Sprint 2

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

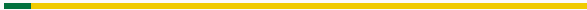Khem Khadka   Cody Scott   Joshua Hernandez

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DTSC 4301
School of Data Science
University of North Carolina at Charlotte
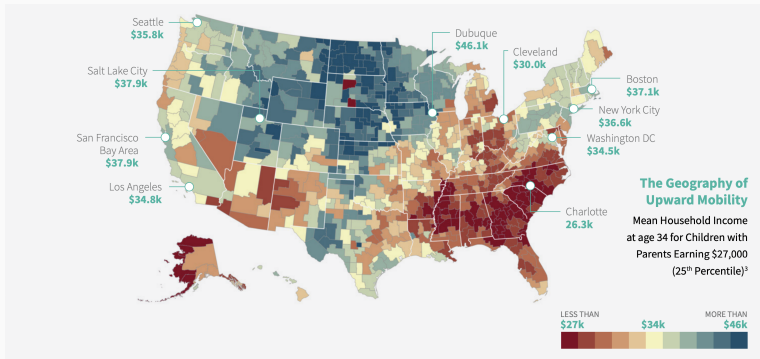
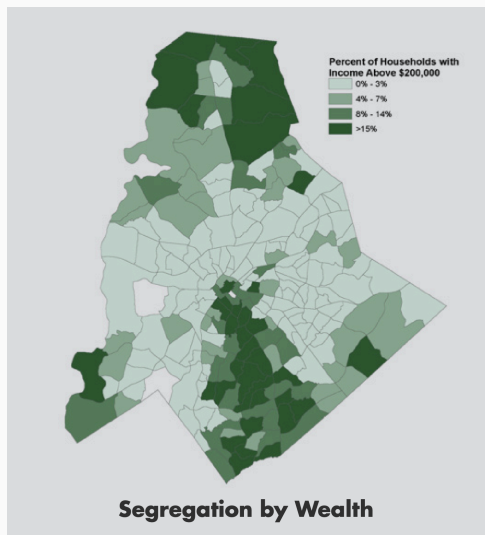# Table of contents

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Overview

Project Overview

- Out of 50 largest cities in the United States, Charlotte ranks last in upward economic mobility

- Leading On Opportunity Task Force worked with experts and communities to recommend structural changes to improve mobility

Figure 1

The Geography of Upward Mobility
Mean Household Income at age 34 for Children with Parents Earning $27,000 (25th Percentile)[3]

Seattle $35.8k
Salt Lake City $37.9k
San Francisco Bay Area $37.9k
Los Angeles $34.8k
Dubuque $46.1k
Cleveland $30.0k
Boston $37.1k
New York City $36.6k
Washington DC $34.5k
Charlotte 26.3k

LESS THAN $27k $34k   MORE THAN $46k

Source: Chetty Report, 2014

Figure 2

Segregation by Wealth

Percent of Households with Income Above $200,000
- 0% - 3%
- 4% - 7%
- 8% - 14%
- >15%

Source: Leading on Opportunity Report, 2017

Will the recommendations made from the task force show a positive effect on minority children, and children from low economic statuses in educational performance, college readiness, or career readiness?

Hypotheses

Hypothesis 1

As the number and quality of mentors increase, there will be an increase in academic performance and college acceptance rates for low-socioeconomic students.

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Variables

- ▷ AP Participation Rate
- ▷ AP Passing Rate
- ▷ College Enrollment Rate
- ▷ Total Guidance Counselors in Charlotte-Mecklenburg Schools
- ▷ Quality of Mentor Bias Training

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.
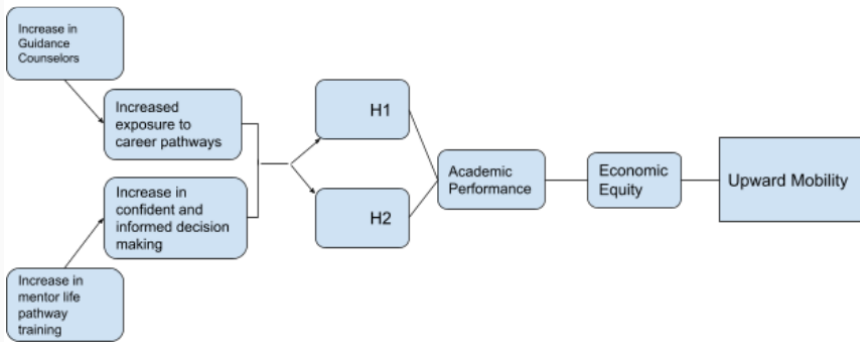
Hypothesis 2

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

Variables

▷ Career and Technical Education Enrollment
▷ Career and Technical Education Credentials
▷ Total Guidance Counselors in Charlotte-Mecklenburg Schools
▷ Quality of Mentor Bias Training

Data Sources

Data Sources

Sources

▷ North Carolina Department of Public Instruction
  - North Carolina School Report Cards
  - North Carolina Public Schools Statistical Profile
  - The Educational Directory and Demographical Information Exchange (EDDIE)

▷ The National Center for Education Statistics
  - Education Demographics and Geographic Estimates on School Neighborhood Poverty

▷ Charlotte Open Data Portal
  - 2019 Median Household Income by school Zip Code

Variable Information
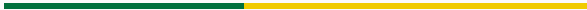
Table 1

Codebook

Variable	Information		
	Years	Type	Description
AP_pass_pct	2014-2020	Continuous	Percent of AP exams with a score of 3 or more
enroll_**subgroup**	2011-2019	Continuous	Percent of students enrolling in college by demographic
CTE_cred_pct	2018-2020	Continuous	Ratio of CTE credentials earned over students enrolled in CTE programs
total_counselors	2015-2020	Discrete	Guidance counselors employed district wide
int_**intention**	2015-2020	Continuous	Percent of students by post-secondary intention

Note. Rest of codebook available in appendix

Table 2

Summary Statistics

Variable	Statistics					
	Count	Mean	Std	Min	Max	Missing
AP_pass_pct	136.0	0.43	0.23	0.05	0.84	0.04%
enroll_Disadvantaged	63.0	0.36	0.19	0.07	0.85	0.56%
enroll_All	42.0	0.63	0.17	0.34	0.95	0.70%
CTE_cred_pct	19.0	16.26	14.95	0.0	54.0	0.87%
total_counselors	142.0	440.77	46.77	361.0	508.0	0.00%
int_employ	142.0	11.24	2.66	8.3	15.0	0.00%
int_tradesch	142.0	0.9	0.15	0.7	1.1	0.00%
int_commcoll	142.0	33.81	1.92	31.3	36.9	0.00%
int_pubsr	142.0	40.58	1.48	38.4	43.4	0.00%

Note. Rest of variables can be found in the appendix.

Analysis and Validation

Potential Analysis

Regression

▷ Multivariate Regression

▷ Random Forest Regressor

Evaluation Metrics

▷ R and R^2

▷ Mean Squared Error

▷ Mean Absolute Error

Chi-Squared Test

▷ Requires binning the data

▷ Determine significance of relationships between variables

▷ Metric to evaluate model performance

Hypothesis Validation

Limited Career and Technical Education Data

- ▷ Requires binning the data
- ▷ Determine significance of relationships between variables
- ▷ Metric to evaluate model performance

Advanced Placement as a Measure of Academic Success

- ▷ Conflicting findings in literature
- ▷ Supplement with GPA, Reading, or Math scores

Guidance Counselor Aggregation Level

- ▷ Current aggregated at the district level, not individual school

Next Steps

▷ Search for more descriptive counselor data

▷ Incorporate community and school organizations that help increase the social capital of students

▷ More descriptive demographic information of schools and surrounding zones

▷ Adjust hypotheses accordingly

QUESTIONS?

Appendix

Table 1

Codebook

| Variable	Info		
	Years	Type	Description
AP_part_pct	2014-2020	Continuous	Percent of students enrolled in AP classes
CTE_enroll_pct	2018-2020	Continuous	Percentage of students enrolled in a CTE program
2019_med_hh_inc	2019	Discrete	2019 Median Household Income by Zip Code

Table 2

Summary Statistics

Variable	Count	Mean	Std	Min	Max	Missing
			Statistics			
AP_part_pct	138.0	0.22	0.13	0.0	0.57	0.03
CTE_enroll_pct	69.0	65.91	14.8	22.12	97.99	0.51
enroll_AmericanIndian	0.0	nan	nan	nan	nan	1.0
enroll_Asian	31.0	0.52	0.31	0.06	0.95	0.78
enroll_Black	88.0	0.41	0.21	0.06	0.95	0.38
enroll_EnglishLearners	12.0	0.3	0.16	0.05	0.55	0.92
enroll_Female	91.0	0.48	0.19	0.15	0.92	0.36
enroll_Hispanic	65.0	0.25	0.19	0.05	0.7	0.54
enroll_Male	87.0	0.4	0.18	0.11	0.84	0.39
enroll_Twoormore	13.0	0.65	0.21	0.05	0.93	0.91
enroll_PacificIslander	0.0	nan	nan	nan	nan	1.0

Note. Continued on next slide.

Table 2

Summary Statistics

| Variable	Statistics					
	Count	Mean	Std	Min	Max	Missing
enroll_Disabilities	16.0	0.39	0.12	0.24	0.66	0.89
enroll_White	63.0	0.52	0.25	0.05	0.91	0.56
int_military	142.0	2.6	0.3	2.2	3.0	0.0
int_other	142.0	1.75	0.81	1.0	3.1	0.0
int_privjr	142.0	0.33	0.11	0.2	0.5	0.0
int_privsr	142.0	8.75	0.63	7.8	9.5	0.0

Figure 3: AP Participation Percent over Time
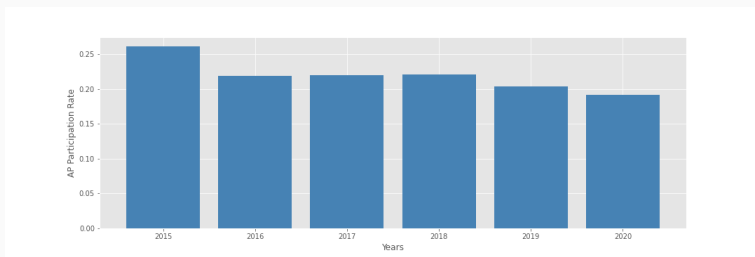
Figure 4: AP Pass Rate over Time
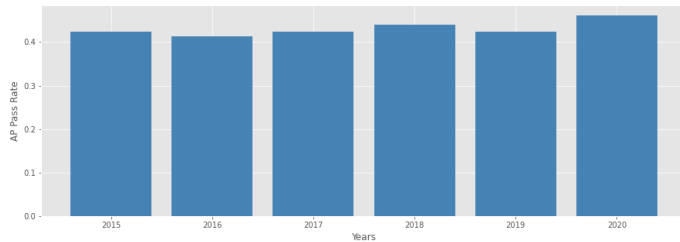
Figure 5: Economically Disadvantaged Students College Enrollment over Time
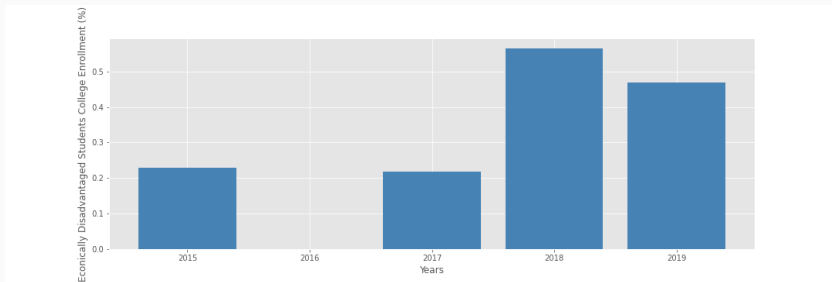
Figure 6: CTE Student Enrollment over Time
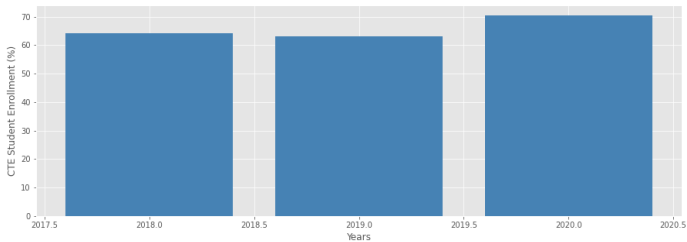
Figure 7: Number of Counselors at District Level