SOCIOECONOMIC ANALYTICS

Statistical Analysis of Local Education Agency Funding and Demographics in the Finger Lakes Region, New York

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Abstract

Local education agencies (LEAs) nationally face revenue disparities, greatly impacting minorities and socioeconomic groups. These disparities can negatively affect student achievement and subject proficiency. Using data from the National Center for Education Statistics during the 2018-2019 school year, 36 multiple linear regression models were fitted to analyze the associations between racial and ethnic groups on local, state, and federal revenue sources. It was found that White and Asian students were positively associated with local revenue sources, particularly local property taxes, and Asian students were negatively associated with state and federal revenue. Black or African American students were negatively associated with property tax revenue but had strong positive associations with state and federal revenue. Hispanic/Latino students had limited significant associations, which were positively linked to federal revenue. Students of two or more races had many positive and negative associations at the local, state, and federal levels. This study highlights the differences in LEA funding based on student demographics and provides insights into policy to provide equitable funding for LEAs in the Finger Lakes Region across racial and ethnic groups.

Keywords

Local education agency, race, New York, Finger Lakes Region, demographics, multiple linear regression, ordinary least squares, revenue, education funding, statistical modeling

1. Introduction

Increased school revenue has many benefits for students. In Texas, increased school funding was found to greatly increase student academic performance, decrease dropout rates, increase graduation rates, and increase college enrollment and graduation rates. These impacts were found to be magnified in poorer districts (Kreisman & Steinberg, 2019). In Kansas, decreased

revenue has had large implications on student achievement and disproportionately affects schools in rural areas (Rauscher, 2020). In California, schools given technology funding through the California Education Technology K-12 Voucher Program had increased school-level student proficiency. Technology funding was also associated with immediate and long-term increases in Math and English proficiency (Bass, 2021). Given the wide variety of benefits that increase school revenue offers, which are present throughout the United States, it is important to evaluate racial differences in school funding.

Differences and disparities in school funding among regions and races are widely prevalent in the United States. A national study found that districts with Latinx students had lower per-pupil spending and revenue and were significantly more likely to be financially disadvantaged (Baker et al., 2020). Nationally, it was also found that ethnic and racial minority groups received up to $1200 less in K-12 expenditures per pupil (Shores et al., 2021). In Texas, a study found that almost half of the poorest school districts were at least 95% Latinx (Alemán, 2007). Funding disparities and differences are prevalent throughout the United States, affecting various minority groups and socioeconomic classes. Studying these differences is vital to understanding the specific factors that affect LEA funding and to inform policy that better promotes equity in the Finger Lakes Region.

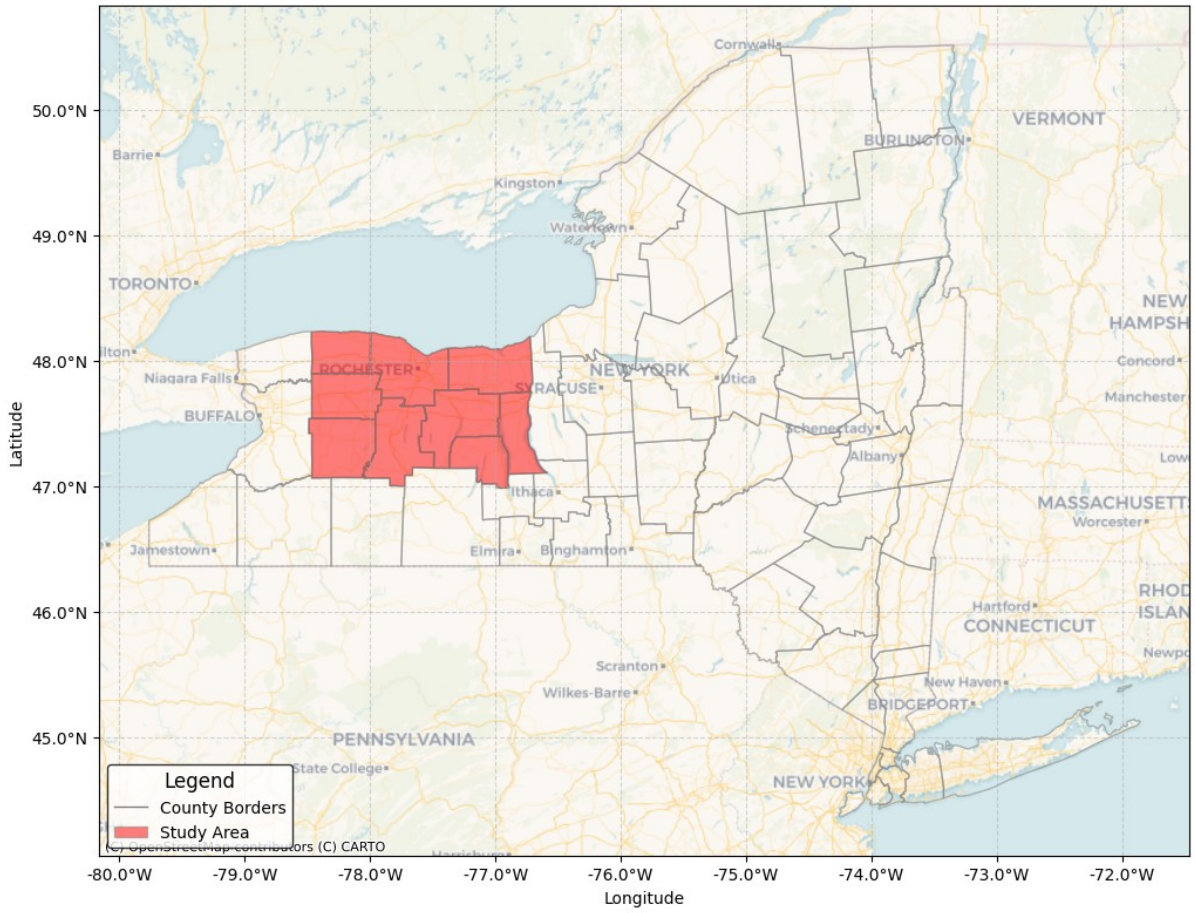
A sparse number of studies provide comprehensive analyses of LEA funding, and no studies evaluate LEA funding based on demographics in the Finger Lakes Region. This study sought to evaluate the differences in LEA funding based on LEA demographics in the Finger Lakes Region of New York, as the first study to do so. In order to evaluate all facets of funding, multiple linear regression was used with individual LEA funding sources as dependent variables, utilizing demographic and fiscal data from the National Center for Education Statistics.

2. Materials and Methodology

2.1. Study Area

The Finger Lakes Region is located in Upstate New York (See Figure 1), containing 9 counties, 4 cities, and 126 towns. It is home to 1.2 million people, mainly residing in Monroe County. A lesser amount of diversity is present in the Finger Lakes Region compared to other regions of New York State, with counties ranging up to 96 percent white non-Hispanic. Median income is less than the New York median, and child poverty is around the state average, although the City of Rochester has a greater level, at a 51.6 percent child poverty rate. School districts in the Finger Lakes Region suffer great economic disparities, seen in the Rochester Central School District, where 88.2 percent of students qualify for free or reduced lunch prices (DiNapoli, 2017). In the City of Rochester, the median household income is $31,946 (U.S. Census Bureau, n.d.-a), whereas in the Town of Pittsford, it is $103,546 (U.S. Census Bureau, n.d.-b).

Fig. 1. Map of New York State with counties outlined and the study area (Finger Lakes Region) highlighted in red.



2.2. Data Source and Preprocessing

Demographic data for all Local Education Agencies (LEAs) were obtained from the Provisional Common Core of Data - LEA Membership dataset for the 2018-2019 school year (U.S. Department of Education, 2019a). This dataset included LEA membership separated by grade, race or ethnicity, and sex. Entries for the same LEA and race or ethnicity were aggregated by summing student counts across all grades and sexes. This study analyzed the following ethnic groups: Asian, Black or African American, Hispanic/Latino, Two or more races, and White. Native Hawaiian or Other Pacific Islander and American Indian or Alaska Native groups were not analyzed due to a low average presence (less than one percent, see Table 1) in LEAs in the Finger Lakes Region.

To identify LEA locations, the Provisional Common Core of Data - LEA Directory dataset for the 2018-2019 school year was used, containing LEA street addresses (U.S. Department of Education, 2019b). The zip codes of the LEA locations were converted to county designations using the HUD-USPS ZIP Crosswalk ZIP-COUNTY dataset from Q4 2018 (U.S. Department of Housing and Urban Development, 2018). LEAs were filtered to only contain entries located in Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, and Yates

counties, or the Finger Lakes Region (DiNapoli, 2017). LEAs without any students were excluded.

LEA revenue data were obtained from the School District Finance Survey (F-33) for fiscal year 2019 (U.S. Department of Education, 2021). This dataset provided comprehensive LEA revenue data from federal, state, and local sources. Of the 52 revenue sources in this dataset, 36 revenue sources were used in the Finger Lakes Region. Four of the 36 revenue sources were aggregations of the others, being total revenue, total federal revenue, total state revenue, and total local revenue. LEAs with missing or not applicable revenue data were excluded. After filtering on the basis of demographic, spatial, and data availability factors, 80 applicable LEAs were retained for analysis.

2.3. Methods

To model the relationships between all racial or ethnic groups and LEA revenue sources, 36 multiple linear regression models were fitted using Ordinary Least Squares (OLS), fitting a model for each revenue source. In each model, the dependent variable was the total revenue from a source, and the independent variables were the five racial or ethnic groups selected to be analyzed in this study. Analyses were conducted using the "statsmodels" package in Python 3.11.

3. Results

3.1. Descriptive Statistics

Table 1 summarizes the descriptive statistics of the school demographics, using data points as a percentage of the total enrollment of an LEA. American Indian or Alaska Native and Native Hawaiian or Other Pacific Islander students had respective averages of 0.38% and 0.05% of an LEA's total enrollment. All groups displayed a high coefficient of variation (CV), with minority groups being exceptionally high. Among the racial and ethnic groups included in the study, Black or African American and Asian groups had the highest CVs, with CVs of 174.50% and 162.40%, respectively, showing a high level of demographic variation. White had the lowest CV of all groups, of 17.38%, and a mean of 83.94%, highlighting that in the Finger Lakes Region, LEAs consistently have a high percentage of White people.

Table 1. Descriptive statistics of LEA demographic data as a percentage of total LEA enrollment from 80 LEAs in the Finger Lakes Region of New York; SD is standard deviation; CV is coefficient of variation

Race or Ethnicity	Min	Max	Mean	Median	SD	CV
American Indian or Alaska Native	0.00	12.05	0.38	0.13	1.36	353.74
Asian	0.00	13.23	1.43	0.72	2.33	162.40
Black or African American	0.00	55.31	4.21	1.49	7.34	174.50
Hispanic/Latino	0.27	33.33	6.73	5.16	6.59	97.86
Native Hawaiian or Other Pacific Islander	0.00	0.66	0.05	0.00	0.10	198.92
Two or more races	0.00	11.35	3.25	2.97	2.48	76.19
White	10.04	97.18	83.94	88.24	14.59	17.38

3.2. Multiple Linear Regression Results

Figure 2 displays all the significant ($p < 0.05$) regression coefficients for the five races and ethnicities from the 36 multiple linear regression models fitted using OLS. Nonsignificant ($p > 0.05$) results are not shown.

An increased presence of White students was positively associated with aggregated local revenue ($\beta = 10923.57$). The main local revenue sources were property taxes ($\beta = 9464.36$), revenue from cities and counties ($\beta = 892.72$), and school lunch ($\beta = 209.98$). Aggregated state revenue displayed a strong positive association ($\beta = 7192.81$), encompassing general formula assistance ($\beta = 4274.41$), other state revenue ($\beta = 1966.69$), and special education programs ($\beta = 898.93$). Overall, white students were associated with an increase in total revenue ($\beta = 18261.31$). The presence of White students did not display any major negative associations.

The presence of Black or African American students was negatively associated with revenue in multiple cases. Although there was no significant local revenue coefficient for black or African American students in the model, there was a strong negative association with local property taxes ($\beta = -8393.76$) and a negative association with school lunch revenue ($\beta = -181.02$). Local parent government contributions ($\beta = 7150.84$) and miscellaneous local revenue ($\beta = 1962.87$) showed a positive association. Aggregated federal revenue ($\beta = 3042.17$) has a moderate positive association with Black or African American students, containing revenue from Title I ($\beta = 1067.01$), the Child Nutrition Act ($\beta = 966.42$), and the Individuals with Disabilities Education Act or IDEA ($\beta = 509.00$). As aggregated local and aggregated federal revenue do not have major impacts on LEA revenue, the majority of funding associated with Black or African American students is state revenue. Aggregated state funding has a strong positive correlation ($\beta = 41427.20$). Individual sources of state revenue include general formula assistance ($\beta = 28515.16$), special education programs ($\beta = 7173.69$), other ($\beta = 3085.66$), and nonspecified revenue ($\beta = 2684.90$). Despite a lack of local and federal funding associated with Black and African American enrollment in LEAs in the Finger Lakes Region, total revenue was found to be strongly associated ($\beta = 46607.78$) with Black and African American student enrollment.

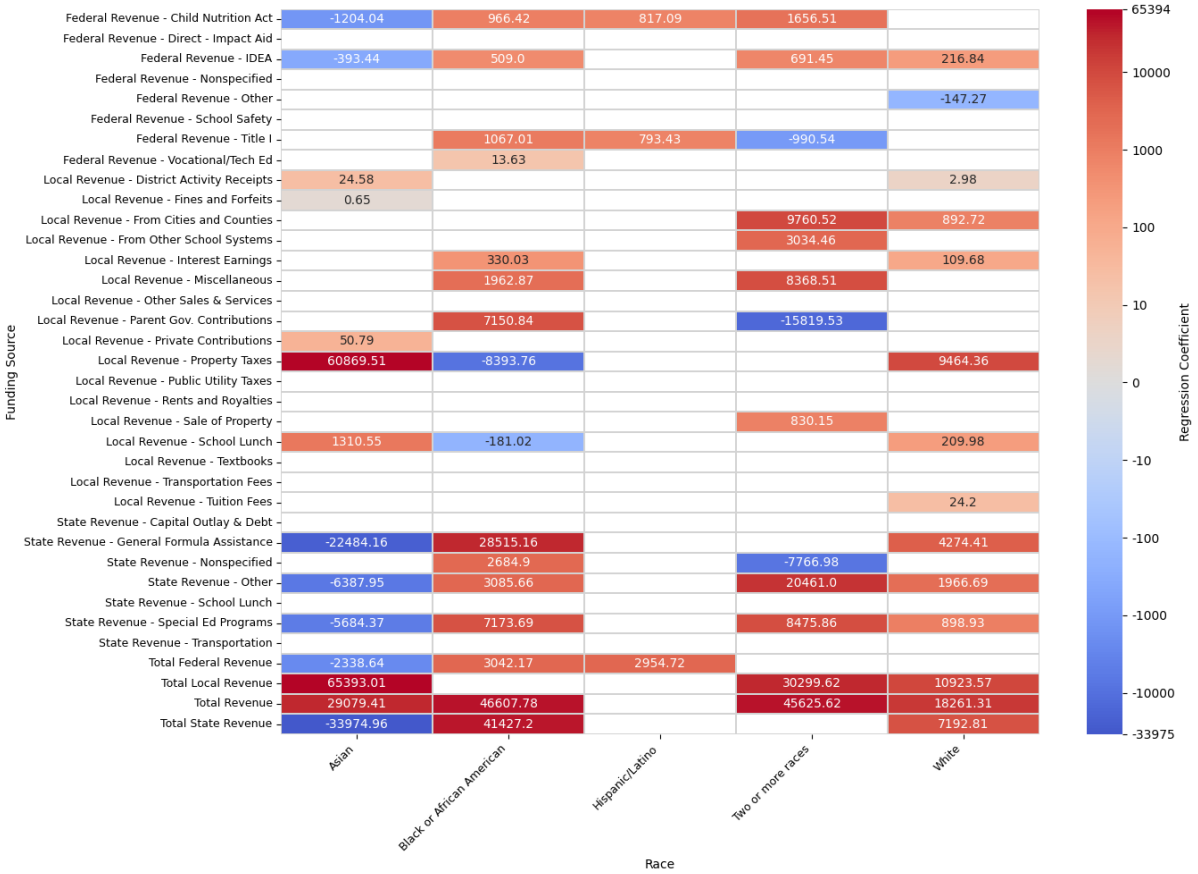
A small number of significant associations were found between funding sourcing and Hispanic/Latino students. No significant associations were found in local revenue sources or state revenue sources. However, the presence of Hispanic/Latino students was associated with increased aggregated federal revenue ($\beta = 2954.72$), mainly including revenue from the Child Nutrition Act ($\beta = 817.09$) and Title I ($\beta = 793.43$). Hispanic/Latino students had the least overall positive associations with LEA revenue, despite a consistent presence in LEAs in the Finger Lakes Region and a high CV of 97.86%.

Asian students were associated with many strong positive and negative correlations. Aggregated state revenue ($\beta = -33974.96$) and aggregated federal revenue ($\beta = -2338.64$) both possessed strong negative associations with the presence of Asian students. All significant associations found with state revenue were negative, including general formula assistance ($\beta = -22484.16$), other state revenue ($\beta = 6387.95$), and special education programs ($\beta = -5684.37$). Significant associations with federal revenue were similarly solely negative, including the Child Nutrition Act ($\beta = -1204.04$), and IDEA ($\beta = -393.44$). Asian student presence was strongly associated with aggregated local revenue ($\beta = 65393.01$), mainly including property

tax revenue (β = 60856.51), and school lunch revenue (β = 1310.55). LEAs with higher Asian populations in the Finger Lakes Region may rely more on local revenue than state or federal support.

The presence of students with two or more races was found to have many positive and negative associations, while representing a wide variety of races nationally (Jones & Smith, 2001). Aggregated local revenue was found to have a strong positive association (β = 30299.62), including revenue from cities and counties (β = 9760.52), miscellaneous local revenue (β = 8368.51), and revenue from other school systems (β = 3034.46). Despite a strong positive association with aggregated total revenue, the presence of students with two or more races has a negative association with parent government contributions (β = -15819.53). No significant association was found with aggregated federal or state revenue, yet the total revenue had a strong positive association (β = 45625.62). Significant associations with federal revenue include other state revenue (β = 20461.00), special education programs (β = 8475.86), and nonspecified state revenue (β = -7766.98). Federal revenue also possessed multiple significant associations, including the Child Nutrition Act (β = 1656.51), Title I (β = -990.54), and IDEA (β = 691.45).

Fig. 2. Heatmap showing statistically significant ($p < 0.05$) regression coefficients from multiple linear regression models assessing the correlation between students' races or ethnicities and LEA revenue sources. Red indicates an increase in revenue, and blue indicates a decrease in revenue.



4. Discussion

This study examined how demographic factors in LEAs, particularly the race or ethnicity of students, related to sources and amounts of funding for LEAs in the Finger Lakes Region of New York. The results suggest that significant differences in LEA revenue sources and amounts exist among the five races or ethnicities examined. An increased presence of Asian students was strongly associated with increased local property tax revenue and decreased state and federal revenue. Conversely, Black or African American students were negatively associated with property tax revenue and possessed a strong positive association with state revenue. Hispanic/Latino students showed limited relationships with LEA funding, having a positive association with federal funding. Students with two or more races had a strong positive association with local and total revenue, and some positive associations with state revenue sources. LEAs with White students had positive associations with both aggregated state and local revenue, with local revenue associations mainly consisting of property tax.

In the context of previous research, this study highlights and quantifies differences in LEA funding based on LEA demographic composition. Previous studies have found that school district funding is correlated with race, and that districts with greater white student levels receive greater amounts of local revenue (Ryan, 1999; Rothbart, 2020). Previous studies have also found that White students have a positive correlation with state aid, despite its use to help underfunded communities (Stiefel et al., 2005). These correlations are reaffirmed in this study. This study found that in the Finger Lakes Region, Asian students have strong positive associations with local revenue, primarily being property taxes. The presence of Asian students also has negative associations with federal and state revenue in the Finger Lakes Region.

While this study provides valuable results regarding LEA funding in the Finger Lakes Region, it has limitations that must be acknowledged. The analysis performed in this study is based on a single school year (2018-2019). This study also possesses a low sample size, limiting the accurate use of Native Hawaiian or Other Pacific Islander and American Indian or Alaska Native groups due to low representation in the Finger Lakes Region, restricting the completeness of this analysis. This study solely focuses on the Finger Lakes Region, a region with a unique demographic composition compared to New York State, and a unique level of funding and racial disparities. Results may not be able to be generalized to regions outside of the Finger Lakes.

Further research can examine LEA and school funding over a longer period to determine changes over time and the effects of policy changes on school funding. Future research should also include a larger region to examine differences in associations of LEA funding with LEA demographics across New York State or the United States. Expanding the study area can provide better insights into underrepresented minority groups and can help identify states and regions with great LEA funding disparities.

This study highlights the associations between racial demographics and LEA funding in the Finger Lakes Region. The most significant findings are that White and Asian demographics are mainly associated with an increase in local funding through property taxes, and that Asian students are negatively associated with state and federal funding. Recognizing and understanding these differences in funding across demographics is vital for policy and practice in LEA funding to promote equity for students regardless of race or ethnicity.

5. Conclusions

This study examined the relationships between LEA demographics and funding in the Finger Lakes Region, New York, during the 2018-2019 school year. By fitting 36 multiple linear regression models for each applicable funding source, many significant associations were revealed between the demographic composition of LEAs and revenue sources at the local, state, and federal levels. This study reveals that student race or ethnicity is strongly associated with the amount and type of funding LEA receives.

White and Asian students were positively associated with higher levels of local revenue, particularly including property taxes. Asian students had negative associations with state and federal revenue. In addition, African American students showed a negative association with property taxes, but many positive correlations with state revenue sources. Many differences in LEA funding exist across races and ethnicities, which must be accounted for by policymakers. These differences should be studied further by using data over a larger timespan or region.

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Conflict of Interest Declaration

The author has no conflicts of interest to declare, and there is no financial interest to report.

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