

# EDUCATION INEQUALITY

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CS 410: Explorations in Data Science  
Summer 2020



# What is Education Inequality?

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The difference in resources, such as:



Funding



Classroom Materials



Living Environments



Quality of Educators



# Why Does It Matter?

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Education is a pathway towards a stable and secure future.

A country without fairness in education cannot be deemed an equitable country.

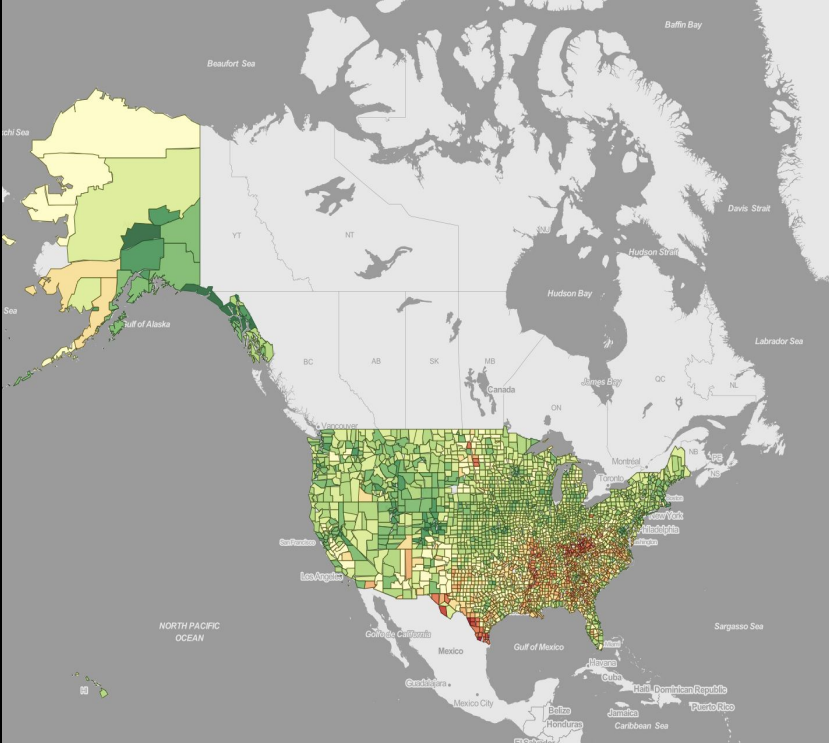
# Choropleth Map

## WHAT WE IMPLEMENTED

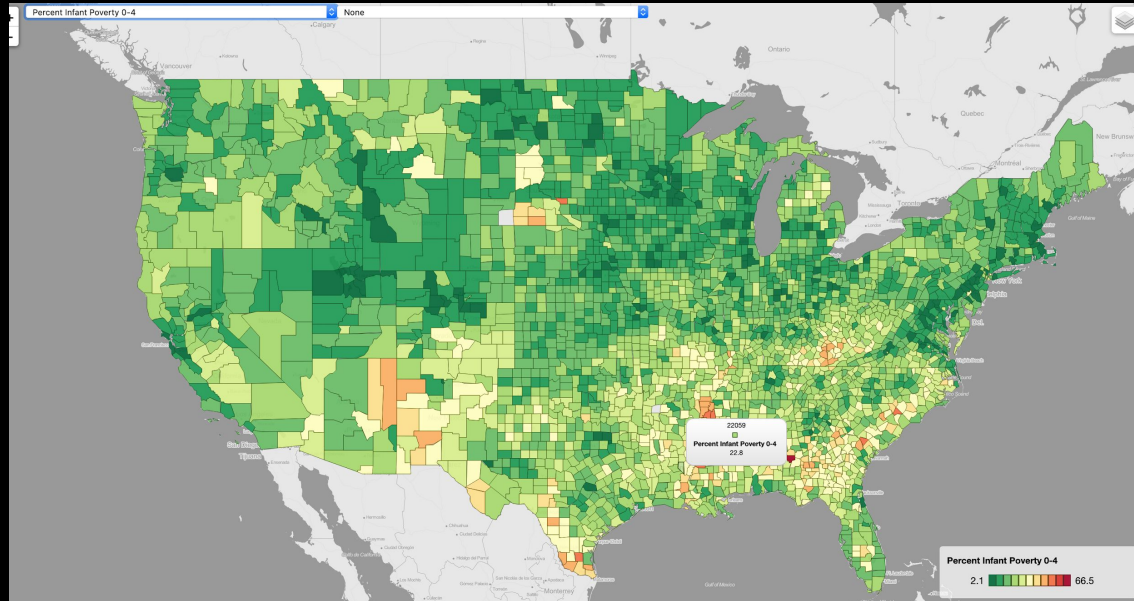
We implemented a choropleth map to highlight the current trends in education inequality.

## DATA SETS USED

1. "By County Data Sets on Education, Poverty and Median Household Income"  
(<https://www.ers.usda.gov/data-products/county-level-data-sets/>)
2. "By County Demographics for Each State in US"  
(<https://www.ers.usda.gov/data-products/county-level-data-sets/>)
3. "School Funding Fairness Data System"  
(<http://www.schoolfundingfairness.org/data-download/>)
4. "National Assessment of Educational Progress"  
(<https://www.nationsreportcard.gov>)

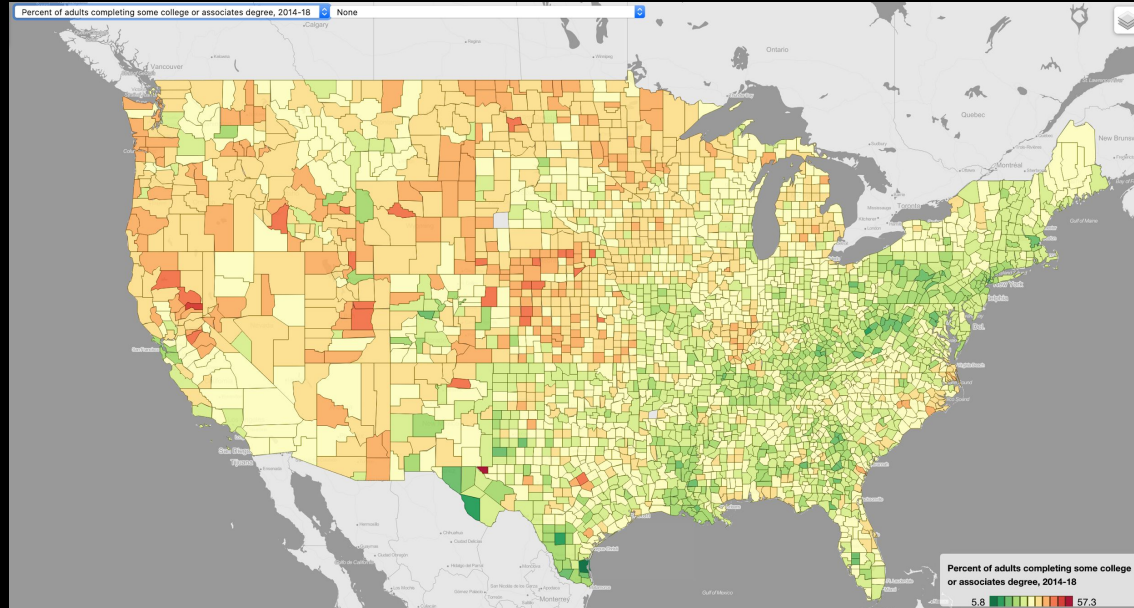


# Choropleth Map



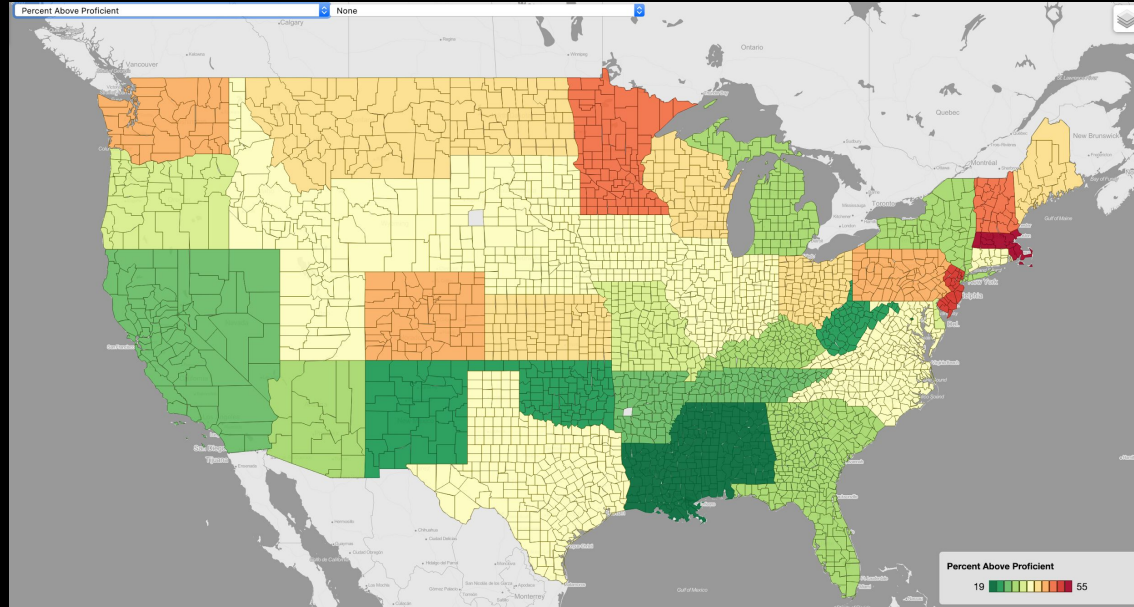
**Percent of infants living in  
poverty by US county**

# Choropleth Map



**Percent of adults completing  
some college by US county**

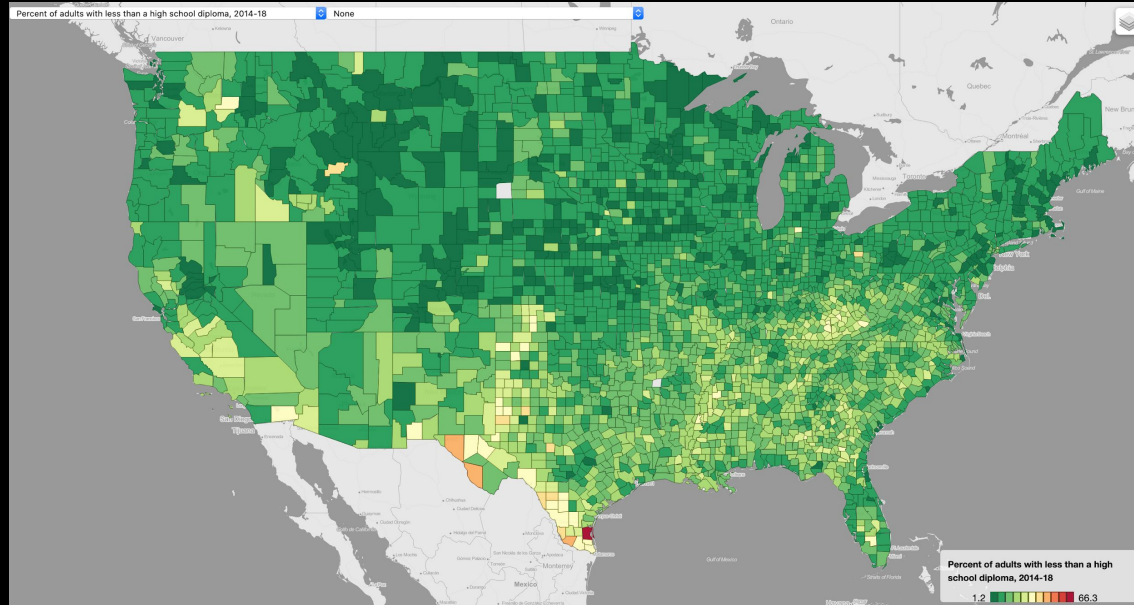
# Choropleth Map



**Percent of students in grade 8  
with higher than proficient test  
scores by state**



# Choropleth Map

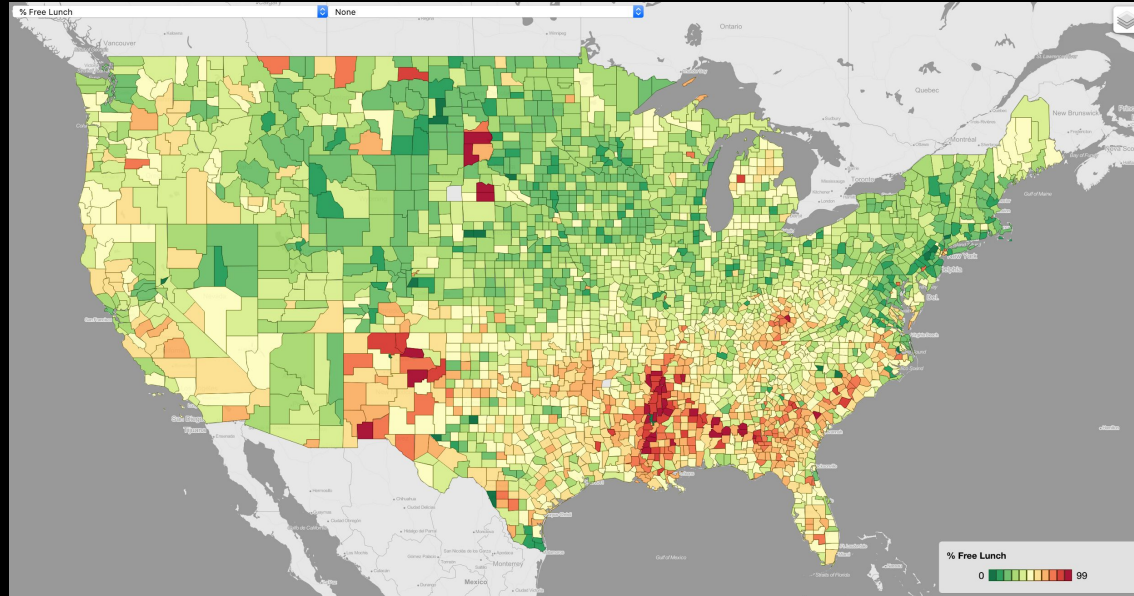


**Percent of less than high school  
attainment**



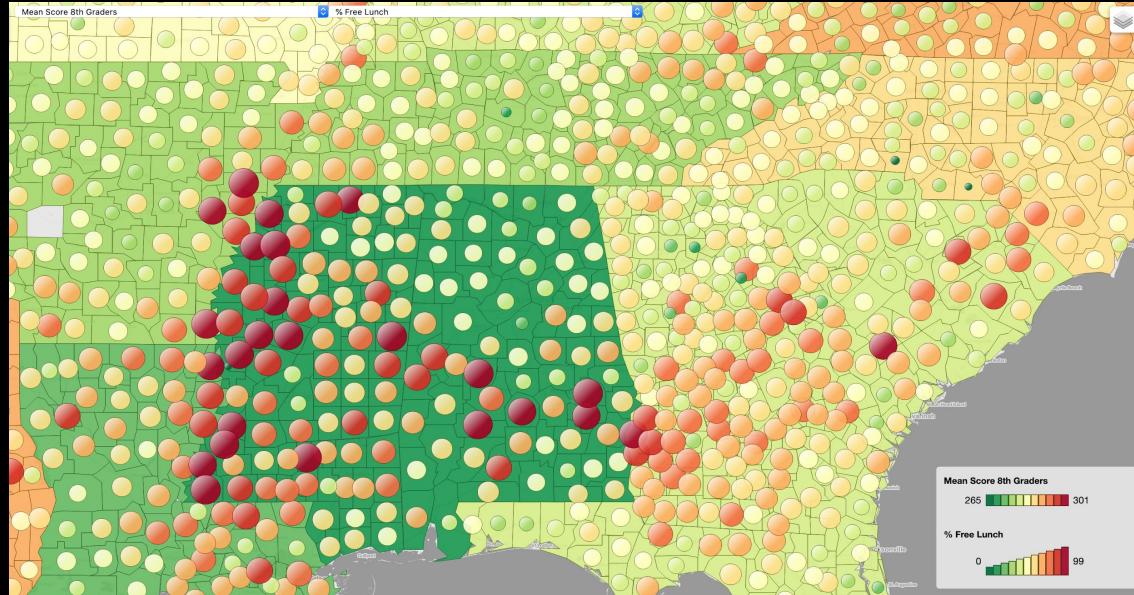
# Choropleth Map

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**Percent of students given free  
lunch**

# Choropleth Map



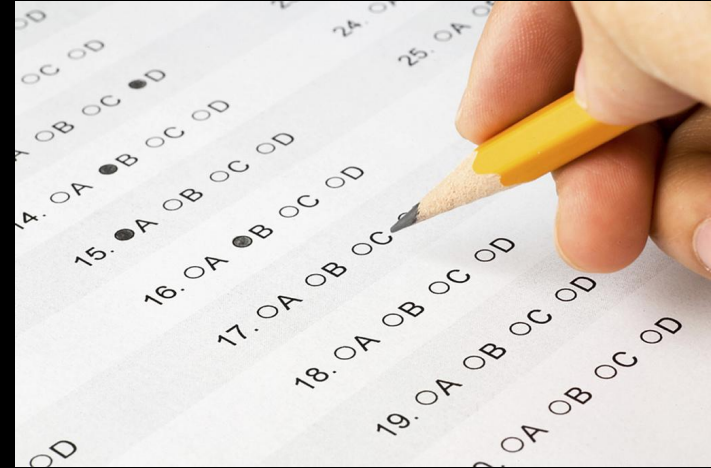
**Average test scores vs.  
percentage of students getting  
free lunch**

# Trends to Note

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An increase in funding does not necessarily mean that the quality of education increases.

However, higher household incomes correlated to higher test scores.



# What Needs to Be Done

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## POLITICAL

- Redistribute funding for schools
- Improve our health care systems
- Provide more support to disadvantaged families
- Ensure that all students reach national testing standards
- Deploy experienced teachers to the most disadvantaged areas

# What Needs to Be Done

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## PUBLIC AWARENESS

- Place an emphasis on education and its importance
- Educate our communities and officials on the inequalities that persist in our education systems

# What Needs to Be Done

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## EQUITABILITY

- Provide evidence that making education a priority is important
- Promote equitable learning
- Deliver quality education for everyone



# Key Takeaways

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We hope this choropleth map will highlight other correlations and shed light on the education inequalities in the US.

To close the gap, we need to increase our commitment to education, invest in efforts to provide equitable learning for all students, and recognize the economic disparities in our schools.





THANK  
YOU

# APPENDIX

Additional Information About the Context and Details of Our  
Implementation Project

# 1 Education Inequality and Its Impacts

A main problem in this world is education inequality. We decided to do our implementation project on education inequality because we believe that education is crucial to having a stable, secure, and bright future. We also believe that all children deserve to have an equitable and enriching experience in education. Education provides with the knowledge to be self-sufficient in this world and to be a well-informed member of society. Some people may say that we do not need education to be knowledgeable, but it is on the basis of education that information is converted into knowledge.

## 2 Motivation

In hopes of increasing the concern with the United State's education system and in hopes of raising awareness of the importance in investing in today's youth, we decided to construct a choropleth map using the

1. "By County Data Sets on Education, Poverty, and Median Household Income" (<https://www.ers.usda.gov/data-products/county-level-data-sets/>)
2. "By County Demographics for Each State in the US" (<https://www.ers.usda.gov/data-products/county-level-data-sets/>), "School Funding Fairness Data System" (<http://www.schoolfundingfairness.org/data-download>), and
3. "National Assessment of Educational Progress" (<https://www.nationsreportcard.gov>)

As emphasized by the University of Washington's Calling BS course, visualizations are key for many people, as numbers and concrete data can be harder to understand. Visualizations can help us easily detect trends, work with large datasets, and look into correlations that may arise.

### 3 Education inequality in the past, present, and future

It should be noted that the education system in the United States was one of the most attractive features of our country. As stated by Nick Hanauer, in “Better Schools Won’t Fix America”, “America created a public-education system that was the envy of the modern world. No nation produced more or better-educated high-school and college graduates, and thus the great American middle class was built. But then, sometime around the 1970s, America lost its way.” The 1970s was a time where our economy was falling. We experienced the steady decline of our economy, the decrease in the quality of our education, and a drop in our nation’s test scores.

### **3 Education inequality in the past, present, and future (cont.)**

From the Trump administration data in 2019, it was stated that “the funding gap between rich and poor schools had increased slightly to \$473 per student between the 2014-15 and 2015-16 school years.” In a federal report that covered the 2016-2017 school year, “one out of every four schools in America was classified as high poverty.”

## 4 No Child Left Behind Act

This brings us to a discussion of the No Child Left Behind Act of 2002. This act was an update of the Elementary and Secondary Education Act. This “effectively scaled up the federal role in holding schools accountable for student outcomes”

(<https://www.edweek.org/ew/section/multimedia/no-child-left-behind-overview-definition-summary.html>). This act was established in efforts to reduce the gap between the less advantaged students (minorities and those that are living in poverty), from their more advantaged peers.



## 4 No Child Left Behind Act (cont.)

As a result of the act, The Center on Education Policy concluded that

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- Districts are better aligning classroom teaching with state academic standards.
- Principals and teachers are making better use of test results to improve teaching.
- Scores on states tests are higher in a large majority of states and school districts.
- Teachers report high stress levels and poor staff morale because of the pressure to improve scores.
- Most school districts are cutting back on social studies, science, art or other subjects to make more time for reading and math, the subjects that are tested.
- The effect on achievement gaps between groups of students of different races or ethnicities is unclear. While most states and districts reported that the achievement gap in test results had narrowed or stayed the same, the center's own case studies did not find the same results. As a result, the study concluded, it is "impossible to reach an overall conclusion about achievement gaps."

## 4 No Child Left Behind Act (cont.)

From this report, it is seen that there are shortcomings to the No Child Left Behind Act. We are hoping that the choropleth map that we implemented can help to pinpoint the causes of these shortcomings and emphasize that change needs to happen to reduce the education inequalities that persist in the United States.

# 5 Education in Other Countries

As shown by other countries, an equitable education has great impact. Equity ensures that all students, regardless of their race, their social and economic status, have all the tools necessary in order to excel in their academics. The young people of our generation have the potential to be future leaders, and they all deserve a fair shot at achieving that. Investment and redistribution of funds in education can help to ensure that every child receives quality education.

Stated by OXFAM in 2019 in “The Power of Education to Fight Inequality. How increasing educational equality and quality is crucial to fighting economic and gender inequality”, Finland “set out on substantial education reforms in the 1970s” and is credited for having one of the best education systems in the world (<https://policy-practice.oxfam.org.uk/publications/the-power-of-education-to-fight-inequality-how-increasing-educational-equality-620863>). Estonia has also carried out similar reforms and has seen similar successful results.

# 6 2015 OECD Findings from PISA Report highlighting 5 areas to address

The 2015 OECD Key findings from PISA report highlighted 5 key areas that need to be addressed in order to further equitability in education (<https://www.oecd.org/pisa/keyfindings/>):

1. Education strategy to improve performance and equity.
  - We need to relook at our education system and fix areas that need to be improved.
2. Rigorous and consistent standards across all classrooms.
  - Currently, states have their own standards for education. We need to make sure that all states are meeting national standards.
3. Improved teacher and leader capacity across the system.
  - We need to strengthen teacher standards and take a second look at teaching techniques (not all students learn the same way).
4. Equitable access to resources.
  - All students deserve equitable access to resources.
5. Targeting at risk students and schools
  - We need to send the most experienced teachers to at risk students and schools.

# 7 Why Implement a Choropleth Map

From the 2015 OECD Key findings from PISA report, we believe that implementing a choropleth map can address concerns regarding:

1. Rigorous and consistent standards across all classrooms.
2. Targeting at risk students and schools.

Visualizations can help users better understand large datasets and point out possible correlations in the data. This choropleth map address the inconsistent standards across schools and the state of education data gathered from geographical areas in the United States.

Our choropleth map was built using a JavaScript framework and the OpenStreetMaps tool implemented with the open source Leaflet library.

# 8 Data Processing and Leaflet

The data sets that we chose to use had multiple columns, but we decided to merge and split to only keep the columns that were necessary for our project. We merged these data sets based on Federal Information Processing Standards (FIPS) codes. These columns were:

- Population
- < 18
- African American
- American Indian
- Asian
- Native Hawaiian
- Hispanic
- Non-hispanic white
- Household Income
- % Free Lunch
- Percent of adults with less than a high school diploma, 2014-18
- Percent of adults with a high school diploma only, 2014-18
- Percent of adults completing some college or associate's degree, 2014-18
- Percent of adults with a bachelor's degree or higher, 2014-18
- Percent All Poverty
- Etc.