

**College and Career Readiness in Charlotte, NC: An Analysis on Academic
Performance, Career Readiness, and Upward Mobility.**

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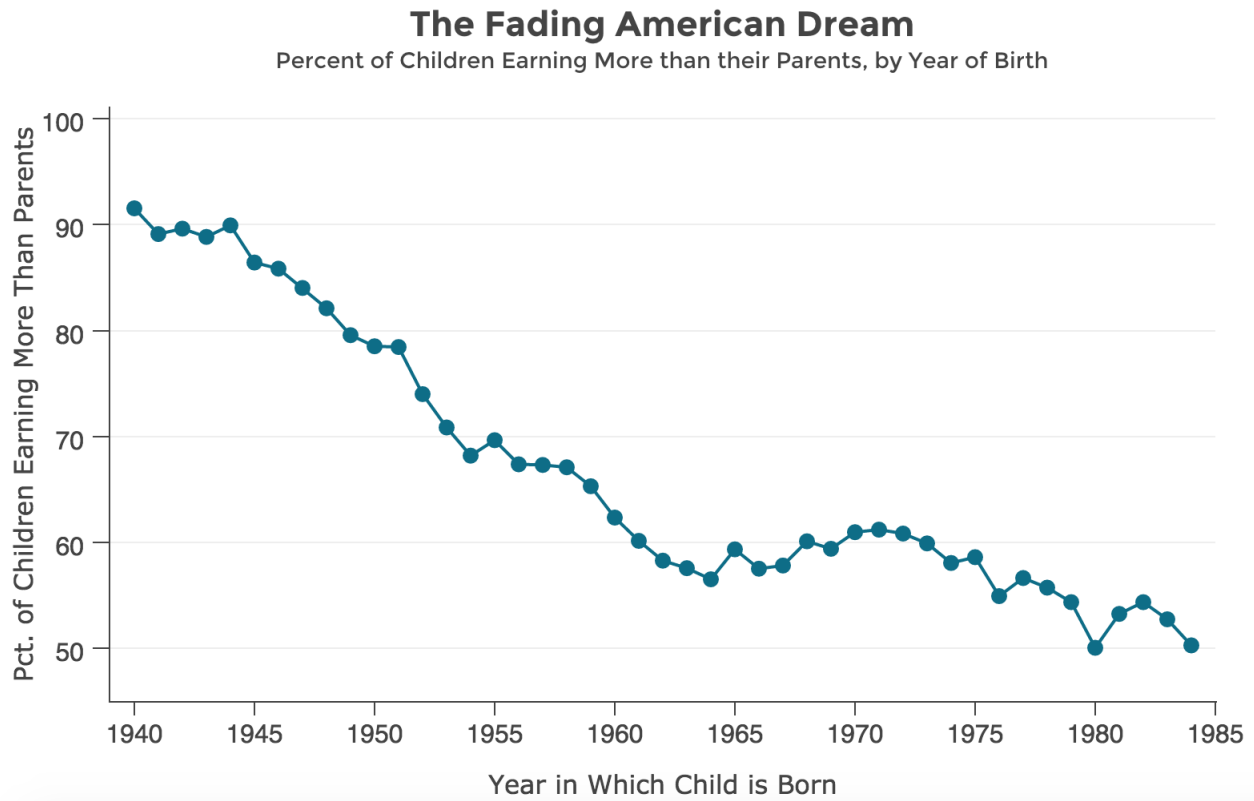


College and Career Readiness in Charlotte, NC: An Analysis on Academic Performance, Career Readiness, and Upward Mobility.

Overview

Figure 1

Source: OpportunityInsights, 2021



Opportunity Insights is a non-profit and partisan organization operating out of Harvard University in Massachusetts. They focus on research using large datasets to locate economic inequity. The team has experts in a variety of fields, using the collective disciplines to formulate solutions in battling inequality and poverty (OpportunityInsights, 2021). Opportunity Insights is led by Director Dr. Raj Chetty, Professor of Economics at Harvard. As part of a broader research initiative to examine the impacts ‘of tax expenditures on the budget deficit and economic activity’, Chetty and his colleagues

published the 2014 paper ‘Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States’, inspecting economic mobility of the fifty largest cities in the United States, and exploring the classic idea of the ‘American Dream’ (Chetty et al., 2014; OpportunityInsights, 2021). Economic Mobility in this case was defined as moving from the bottom fifth income group to the top fifth group. They found that mobility was linked with racial and income segregation, income inequality, school quality, access to social capital, and family stability (Chetty et al., 2014). Areas with high economic mobility were also found to have less segregation and income inequality, while having better schools, stable families, and a larger amount of social capital (Chetty et al., 2014). Charlotte, North Carolina (NC) was included in this report, and ranked last in terms of economic mobility (Chetty et al., 2014, p. 1). Mecklenburg County was found to be 99 out of 100 counties in terms of economic mobility (OpportunityInsights, 2021). This shocked those who saw Charlotte as a growing economic hub in the South-East, but not the residents of Charlotte struggling with this economic disparity.

In response, the city of Charlotte formed the Opportunity Task Force to address barriers of economic mobility and find solutions (Task-Force, 2017). The Task Force met with over 50 experts to understand the issue of intergenerational poverty, and thousands of local residents that experience this inequality first-hand (Task-Force, 2017, p. ii). After 18 months of research, the Task Force published its recommendations and formed Leading On Opportunity (Task-Force, 2017), a board to oversee the implementation of the recommendations in Mecklenburg County in March 2017 (Task-Force, 2017, p. ii). The Task Force identified three key determinants of economic mobility and two cross-cutting factors that have an effect on all three determinants. Family Stability, Early Care and Education, and College and Career Readiness were the three major components to a child’s ability to climb the economic ladder. Segregation (both racial and income) and Social Capital were the cross-cutting factors that can deeply affect a child’s growth. Charlotte has a history of racial and economic segregation. The poor and minority neighborhoods form a

‘crescent’ shape, while the white and rich neighborhoods are clustered in a ‘wedge’ within the crescent (Task-Force, 2017, p. iii). The home of students determines the school they go to, and in turn, the area around a school can determine the funding. It is because of this that segregation is a key issue that cannot be ignored in any three of the determinants.

Likewise, social capital is associated with higher income students. Those from low-income areas may not have the resources to succeed in school that other students do (Task-Force, 2017, p. viii). Safe places to study, knowledgeable and helpful mentors, and broad social networks are often not as readily available to low-socioeconomic students (Task-Force, 2017, p. viii). A community that is invested in its young people and a bright future for the city is essential in increasing social capital for students (Task-Force, 2017, p. iv). The Opportunity Task Force not only identified these determinants and factors, but also devised changes to be made structurally in Charlotte to mitigate economic barriers (Task-Force, 2017, p. ii). This plan included 91 recommendations, each with several implementation tactics (Task-Force, 2017, p. ii).

Our team is focusing on Career and College Readiness in Charlotte-Mecklenburg Schools (CMS), specifically at the high school level.

Career and College Readiness is a broad term, but generally speaks to a student’s ability to enroll and succeed in college, as well as their ability to enter the workforce successfully. Charlotte-Mecklenburg Schools, much like the city itself, is a school district segregated by race and wealth. See Figure 2 for median income by school zip code.

The demographics district wide do not represent the demographics at each school.

... with about 39 percent, black, 29 percent white, 23 percent Latino and 6 percent Asian.⁹ A third of the 168 schools in the system are segregated by poverty, half are segregated by race and a fifth are hyper-segregated, meaning that 90 percent of their students are from a particular race.¹⁰ Over half of all African American students attend schools that are 90 percent non-white. The majority of white students attend majority-white schools in our high-growth

Figure 2

Median Household Income of Zip Code Each School Resides In



southern and northern suburbs where most of our new schools have been built in recent years, as well as in more affluent close-in neighborhoods such as Myers Park and Eastover. (Task Force, 2017 p. 14)

With growing economic disparity, further hardships for Charlotte children should be mitigated to increase their socio-economic potential, whether that is perceived or real because of structural barriers. According to a Georgetown University study by Carnevale et al., “two of every three new jobs now require some level of postsecondary education—training credentials, an associate degree, a four-year degree, or higher” (as cited in Task-Force, 2017, p. 26).

The actual factors that are required to guarantee a student’s success is unknown (Task-Force, 2017, p. 27). This is why every avenue of assistance to increase a student’s

ability to succeed should be explored. College can lead to future success, but technical jobs should not be written off as the requirements for those jobs evolve (Task-Force, 2017, p. 27). College Readiness can be increased by more exposure to college-level studies and rigorous courses, arming students with knowledge and information ahead of their future life choices, and increasing their access to social capital. This can be accomplished through dual enrollment courses, such as the Career and College Promise Program, giving students access to college courses while in high school through Central Piedmont Community College (CPCC). Guidance counselors can provide social capital to students with little or none through their knowledge of college or career resources the students may not otherwise come into contact with (Tang & Ng, 2019). Career Readiness can involve being prepared for college, but equipping students with the knowledge and skills to succeed in the workforce out of high school is essential in preparing students for careers. Career and Technical Education (CTE) courses can provide students with the ability to attain relevant credentials, increasing their ability to find gainful employment immediately following graduation. Internships in the community is a way to build social capital for students while still in high school, building their network of employer contacts and recognition in the community. Also, internships can lay the foundation for full-time employment at the same company. Paid internships can provide supplemental means to students that would otherwise need to work at a job, freeing their time away from financial obligations by simultaneously compensating students and increasing their career-related experiences. By broadening the access of opportunities to more students, especially to low-socioeconomic students, Charlotte-Mecklenburg Schools can further their part in increasing the socio-economic growth of children from Mecklenburg County. As said best in Sprint 1, ‘In the end, it will not be just the high schools that need to prepare the future workforce, but it will take a partnership of primary, secondary, postsecondary, and community organizations to effectively leap the hurdle of economic mobility’ (Khadka et al., 2022, p. 2).

Hypotheses

Hypothesis 1 *As the number and life pathway training of mentors increase, their instruction will lead to an increase in high school academic performance, leading to higher college enrollment rates for low-socioeconomic students.*

A postsecondary education has been the traditional path towards a well-paying career and remains the primary goal of many high school students with plans after high school. Low income students have been shown to have attitudes opposing college or not have the usual educational experiences that are consistent with four-year degree students (King, 1996). The cost associated with a university education can often dissuade low income students from wanting to attend (King, 1996) Stereotype threat can be detrimental to a student's self-worth and potential (Croizet & Claire, 1998). A student that does not see themselves in successful positions will not take the steps necessary to achieve those goals. These perceptions need to be changed through active intervention from our schools and mentors that interact with students. Proactive intervention by counselors has been shown to have a positive effect on students' attitudes towards school and testing performance (Lee, 1993). Guidance counselors are a boon in the confusing college application environment. Their knowledge of the process, schools, and costs associated with enrolling in postsecondary education is essential to students, especially those of low-socioeconomic status, who often do not fully understand the financial burdens associated with college (Castleman & Goodman, 2014; Deslonde & Becerra, 2018). The duties for a counselor can go beyond just the choice and application of schools (Deslonde & Becerra, 2018). In schools with majority Black students and numerous students eligible for reduced lunches, the role of counselors extends beyond that of college applications, to mentorship in all areas of life where the student may face barriers (Farmer-Hinton & Adams, 2006). With the racial and income segregation apparent in CMS schools, more effective and socially equipped counselors are a necessity to achieve educational equity. Access to a counselor provides students with the social capital available to the counselor

(Tang & Ng, 2019). Counselors may have contacts, knowledge of helpful resources, and beneficial programs to supplement students' efforts in succeeding academically, both in secondary school and postsecondary.

The variables to operationalize the concepts in hypothesis 1 is the ratio of guidance counselors to students throughout CMS high schools. High school graduate intentions will be used to determine the training of counselors, a lagging indicator of bias and discrimination training. Academic performance is AP participation rate in each school, and the passing rate for AP exams. A three or more is considered passing for this variable. College enrollment rates will be for economically disadvantaged students in each school. Further hypothesis 1 development and additional variables will be discussed later in this paper.

Hypothesis 2 *As the quality and number of mentors increase, there will be an increase in obtained CTE Credentials by students within Charlotte Mecklenburg County Schools.*

The catalyst for economic mobility is not only related to postsecondary attainment, but technical and middle-skill jobs provide opportunities for growth and upward mobility (Task-Force, 2017, p. 27) Research results suggest that proactive engagement with students often has a direct impact on academic performance, career selection, and postsecondary decisions (Lee, 1993). An example of this is Magnuson and Starr's paper, 'How early is too early to begin life career planning? the importance of the elementary school years', it was shown that academic guidance and life pathway instruction beginning at an early age are more likely to rise in economic status (2000). This deliberation and perspective on their future allowed for a more successful transition into secondary students and beyond into prosperous careers, including technical employment. This early consideration leads to a well-informed decision in career selection, giving students that may prefer a technical vocation to that of a postsecondary degree. Early childhood habits help familiarize students with their occupational preferences, competence, and parameters of success in

their chosen field (Magnuson & Starr, 2000).

The literature suggests that parents, educators, and counselors should emphasize the pursuit of vocations within the United States, primarily because of its dichotomy of historical attrition and increased necessity; this ideal was additionally supported by the Perkins Career and Technical Education (CTE) Act of 2006 (Castellano et al., 2017) ((unpublished work) Kadka et al., 2021)

The variables to be operationalized in order to test hypothesis 2 are the number of CTE credentials that are obtained in each school by Charlotte-Mecklenburg students, as well as the percentage of students enrolled in a CTE course. The Opportunity Task Force's recommendations are to not only enroll more students in CTE courses, but provide financial assistance in acquiring the credentials (Task-Force, 2017, p. 28). The ratio of counselors and mentors to students within high schools will be used to operationalize the number of mentors. The number of counselors within Charlotte-Mecklenburg Schools is well below the suggested 250 students to each counselor (Task-Force, 2017, p. 30). The target variable will be the intentions of high school graduates to enter trade, business, or nursing after high school. Further development of hypothesis 2 concepts and other variables to operationalize are discussed later in this paper.

Data Description

An essential data source for this research is the North Carolina Department of Public Instruction (NC DPI). It is the organization in charge of executing educational legislation (2021). NC DPI governs public, charter, and educational institutions for students with hearing and vision impairments. The curriculum for North Carolina (NC) is developed by the NC DPI, as it administrates accountability, finance, and administrative work throughout NC schools. Licensing for NC teachers is also the responsibility of the NC DPI. It oversees the data collection, in efforts to aggregate accurate school records and accountability information in an organized, accessible format (2021).

The North Carolina School Report Cards is a tool utilized by the NC DPI to compile demographics, scores, and other statistics on NC schools (2021). Academic performance and enrollment is measured in a variety of ways, from test scores to Advanced Placement (AP) classes. The information ranges in years, and some features have been retired in lieu of more accurate measurements, so this data set is a bit eclectic, but comprehensive (2021).

Another dataset handled by the NC DPI is the North Carolina Public Schools Statistical Profile (2021). It was established in 1975 to provide open, general statistics on NC Public Schools at the state, school district, school, and charter school level (2021). An issue that arose with this dataset was the lack of school-level data on all features. For example, data exists at the district and school level for high school graduate post secondary intentions, but not for school personnel (2021). When following this data to the source, Common Core Data managed by the National Center for Education Statistics, it was discovered that North Carolina either did not or could not provide this granular level of data for the Common Core survey (2021). Future plans to deal with this problem are addressed later in this paper.

Charlotte's Quality of Life Explorer inspects socioeconomic and structural conditions in Mecklenburg County (2022). Information regarding these topics are available as interactive maps, tables, and downloadable reports by neighborhood (2022). Reports can be generated by filtering data geographically, allowing for unique geospatial analysis, such as the 'crescent and wedge' or the light rail corridor (2022). This source of data was used to find the 2019 median household income by zip code in Mecklenburg County. This is the current placeholder value for economic data per school, and will be used to separate schools into rough economic clusters (2022).

Table 1*Codebook*

Variable	Information		
	Years ^a	Type	Description
agency_code	N/A	Text	Unique six digit school identifier code. All begin with ‘600’ digits
school	N/A	Text	Name of the school.
zip_code	N/A	Text	Zip code of the school.
year	2011–2021	Discrete	Year of data observation
2019_med_hh_inc	2019	Discrete	2019 Median Household Income by Zip Code
int_pubsr	2011–2020	Continuous	Percentage of high school graduates with intention to enroll in a public senior institution
int_commcoll	2011–2020	Continuous	Percentage of high school graduates with intention to enroll in a community or technical college
int_trdbusnrs	2011–2020	Continuous	Percentage of high school graduates with intention to enter trade, business, or nursing
AP_pass_pct	2014–2020	Continuous	Percentage of high school students that are enrolled in Advanced Placement classes
AP_part_pct	2014–2020	Continuous	Percentage of Advanced Placement exams with a score of 3 or better
CTE_cred_pct	2018–2020	Continuous	Percentage of high school students enrolled in Career and Technical Education courses

Note. Table continued on next page.

^aYear refers to end of school year. 2011 refers to the 2010–11 school year.

Table 1*Codebook (continued)*

Variable	Information		
	Years	Type	Description
CTE_enroll_pct	2018–2020	Continuous	Percentage of credentials earned by students enrolled in Career and Technical Education courses
enroll_Disadvantaged	2011–2019	Continuous	Percentage of economically disadvantaged high school graduates enrolling in college

^aYear refers to end of school year. 2011 refers to the 2010–11 school year.

Table 2*Summary Statistics*

Variable	Statistics					
	Non-Missing Count	Mean	Std	Min	Max	Missing
AP_pass_pct	195	0.406	0.23	0.05	0.87	42.14 %
AP_part_pct	195	0.219	0.125	0	0.72	42.14 %
int_commcoll	337	0.35	0.162	0	1	0 %
int_pubsr	337	0.398	0.181	0	1	0 %
int_trdbusnrs	337	0.016	0.02	0	0.139	0 %
CTE_cred_pct	24	0.143	0.14	0	0.54	92.878 %
CTE_enroll_pct	78	0.661	0.148	0.221	0.98	76.86 %
enroll_Disadvantaged	209	0.378	0.219	0	0.919	37.982 %

Note. Histogram distributions for each variable can be found in the appendix.

Hypothesis 1 and 2 have both run into roadblocks in terms of operationalizing variables. In terms of operationally defined variables, the number of school counselors per high school is unavailable. Instead, only the district level aggregate data exists, broken down by primary and secondary schools. Although an increase is shown in total counselors every year, the economic disparities between Charlotte schools is not addressed with this operationalization. Social capital variables are the number of counselors and median household income. These are relatively poor proxies for social capital, considering we do not have the school level data on guidance counselors and median household income doubles as our only economic status indicator.

Accountability laws and data collection standards are prone to change, which makes

the data available change. CTE course enrollment and credentials earned by students was only publicly available in 2017 and on. This makes an analysis of Career and College Readiness before and after the formation of LOO difficult. At the same time, data that does have expanded years may be available in a retired dataset, but with different collection standards. For example, students participating in the College and Career Promise Program from CPCC is available from 2017 and on, however before this the data is only available for students enrolled in any postsecondary classes. Thus far, the hypotheses are not fully operationalized by the variables collected. A plan has been made to address this issue, and is covered later in this paper.

Analysis

Methodology

The available data was filtered to group schools based on the median family income. For the year 2021, the median family income for the Charlotte region, according to the US census bureau, is \$62,817. As a loose grouping of schools, the schools where the median income was more than \$62,817 were classified as high socioeconomic groups and the schools where the median income was less than \$62,817 were grouped as low socioeconomic groups. The data was further filtered creating datasets for before and after 2017 for each socioeconomic group.

Hypothesis 1

In order to test hypothesis 1 which asserts that increasing the numbers of mentors will eventually lead to higher college enrollment for low socioeconomic students, intention for enrolling in community college, intention for enrolling in senior institutions, AP participation rate, AP passing rate, and enrollment of disadvantaged students were considered for analysis and building model. Enrollment of disadvantaged students is considered as a response variable and the other variables are considered predictors. The correlation between the variables for both socioeconomic groups before and after 2017 were calculated. The correlation matrix showed that students from higher socioeconomic status,

both AP participation and AP passing rate have negative correlation with intentions of enrolling in community college whereas the same variables have positive correlation with the intention of enrolling in senior public institutions. This indicates that the students from higher socioeconomic backgrounds who participated in AP courses are more likely to enroll in senior public institutions. For low socioeconomic student group, the enrollment variable and AP participation rate and AP passing rate have a higher correlation coefficient for data after 2017. However, higher socioeconomic status students, AP and community college enrollment intentions are negatively or insignificantly positively correlated indicating that students from higher socioeconomic groups are less likely to intend to go to community college. For this group the correlation of AP with intention to enroll in senior public institutions is higher indicating that this group of students are more likely to intend to enroll in senior public institutions. A linear regression model was constructed using enrollment of disadvantaged as dependent variable and the rest of the variable as predictors. The model was tested for any multicollinearity among the predictor variables, the VIF test showed no indication of presence of multicollinearity. However, the parameter estimates associated with AP participation rate, AP passing rate, and community college intentions were statistically insignificant. Also log transformation on dependent variable indicated better linearity. So a final model was created, dropping the insignificant predictors and performing log transformation on the dependent variable. The model was statistically significant with improved adjusted R-square and lower standard error. The model passed normality and constant variance assumptions.

Correlation coefficients between the predictors and the response variable in the data

before and after 2017 is shown in table 4.

Table 4

Correlation Coefficients

Dependent		Independent			
		Intention of Com- munity College	Intention of Pub- lic Senior Institu- tions	AP Participa- tion Rate	AP Rate
College		Pre 2017			
Enrollment of	0.222	-0.048		-0.18	-0.609
Economically					
Disadvantaged		Post 2017			
Students	0.014	0.081		0.1182	0.112

The correlation coefficients among the dependent and independent variables before 2017 are all negative indicating the predictors were not positively influencing the enrollment of disadvantaged students. However, the correlation coefficient among the same variables after 2017 are all positive indicating that these predictors are starting to positively influence the response variable, enrollment of disadvantaged students.

The model for data after 2017 also shows no presence of multicollinearity. However, the summary of the model shows that none of the predictors are significant in explaining the variability in the response variable. This is an issue our team is going to look into at depth in the next project.

Hypothesis 2

Hypothesis 2 currently has no data on CTE enrollment and credentials earned before 2017. K-Nearest Neighbors (KNN) was discussed as a method for filling in this missing data, however, it is getting trained on only data post-2017. This is after the

creation of LOO, which would be training data before the recommendations on data made after the recommendations. A KNN model was decided against due to this reason, as the current objective is to compare pre-2017 with post-2017 data. This missing data presents a problem for testing hypothesis 2. Plans for dealing with this issue are addressed later in this paper.

Theoretical Analysis

Conclusion

In both hypothesis 1 and hypothesis 2, the only concepts measuring social capital are the social capital that guidance counselors provide to students and median household income. This is neglecting the many other sources of social capital that could benefit students on their journey. Higher socioeconomic areas have been associated with higher social capital. This lack of consideration on the effect of low social capital on academic success leaves a gap in the research that needs to be addressed. Economic mobility has been associated with health, and health with access to parks or green spaces (Browning & Rigolon, 2019). Considering socioeconomic status plays a role in the level of health, access to more green spaces can be beneficial to the overall health of low-socioeconomic students (Browning & Rigolon, 2019). Improving health can improve cognitive function (Browning & Rigolon, 2019). Healthy students are less likely to miss school and not fall behind on their work. Access to green spaces can be a conceptualization for social capital, as recreation has been a recommended method to foster social capital (Degraaf & Jordan, 2003). Schools having programs that are proactive in students' lives can also help improve social capital. Access to more in-depth advising, college prep services, and internships can help build the social capital of a student. By inspecting school programs, we can operationally define another source of social capital. Available data will be explored to operationalize various sources of social capital for Project 2. The proxy for the economic status of the schools could be better defined. Some avenues the team is exploring to do this are: tax return data, poverty-to-income ratio, and eligibility of reduced lunch within the

student population. Tax return data is available at zip code, making it very easy to join with preexisting data. This data is publicly available from the Internal Revenue Service (IRS) and even includes information on income bracket or real estate taxes paid. This can be a proxy for the economic status of the school zone. Some shortcomings to this are that one can live in a zip code and pay property taxes in another zip code. The number of tax returns can be a good estimator of the number of households within a zip code. The poverty-to-income ratio is a dataset that has information on the poverty of each school. The upside to this is that it is at school level, it has unique identifiers that are easily joined with the preexisting data, and provides a good look at the poverty level in each high school. The drawbacks of this is that the data set only contains information from the 2015–16 school year and onward. Eligibility for reduced lunch has often been linked to low income. This is a method that can help estimate the percentage of students in poverty, but there have been conflicting findings on if reduced lunch equates to poverty. Further research is needed before this indicator can be used.

Similarly, the current geographic data for each school is by zip code. School districts are not zoned by zip code, so this can skew the results for the socioeconomic status of each school. Neighborhood codes can be used, in conjunction with maps of the school zones to map out which neighborhoods belong to which school. This process would be manually done, as there is no registry of addresses belonging to each high school. Instead, this information is in the form of maps with little detail and no street names. Cross-referencing these maps with the interactive Quality of Life Explorer, it would be possible to obtain all neighborhood codes belonging to each school. The team is discussing the future of zip codes as the measure for school zones.

For hypothesis 1, AP participation and passing rate can be an issue in future analysis. There are a variety of indicators to measure high school success, such as grade point average, graduation rate, and test scores. Another indicator has been left out entirely, which is how many students are enrolled in college courses during high school.

This data was just recently discovered by the team and has not been incorporated into the hypothesis model, nor analysis. Exposure to college courses and a head start on credits can be beneficial to high school students entering postsecondary education. This was a concept that was worked out of hypothesis 1 due to data limitations and the team is eager to include this variable going forward. This variable will be included in Project 2. Other measures of academic performance, such as the ones listed above, will be investigated to replace or supplement AP passing and participation rates.

The future of Hypothesis 2 is largely determined by a CMS data request. Public data on the predictor variables is not available. Currently, the team is reaching out to the research request manager at CMS. Information on CTE and number of counselors are both being requested, and information on spending for staff training to better operationalize the life pathway and discrimination training of mentors. If this data can be made available to the team, then hypothesis 2 will receive the same analytical methodology as hypothesis 1. If not, hypothesis 2 will be altered in a way that is measurable with available information. The data request manager will be emailed in the near future.

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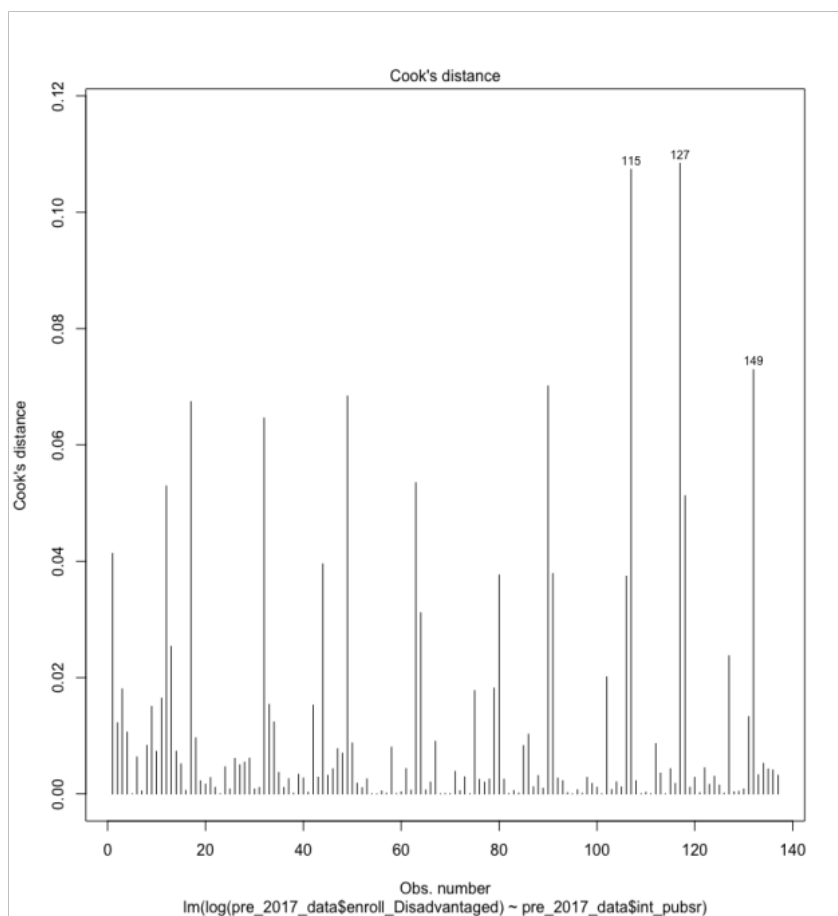
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Appendix A

Analysis Plots

Figure A1

Cooks Distance

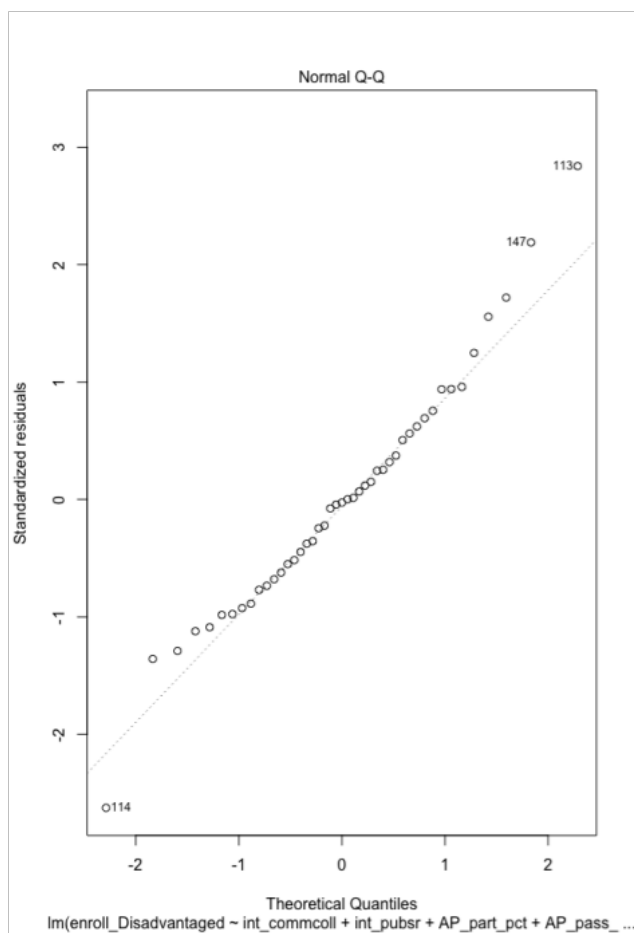


Appendix B

Analysis Plots

Figure B1

Q-Q Plot



Appendix C

Variable Distributions

Figure C1

AP Participation Histogram

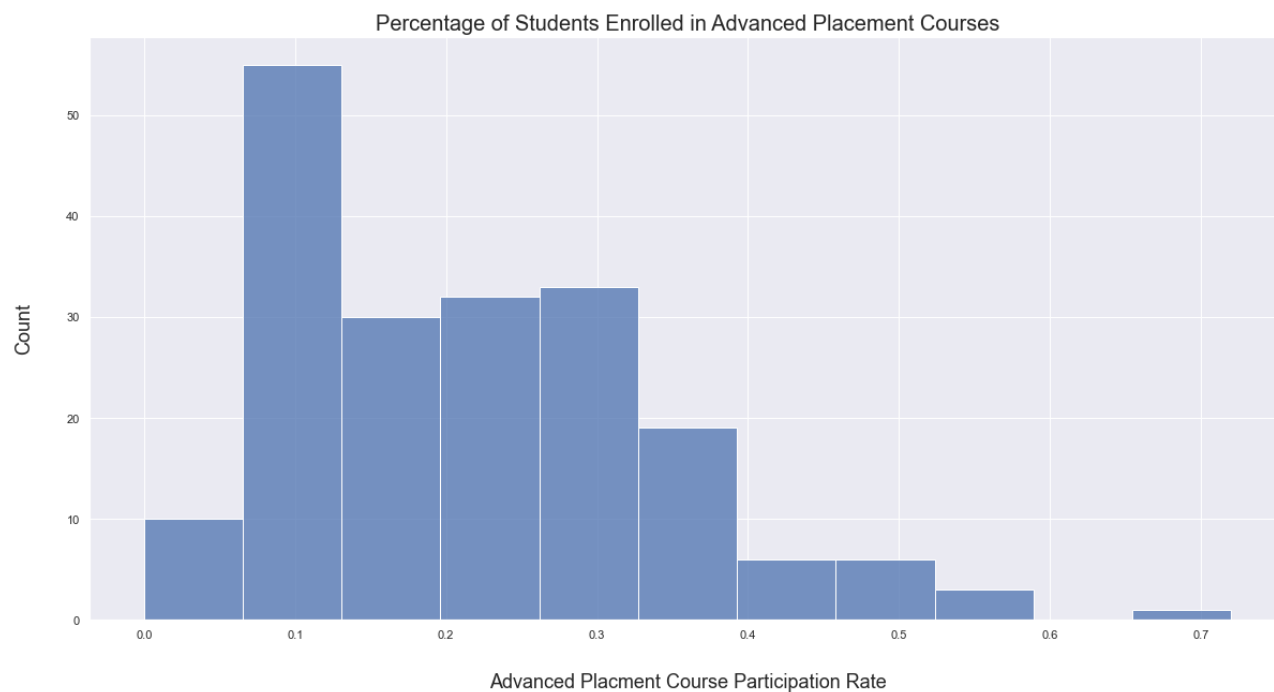


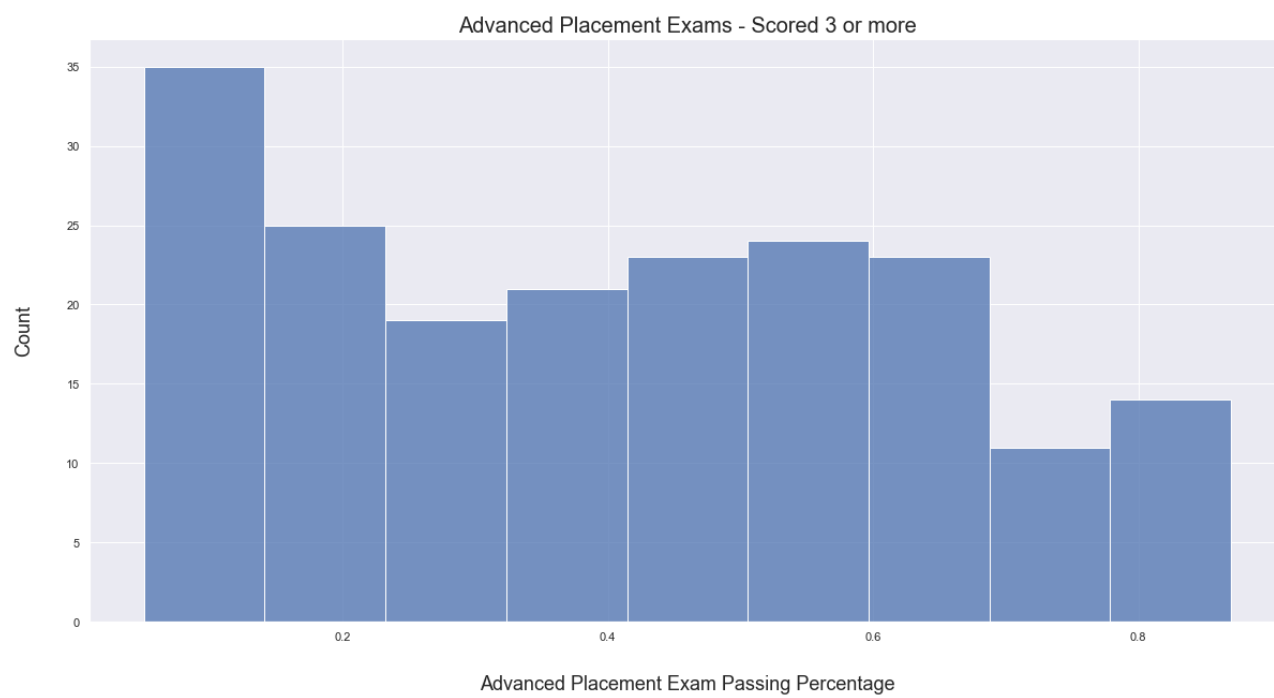
Figure C2*AP Passing Histogram*

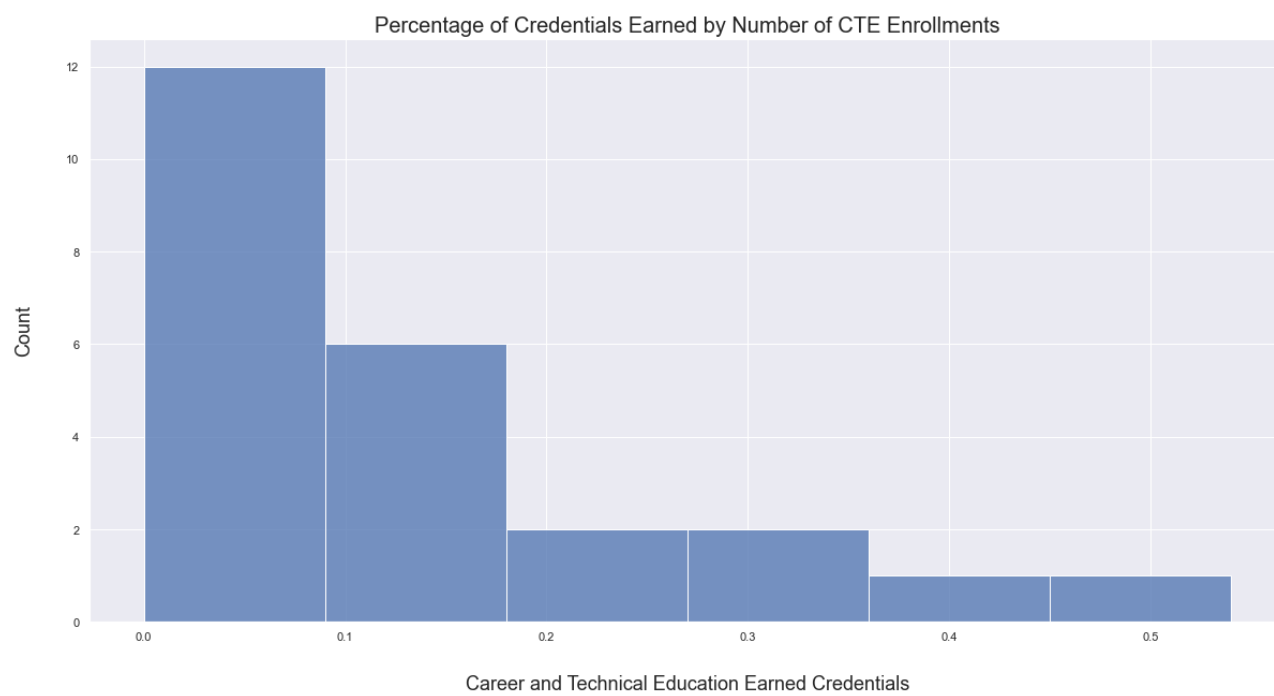
Figure C3*CTE Credentials Histogram*

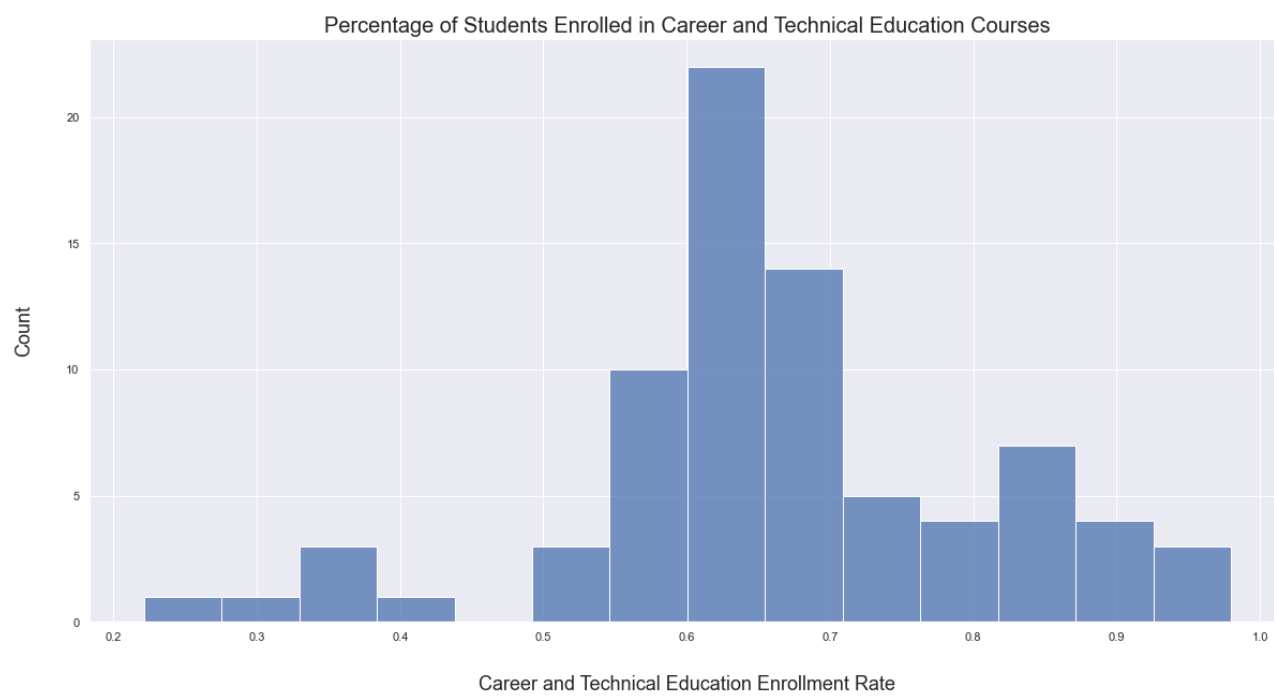
Figure C4*CTE Enrollment Histogram*

Figure C5

Community College Intentions Histogram

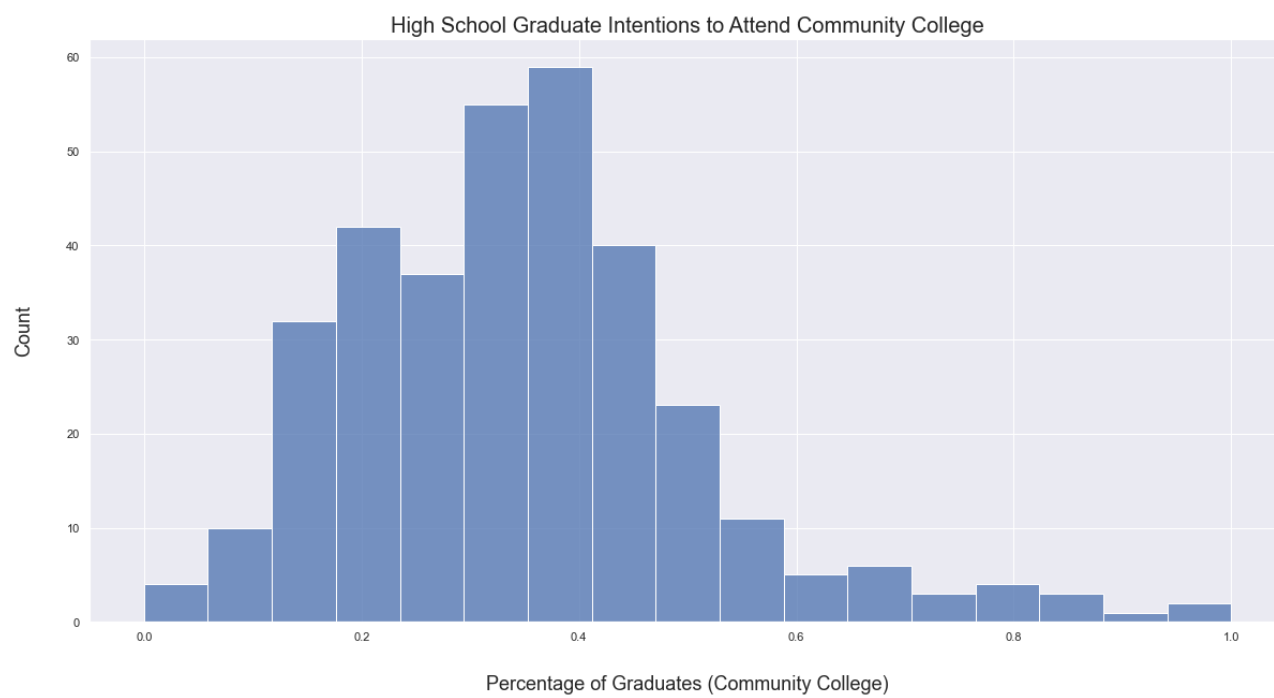


Figure C6

Public Senior Institutions Intentions Histogram

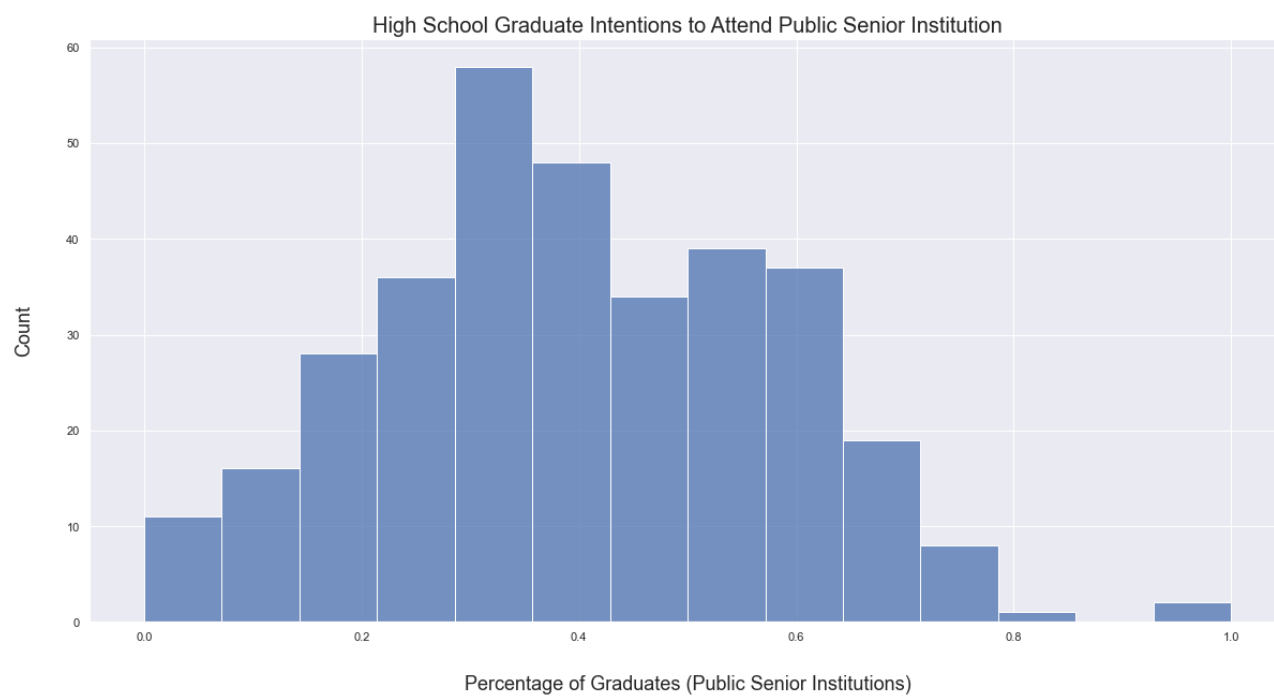


Figure C7*Trade/Business/Nursing Intentions Histogram*