

# **Are Charter Schools Really Better than Public Schools?**



**BSAN-6060: Data Management and Business Intelligence**

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**April 30, 2022**

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# **Background**

## **Business Problem**

There is a wide disparity in student performance in public schools, especially those located in low-income areas, and private schools. Private schools sufficiently prepare students for academic success since they have more resources and lower student-teacher ratios. In contrast, public schools in low-income neighborhoods struggle to support their students academically since they have fewer resources and overcrowded classrooms. In 1992, California enacted the Charter School Law to introduce the charter school, a hybrid institution that has characteristics of a public and private school. Like public schools, charter schools are free and funded by the government. Like private schools, charter schools have capped admissions and an application process before enrollment.

Although there are similarities between public and charter schools, there are also distinct differences between these types of schools. Public schools accept all students within a school district without an application, whereas charter schools require an application process and have capped admissions. Open enrollment in public schools risks overwhelming school resources and overcrowded classrooms, which may deteriorate the quality of education. Charter schools are funded based on a per-pupil basis with government funds, and schools may receive private funding in some cases. Alternatively, public schools primarily receive funding from local taxes and partial funding from the state. Each charter school has a different curriculum designed by stakeholders, such as for-profit organizations, teachers, parents, the local school district, or government entities. In contrast, public school curricula must adhere to standards set by the school education board.

Given the differences between public and charter schools, our group is interested in exploring whether low-income neighborhoods should consider converting public schools to private schools or building more charter schools.

## **Project Overview**

Our project compares student performance in charter and public schools in the Los Angeles Unified School District to determine whether neighborhoods should convert their public schools into charter schools or build more charter schools. Student performance represents dropout rates and high school graduation rates. Since we will be using dropout and high school graduation rates as metrics to evaluate student performance, we will be analyzing public high schools and charter schools. We assume that students who attended public high schools have also attended public middle and elementary schools. Most charter schools have grade levels from kindergarten to 12th grade. We will examine student-teacher ratios to determine the level of support students receive in schools. Our group will also analyze household income in Los Angeles to understand the amount of resources schools receive from local taxes. Our project will utilize MySQL to run queries on educational datasets to answer our business problem, and we will use Tableau to visualize our data findings.

# Data processing

## Data Collection

We collected education data from the California Department of Education and the United States Census Bureau. We collected datasets for staff assignments, staff demographic, schools, and graduation rates for academic years 2017 and 2018. Academic years are from 2017 to 2018 and 2018 to 2019.

The staff assignment datasets contained information about staff positions, country, district, and schools. The staff demographic datasets have columns for age, staff position, and ethnicity. The schools' dataset contains information on the total number of enrollment of students per school, charter school status, and school name. The graduation dataset consisted of school name, charter school status, district, county, high school graduation rate, dropout rate, and non-traditional methods of high school graduation such as completing a General Educational Development, GED, Exam. Our project will only focus on high school graduation and dropout rates. Our final dataset is the median household income data from ArcGIS Hub. The dataset is from the year 2016, and it contains data on population, race, employment, English speaking status, income, and zip code.

## Data Cleaning

We created a new column in the median household income dataset that categorizes zip codes by low-income, medium-income, and high-income households. The average family size in Los Angeles is 2.8 persons, assuming there is at least one parent and one child under 18 years old. We rounded up the average family size to three persons since the average is 2.8 persons. We used a VLOOKUP function in Excel to categorize income into low-income, medium-income, and high-income categories. The category low-income refers to household income of less than \$56,799, “medium-income” is considered \$56,800 to \$170,399, and “high-income” is a household income of over \$170,400.

Some datasets, especially the staff assignment and staff demographic datasets are very large, at over one million and 300,000 rows, respectively. It would be inefficient to work with datasets of that size directly in MySQL. We uploaded the datasets into Tableau Prep to clean, rename column headings, and delete columns not needed for our project. After the initial cleaning step in Tableau Prep, we output our dataset into MySQL for filtering. The staff assignment, staff demographic, and graduation rates datasets contained education data from charter and public schools in California; for our project, we wanted to focus on schools located in the Los Angeles Unified School District. We created tables for each dataset and filtered them by where the county name is “Los Angeles” and where the district name is “Los Angeles Unified”. We used the same process to filter 2017 and 2018 education data.

Below is a screenshot of an example SQL query where we filtered the dataset for Los Angeles County and Los Angeles Unified School District:

```

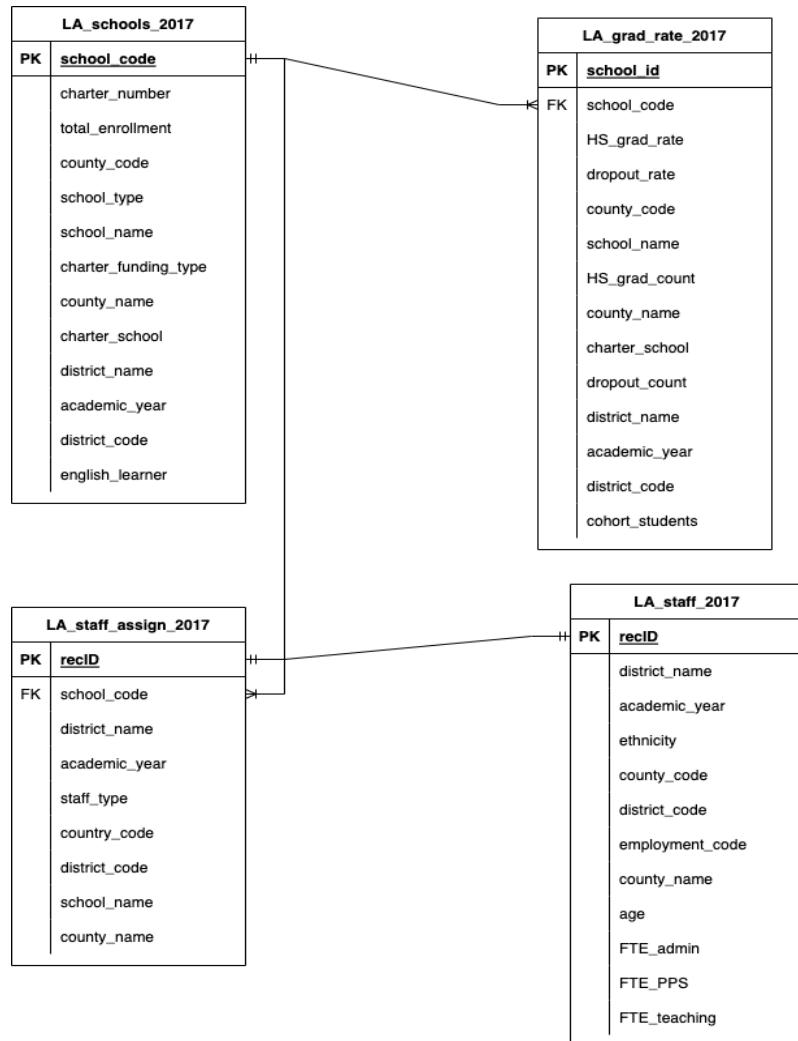
/*
Create a new table named LA_grad_2017 to filter grad_rate_2017
to only include schools in Los Angeles county.
*/

CREATE TABLE LA_grad_rate_2017 AS
SELECT *
FROM grad_rate_2017
WHERE county_name = "Los Angeles"
AND district_name = "Los Angeles Unified";

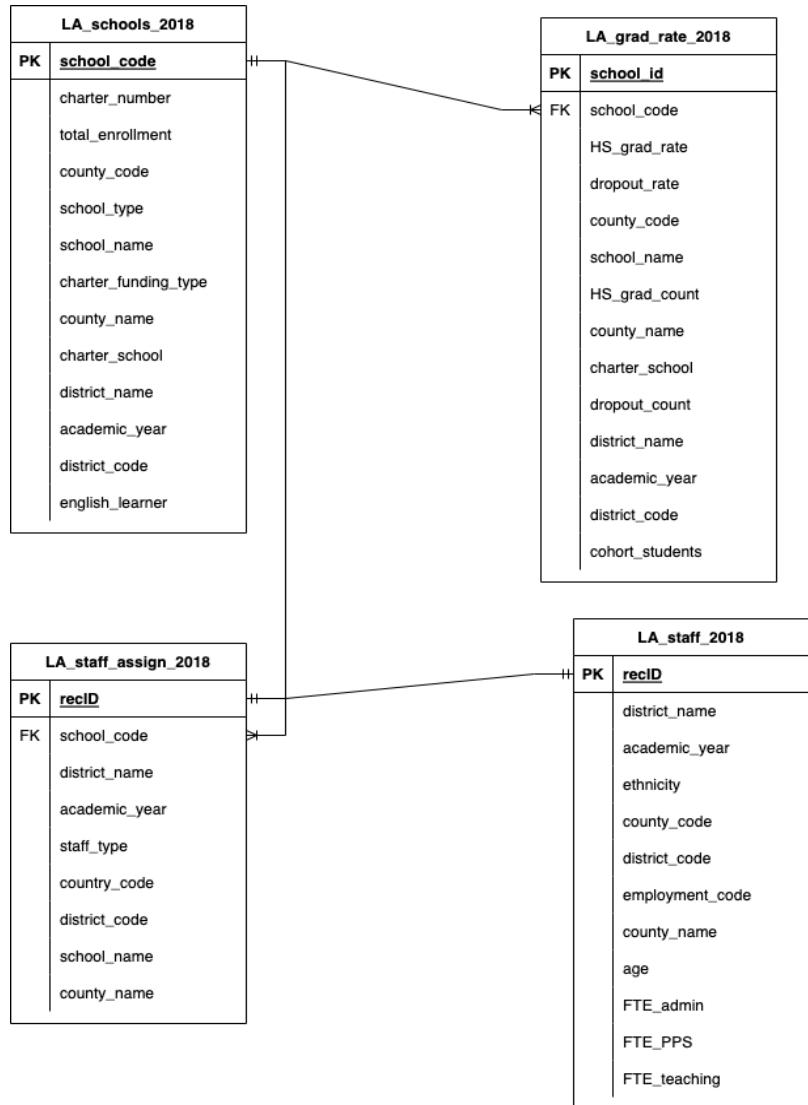
```

Below are the entity relational diagrams (ERD) for the 2017 and 2018 datasets:

### 2017 datasets



## 2018 datasets



## Data analysis

### Data Analysis Techniques

Our group ran queries to gain insights into the education datasets from 2017 and 2018 after filtering for information in the Los Angeles Unified School District. We noticed that there are no unique primary keys for the **LA\_grad\_rate\_2017** and **LA\_grad\_rate\_2018** datasets, so we added a column named “**school\_id**” for both datasets using the following code (The codes in this report displays code written for the 2017 dataset. The 2018 dataset uses the same codes):

```
/*  
Add primary key for LA_grad_rate_2017  
*/  
  
ALTER TABLE LA_grad_rate_2017  
add column school_id INT AUTO_INCREMENT PRIMARY KEY;
```

We used SQL queries to run queries on average dropout and high school graduation rates for charter and public schools in the 2017 and 2018 academic years.

```
/*  
Find the the average dropout and High School graduation rates for  
charter schools.  
*/  
  
• SELECT  
    school_name,  
    SUM(cohort_students) AS total_students,  
    ROUND(AVG(dropout_rate), 1) AS avg_total_dropout,  
    ROUND(AVG(HS_grad_rate), 1) AS avg_total_HS_grads  
FROM LA_grad_rate_2017  
WHERE charter_school = "Yes"  
GROUP BY school_name  
ORDER BY total_students DESC;
```

```
/*  
Find the the average dropout and High School graduation rates for  
Public schools.  
*/  
  
• SELECT  
    school_name,  
    SUM(cohort_students) AS total_students,  
    ROUND(AVG(dropout_rate), 1) AS avg_total_dropout,  
    ROUND(AVG(HS_grad_rate), 1) AS avg_total_HS_grads  
FROM LA_grad_rate_2017  
WHERE charter_school = "No"  
GROUP BY school_name  
ORDER BY total_students DESC;
```

To find student-teacher ratios in schools, we first created tables named num\_teachers\_charter\_2017, which filters by the staff position of teacher and type of schools.

Code to calculate student-teacher ratios for charter schools:

```
# count of teachers in charter schools
CREATE TABLE num_teachers_charter_2017 AS(
    SELECT
        s.school_code,
        s.school_name,
        COUNT(sta.staff_type) AS count_teachers
    FROM LA_staff_assign_2017 sta
    JOIN LA_schools_2017 s
        ON sta.school_code = s.school_code
    WHERE s.charter_school = "Yes"
        AND sta.staff_type = "T"
    GROUP BY s.school_name
);

select * from num_teachers_charter_2017;

SELECT
    g.school_name,
    SUM(g.cohort_students),
    num_teach.count_teachers,
    ROUND((SUM(g.cohort_students)/num_teach.count_teachers), 2) AS student_teacher_ratio
FROM LA_grad_rate_2017 g
JOIN num_teachers_charter_2017 num_teach
    ON num_teach.school_code = g.school_code
GROUP BY g.school_name
ORDER BY student_teacher_ratio DESC
LIMIT 10;
```

Code to calculate student-teacher ratios for public schools:

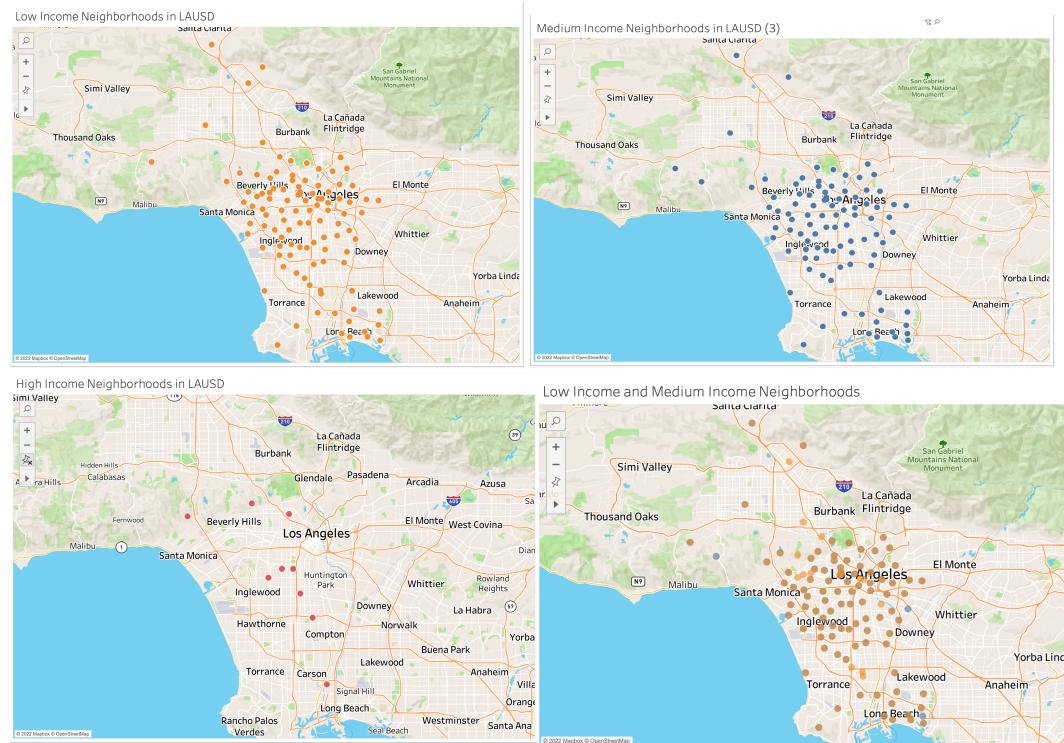
```
# count of teachers in public schools
CREATE TABLE num_teachers_public_2017 AS(
    SELECT
        s.school_code,
        s.school_name,
        COUNT(sta.staff_type) AS count_teachers
    FROM LA_staff_assign_2017 sta
    JOIN LA_schools_2017 s
        ON sta.school_code = s.school_code
    WHERE s.charter_school = "No"
        AND sta.staff_type = "T"
    GROUP BY s.school_name
);

select * from num_teachers_public_2017;

SELECT
    g.school_name,
    num_teach.count_teachers,
    SUM(g.cohort_students),
    ROUND((SUM(g.cohort_students)/num_teach.count_teachers), 2) AS student_teacher_ratio
FROM LA_grad_rate_2017 g
JOIN num_teachers_public_2017 num_teach
    ON num_teach.school_code = g.school_code
GROUP BY g.school_name
ORDER BY student_teacher_ratio DESC;
```

## DATA INSIGHTS

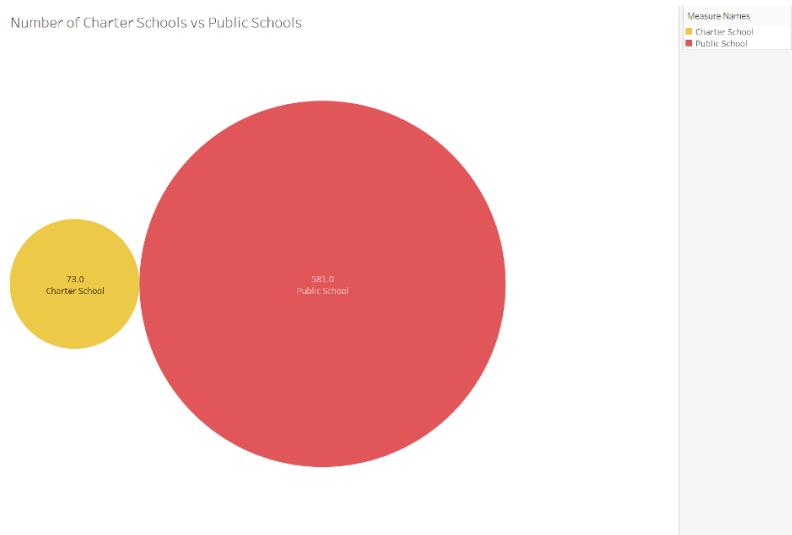
We created three maps to show the income distribution across zip codes in neighborhoods in the LAUSD areas. The class distributions are low-income, medium-income, and high-income.



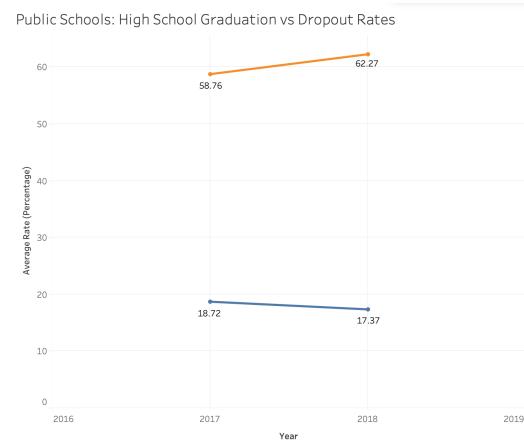
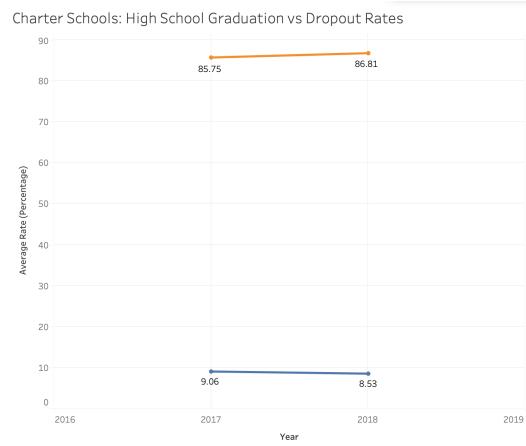
As shown in the “Low Income and Medium Income Neighborhoods” visualization, there is a lot of overlap between zip codes classified as low-income and medium-income. The dark orange circles indicate overlap between orange circles, represented by low-income, and blue circles, represented by medium-income. However, there are few high-income locations in LAUSD. Given the observations from these maps, we are interested in comparing student performance in charter and public schools across different neighborhoods in LAUSD.

There are significantly more public schools than charter schools in LAUSD. There are only 73 charter schools and 581 public schools. The lack of charter schools indicates that many students in low-income neighborhoods may be limited to only public schools.

Number of Charter Schools vs Public Schools

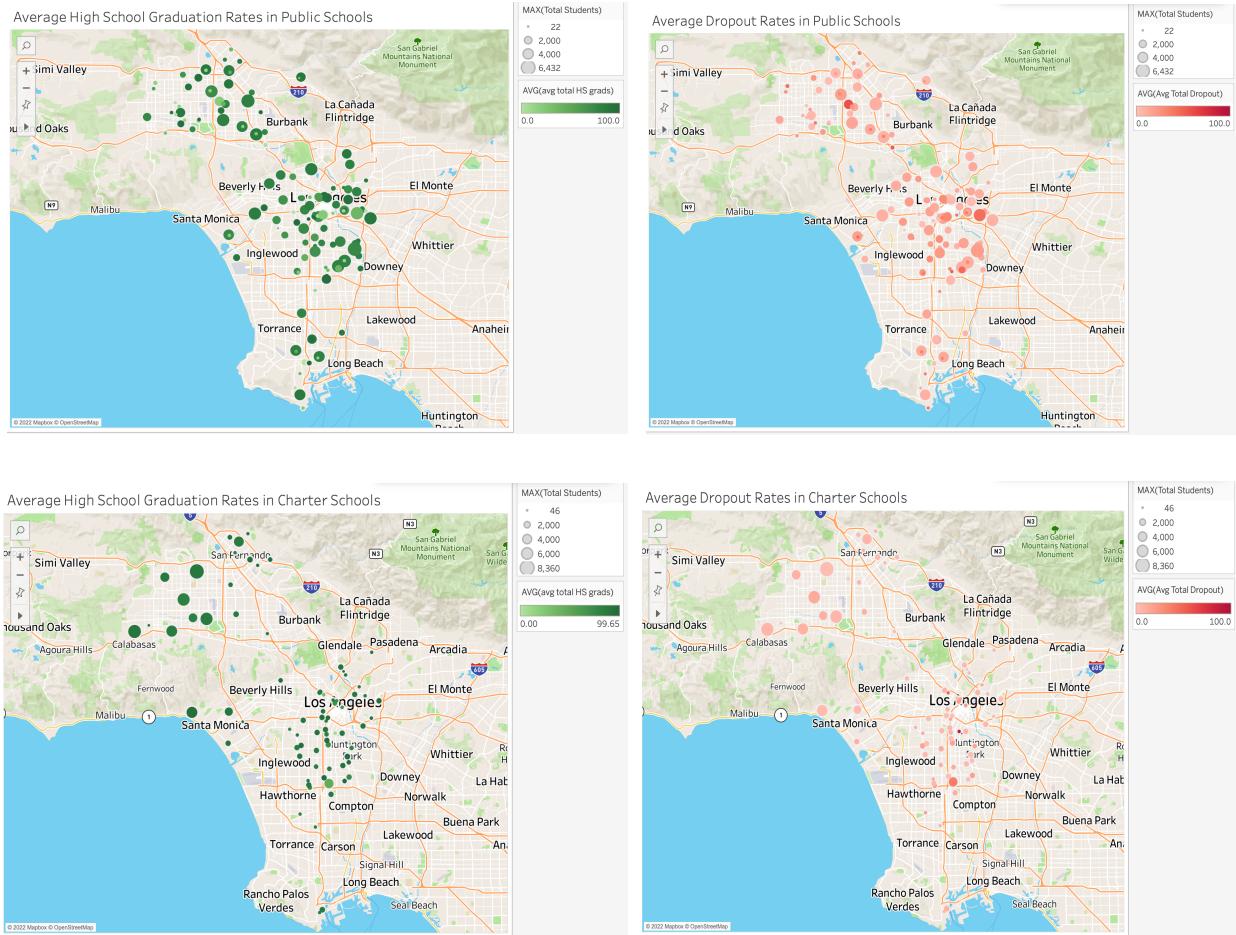


Next, we evaluate the trends among student performance between charter and public schools between 2017 and 2018. There is an increasing trend of graduation rates and a decreasing trend of dropout rates for both charter and public schools. There is about a 1% increase in graduation rates and a 5.8% decrease in dropout rates in charter schools. There is a more distinctive trend in student performance in public schools, with a 5.9% increase in graduation rates and a 7.2% decrease in dropout rates. Although student performance improved in public schools from 2017 to 2018, charter school students still outperformed public school students. Graduation rates in charter schools remained around 80%, while graduation rates in public schools range between 50% to 60%. Similarly, dropout rates in charter schools remained below 10%, whereas public school dropout rates range between 17% to 18%. The variation among student performance between charter and public schools could be due to the difference in the number of charter and public schools in LAUSD.

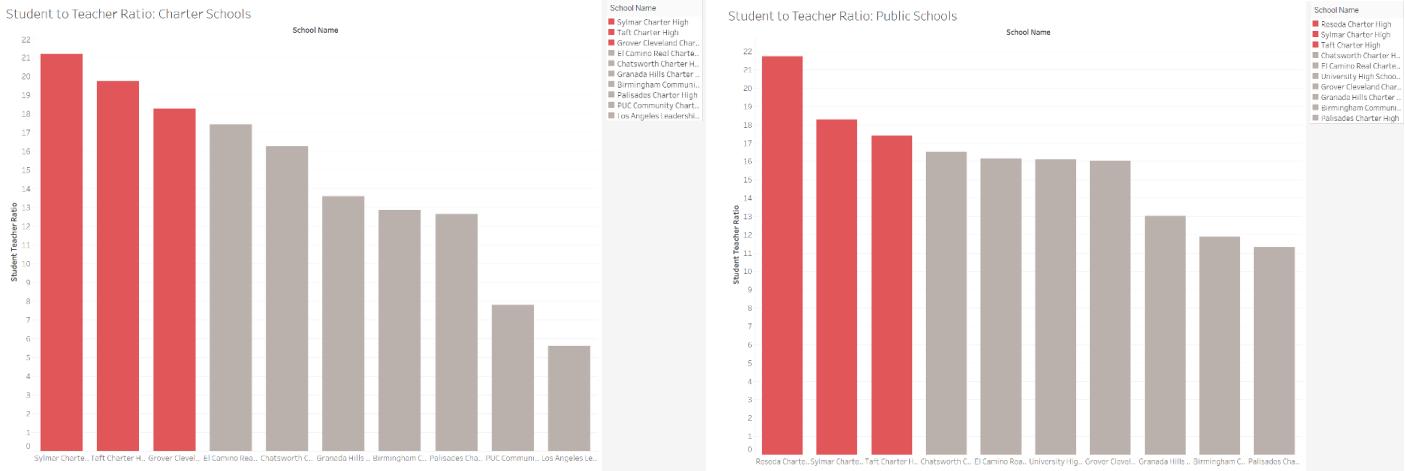


Our group mapped out locations of charter and public schools to evaluate student performance on a more granular level. The following visualizations below display student performance in different schools, indicated by the color range of the circles, and the number of student body in those schools, indicated by the size of the circles. The maximum number of students in a public school is over 6400, and the charter school with the largest student body has over 8300 students. There are more public schools across LAUSD, especially in the inner-city locations of Los Angeles, which includes DTLA, Central, and South Los Angeles. Since there are more public schools, there is also more variation in school performance between the schools. Generally, most schools have high graduation rates and low dropout rates, as indicated by the dark green circles in the "Average High School Graduation Rates in Public Schools" and light red circles in the "Average Dropout Rates in Public Schools"

visualizations. However, there are several schools that are underperforming in the inner-city and valley. Although some charter schools have more students, there is less variation among student performance in charter schools. Locations of charter schools are more spread out, especially in the valley. High school graduation rates stayed high, and dropout rates remained low in charter schools, as shown in the “Average High School Graduation Rates in Charter Schools” and the “Average Dropout Rates in Charter Schools” visualizations. Additionally, inner-city charter schools have smaller student populations, as indicated by the smaller circle sizes in schools concentrated in the heart of Los Angeles.



We created our final two visualizations to compare student-teacher ratios in charter and public schools to determine whether students in charter schools have support from their schools. "Support" is measured by student-teacher ratios per school. A lower-student teacher ratio indicates that a student will receive more attention from teachers. The top three charter and public schools with the highest student-teacher ratios are similar, around 18 to 20 students per teacher. However, after the top three schools, the remaining seven of the top ten schools with the highest student-teacher ratios remained over ten students per teacher. In contrast, student-teacher ratio in charter schools drop to less than ten students per teacher, as shown in the “Student to Teacher Ratio: Charter Schools” visualization.



## Recommendations

### Suggestions for Students, Parents, and Neighborhoods

Our group recommends that parents in low-income neighborhoods consider sending their children to charter schools, that local governments consider developing a yellow bus program for free transportation to charter schools, and that Downey and Torrance/ Long Beach regions consider building charter schools. Public schools in inner-city locations tend to have larger classroom sizes and higher student-teacher ratios, therefore, students and parents should consider applying to nearby charter schools, which have more resources for students. Since students are enrolled based on an application process in charter schools, students will need to apply to multiple charter schools to increase their chances of being accepted into a school. Some students may not get accepted to charter schools near their homes and will need public transportation to go to school. Communities in low-income areas should collaborate with the state or local government to develop programs that offer free transportation for students to attend charter schools. Finally, we suggest that the Downey and Torrance/ Long Beach regions consider building charter schools in their neighborhoods. These areas are considered low-income and medium-income but currently do not have any charter schools. It is beneficial for these neighborhoods to build charter schools since they have been shown to have stronger student performance and lower student-teacher ratios.

### Further Research

Our project used high school graduation and dropout rates for student performance; for further research, college performance, especially first year, should be analyzed to determine if charter schools prepare students better for college. It would be interesting to explore how students performed in their freshman year of college since it might give insight into the level of college readiness among schools. The transition from high school to college is difficult for many first-year students, and their academic performance may reflect their level of college preparedness.

## References

### Datasets

- [https://gisdata-scag.opendata.arcgis.com/datasets/865f2509d5d4450ea6bfd527596ef502\\_0?geometry=-125.669%2C32.599%2C-107.970%2C35.778&selectedAttribute=Asian\\_Pct](https://gisdata-scag.opendata.arcgis.com/datasets/865f2509d5d4450ea6bfd527596ef502_0?geometry=-125.669%2C32.599%2C-107.970%2C35.778&selectedAttribute=Asian_Pct)
- <https://www.cde.ca.gov/ds/si/ds/pubschls.asp>
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