8187	0.000	
Expenditure per pupil	.0000	0.601	

Table 3.

Suffolk County:		N=56	
Socio-economic status indicators			
	R-Sq(adj) value	P-Value	
Percent Minority	.6029	0.000	
Percent Black	.4505	0.000	
Percent Hispanic	.4977	0.000	
Percent Asian	.0250	0.126	
Percent Eligible for Free Lunch	.6518	0.000	
Expenditure per pupil	.0044	0.277	

Table 4.

“Political Long Island” (Nassau and Suffolk Counties):		N=100	
Socio-economic status indicators			
	R-Sq(adj) value	P-Value	
Percent Minority	.5652	0.000	
Percent Black	.5024	0.000	
Percent Hispanic	.5050	0.000	
Percent Asian	.0865	0.002	
Percent Eligible for Free Lunch	.7220	0.000	
Expenditure per pupil	.0000	0.833	

When the R-Sq value of a stepwise regression is between 0-.1, it is considered to have a very small correlation, between .1-.3 is a small correlation, .3-.5 is a moderate correlation, .5-.7 is a large correlation, .7-.9 is a very large correlation and .9-1 is a nearly perfect correlation. The p value shows how significant the test was and if the p value is less than .05 the results of the test are believed to not have happened by chance. Therefore based on the results, that can be seen in Table 1, in New York State there does not appear to be a high relationship between students’ socio-economic status and the percentage of students that graduate with a Regents diploma. However, the percentage that is eligible for free lunch, which represents poverty levels, produced the highest R-Sq(adj) value, for New York State.

For Nassau County, the R-Sq(adj) value for percent minority and the percentage of students that graduate with Regents diplomas was determined to be .6253, which means the data is highly correlated. The R-Sq(adj) values for the three minority groups, Black, Hispanic and Asian were .5963, .5565, and .1070, respectively. The R-Sq(adj) values for the percent Black and the percent Hispanic, both show a large correlation between the percent of students that are of those ethnic backgrounds in a school district and the percentage of students that graduate with a Regents diploma. The R-Sq(adj) value for the percent Asian in a school district is small, but significant with a p-value of less than .05, and thus for Nassau County there is a small correlation

between the percent Asian, in a school district, and the percent that graduates with a Regents diploma. Comparing the percentage of students that are eligible for free lunch in Nassau County to the percentage of students that graduate with a Regents diploma produced an R-Sq(adj) value of .8187. This high R-Sq(adj) value means that there is a very large correlation between free lunch and graduation rates in Nassau County. The last R-Sq(adj) value produced for Nassau County, compared the expenditures per pupil to the percentage of students that graduate with a Regents diploma. This stepwise regression created an R-Sq(adj) value of .0000 and a p-value of 0.601. This means that in Nassau County there is no significance between the expenditures per pupil and the percentage of students that graduate with a Regents diploma. The stepwise regressions for Nassau County, produced higher R-Sq(adj) values than those that were produced for New York State. This means that although for the state as a whole, education appeared to be equitable, in Nassau County, there is a much higher correlation between students' SES status and the percent that graduates with a Regents diploma. Also, like New York State the percent that is eligible for free lunch was the variable most correlated to the percentage of students that graduate with a Regents diploma.

Similar to Nassau County, the Suffolk data showed a higher correlation between students' SES and graduation rates than New York State's data. The R-Sq(adj) value for percent minority in Suffolk was .6029, and this means that there is a large correlation between the percent minority and the percent receiving Regents diplomas. When Suffolk's percent minority was broken down into its three sub-categories, the percent Hispanic had the highest correlation with the percent that graduates with a Regents diploma. The R-Sq(adj) value for percent Hispanic was .4977, which is deemed a moderate correlation. The percent Black also had a moderate correlation, with an R-Sq(adj) value of .4505. While the correlation between the

percent Asian and the percent that graduates with a Regents diploma proved to be insignificant with a p-value of 0.126 and a very small correlation coefficient of .0250. Once again the percent that is eligible for free lunch appeared to be most correlated to the percent that graduates with a Regents diploma, as the R-Sq(adj) value for percent free lunch was .6518. The expenditures per pupil was again proven not significant. Using the Suffolk data, an R-Sq(adj) value of .0044, and a p-value of 0.277 was produced when doing a stepwise regression for the expenditures per pupil and the percent that receives a Regents diploma. This R-Sq(adj) value means the correlation is very small.

After examining both Nassau and Suffolk County individually, their data was combined to test Political Long Island, in its entirety. The combined data was tested the same way as the individual counties; stepwise regressions were produced to examine the effects of the socio-economic indicators on the percent that graduates with a Regents diploma. When combined, Nassau and Suffolk produced an R-Sq(adj) value of .5652 for their relationship between the percent minority and the percent that receives Regents diplomas. This means that the percent minority in a high school has a large relationship with the percentage of students that graduate with a Regents diploma. The R-Sq(adj) value for the percent Black, Hispanic and Asian were .5024, .5050, and .0865, respectively. Thus, the percent Black and Hispanic, in a school district, have a large correlation, while the percent Asian has a very small correlation, with the percentage of students who graduate with a Regents diploma. The stepwise regression for the percent eligible for free lunch produced an R-Sq(adj) value of .7220 and this high correlation coefficient means that there is a very large correlation between the percentage of students in a school that are eligible for free lunch and the percent in that school that graduates with a Regents diploma. The final regression looked at the relationship between school district's expenditures

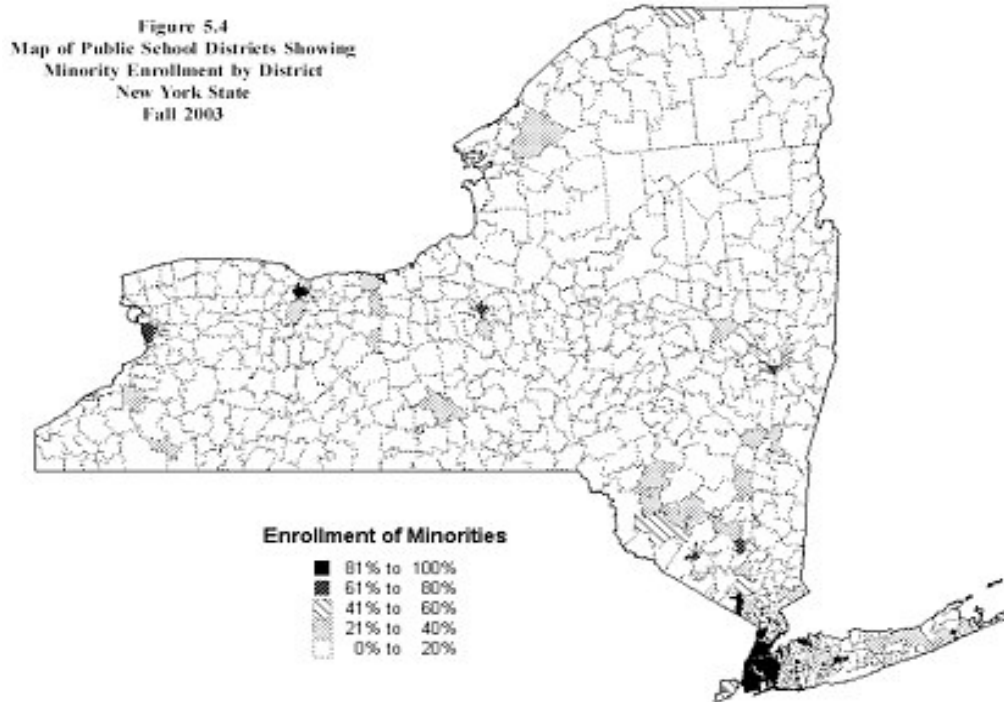
per pupil and the percent that graduates with a Regents diploma. The R-Sq(adj) value for this regression was .0000 and its p-value was .833, which means this correlation was not significant.

According to the results of the stepwise regressions there is educational equity in New York State, when examined as a whole. However, it should be noticed that there was a moderate correlation between the percent that is eligible for free lunch in New York and the percent that graduates with a Regents diploma.

Conclusions:

Despite New York's equity (no significant difference in graduation rates among varying socio-economic groups), education on Long Island does not appear equitable. Using the Long Island data there were much stronger correlations between the SES indicators and the percent that graduated with a Regents diploma. It seems that on Long Island, students who are in a low socio-economic class are less likely to graduate with a Regents diploma. There is an inverse relationship between the percent minority, percent Black, percent Hispanic, and most obviously percent free lunch, and the percent Regents diplomas. This was especially apparent in Nassau County, which had the highest R-Sq (adj) values. According to the US Census, New York State is 26.2% minority, while Nassau is 19.8% minority and Suffolk is 12.6% minority. Furthermore, 14.5% of New York's population is below the poverty level, while Nassau and Suffolk have limited minority and impoverished populations. Minority and impoverished populations seem to be segregated into small communities in Nassau and Suffolk and thus these people are concentrated into only a few school districts. When performing regressions for the whole state the large percentages of minority and families living in poverty in some small pockets on Long Island and in New York City did not have much of an impact on the state, because the influence of these regions is nominal in comparison to the overall homogenous distribution of minorities in

the state. This distribution of minorities in New York State can be seen in the following map, figure 5.4, taken from the New York, the State of Learning: Report to the Governor and the Legislature on the Educational Status of the State's Schools: July 2005 Edition <<http://www.emsc.nysed.gov/irts/655report/2005>>.



The regression for the percentage of students eligible for free lunch had the largest correlation and free lunch is an indicator of poverty. So, it appears as though students' economic status is the prime factor affecting whether or not they graduate. In contrast, a surprising result was that the relationship between expenditures per pupil and the percent graduating with a Regents diploma was not significant. This may mean that money spent is not the biggest issue affecting graduation rates, but perhaps how that money is used.

It should also be noted that the high correlation between the percentage of minority in a school and the percentage that graduates with a Regents diploma on Long Island may be due to

economic inequality, which seems to be the root of educational inequality. According to the U.S. Census, Asians tend to have the highest income, followed by Caucasians, and then by Hispanics and Blacks. Black and Hispanic children are also more likely to live in poverty (Bogges, 1998; McCormick, 1989; McLoyd, 1998; Renchler, 1993; Tough, 2006; Ward, 2006) Thus, the overlapping of the percent minority and the percent that receives free lunch is causing the relationship between low graduation rates in schools with a high percent of minority. With free lunch and graduation rates being so closely linked it continues to be evident that there is a vicious cycle of the poor becoming “poorer” and the rich becoming “richer”.

Limitations:

Limitations in the accuracy and significance of the results, result from only looking at school data for one year. It would be interesting to look at high school data trends for the past ten or twenty years. Another limitation is that equity has only been defined as graduating with a Regents diploma and a lack of equity may still exist, even if the same percentage of students are graduating, due to differences in exam scores and other factors that were not examined that effect graduation rates. Also, this project only looked at correlation and does not determine cause. Just because two variables are related, it does not mean that changes in one will cause changes in the other. A cause and effect relationship may be present, but correlation alone does not prove this. In conclusion, Pearson’s correlation only tests linear data, and if a linear correlation does not exist it does not mean that the data isn’t related in any way.

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