

Need vs. Distribution White Paper

Abstract

With 133,000 unemployed Coloradans as of December 2021 and higher education being out of reach for Americans, assistance from state-funded programs is needed at a high rate. By looking at the population densities of each county in Colorado and state funding allocations, this data may show a trend in resource distribution and Colorado county demographics. Through the analysis and visualization of these variables, it may be determined if each county has the proper resources to combat its socio-economic difficulties. The different resources required by each county may be evaluated by taking a closer look at the different demographics in each one. Socio-economic factors affect the quality of life and how people make decisions, the data gathered for each Colorado county on these factors prove to be a beneficial contribution to the measurement of proper resource distribution.

Introduction

Colorful Colorado, also known as the Centennial State, is reputable for its gorgeous mountain ranges and other varieties of exceptional natural scenery (*Home Collections Symbols & Emblems*, n.d.). The state of Colorado offers a large amount of opportunity throughout its sixty-four counties, attracting many people from all over the entire country. With a combination of beautiful scenery and opportunity, resources are necessary to maintain these two of the many catalysts that fuel the state's remarkable image. These resources can include those beneficial to urban areas with urban circumstances as well as those beneficial to rural areas with rural

circumstances. Overall, the adequate assignment of these resources directly affects the fashion in which different state counties operate. This leads to the question of whether resources are being fairly distributed throughout counties within the state; in the quest for the solution to this question, it is vital to understand the foundational data and research that has been conducted in the past and today's era.

In the journal *An Analysis of the Demographic Predictors of the Use of a Louisiana Parenting Helpline*, Lisa Olson describes the process and results of her study on the demographics using a low-cost helpline service for child-related matters in the state of Louisiana. The service known as KIDLINE is a toll-free helpline offered to parents throughout the state of Louisiana to aid them in matters about their child whether it be crisis intervention, support, parenting information, and referrals to community services Olson, L. M. (2020, p. 8). Prevent Child Abuse Louisiana (PCAL) was interested in the demographics of the callers using KIDLINE, so they started documenting the demographic data about the callers. A multitude of demographic variables was studied ranging from age, race, household details, income, and population statistics. Olson concluded that the variables that correlated to higher use of KIDLINE call volume were population/population density, per capita income, and education levels Olson, L. M. (2020, p. 18-19).

Problem Statement

Socio-economic factors have been proven to have a large influence on the resources that people may need. Measuring the social service resources being distributed throughout Colorado Counties may help get a better view of what is still needed. The overall impact of the resources

being distributed can cause more inequality between demographics of people if not properly dispersed.

Proposed Solution

The variables found by Lisa Olson were the guiding force behind selecting the independent variables for this analysis. The independent variables included Population Density (per square mile), Per Capita Income (in US Dollars), and Education Levels. It was also determined that County Categorization and Total Population were to be included as variables to study.

Education Levels are segmented into three different categories: No High School Diploma, High School Diploma, and Post-Secondary Degree. The data was derived from Statisticalatlas.com and each category counts the highest level of education attained among people in each county aged 25 years or older (Cedar Lake Ventures, Inc, 2022). People in the No High School Diploma category have not attained a diploma or equivalent, people in the High School Diploma category have completed high school and received their diploma or equivalent, and people in the Post-Secondary Degree category have received any type of degree beyond high school.

County Categorization was included to look at correlations between urban and rural, and for this analysis, the USDA's definitions for county categories were used. Rather than defining a category as urban or rural, the USDA segments this definition into three groupings: Metro, Nonmetro–Micropolitan, and Nonmetro–Noncore. Metro counties are defined as densely settled urban clusters containing populations of 50,000 or more (Cromartie, 2019). Areas that aren't

defined as Metro (i.e. Nonmetro) are subdivided into the two delineations Micropolitan and Noncore. Micropolitan counties follow similar criteria as Metro counties except populations found in these counties range from 10,000 to 49,999, and Noncore counties are the remaining counties that do not meet the population criteria for the other categories and are not a part of “core-based” metro or micro areas (Cromartie, 2019).

To determine how much each independent variable factors into determining a county's needs, data for human services offered to the public was sought. By the end, data from Health First Colorado and Free and Reduced Lunch were deemed suitable for analysis, and three variables were chosen: Total Enrollment in Health First Colorado (HFC), Total Expenditure in HFC, and Free and Reduced count. Total Enrollment in HFC accounts for the number of people per county registered for HFC and the Total Expenditure in HFC is how much each county in total each county has spent on expenditures made by the people enrolled for the fiscal year 2020 to 2021. The Free and Reduced count is the number of students in each county who are eligible for both free and reduced lunch for the year 2021.

After reviewing the analyses no proposed solution can be determined. The issue at hand involves a wide array of contributing factors that were not included in this analysis. It is recommended that to develop a better idea of the needs of a county, more demographic variables should be researched and included.

Findings

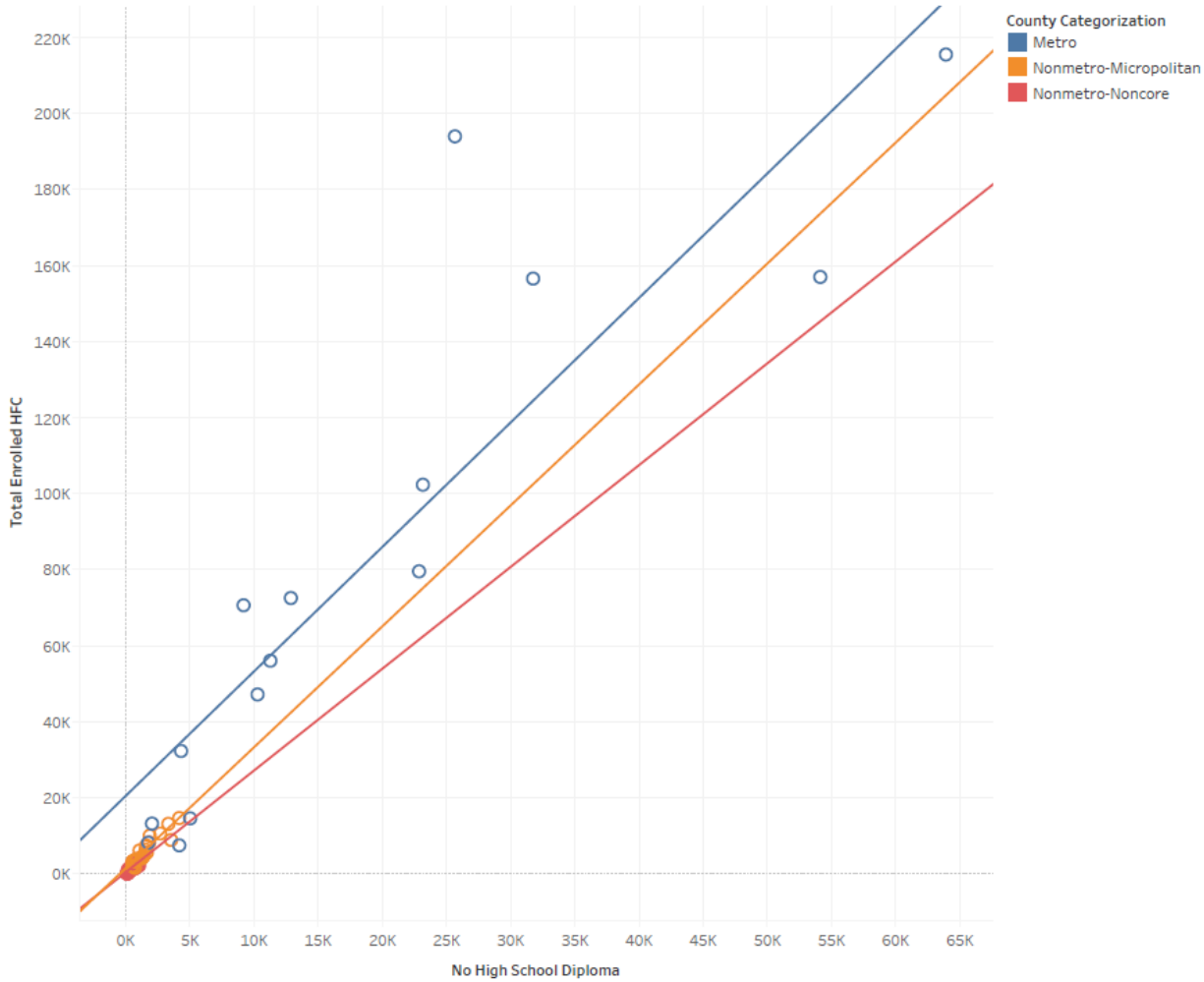
Multiple analyses were run for the three dependent variables which include Total Enrollment counts in Health First Colorado (HFC), Total Expenditure amounts in Health First Colorado, and Free & Reduced counts. The analyses included a multiple linear regression analysis and a correlation matrix.

The Total Enrollment regression analysis showed that, based on the P-values, the most significant variables were Total Population (0.0021), Population Density (0.0439), No High School Diploma (0.0058), and Post-Secondary Degree (0.0124). The variables that showed a correlation of 0.5 - 1 (-1 - -0.5 for negative correlation) in the correlation matrix were Metro (0.7151), Total Population (0.9642), Population Density (0.6183), No High School Diploma (0.9397), High School Diploma (0.9666), and Post-Secondary Degree (0.9114). The variables Population Density, No High School Diploma, and Post-Secondary degree were chosen to develop the visualizations which display Total Enrollment against the three variables in the form of scatterplots.

The scatter plot displays the relationship between Total Enrolled HFC (Y-axis, 0K to 220K) and Population Density (per sq mi) (X-axis, 0 to 4500). The data is categorized by County Categorization: Metro (blue), Nonmetro-Micropolitan (orange), and Nonmetro-Noncore (red). Metro counties show a positive linear relationship, while Nonmetro-Micropolitan and Nonmetro-Noncore counties show a steeper positive relationship.

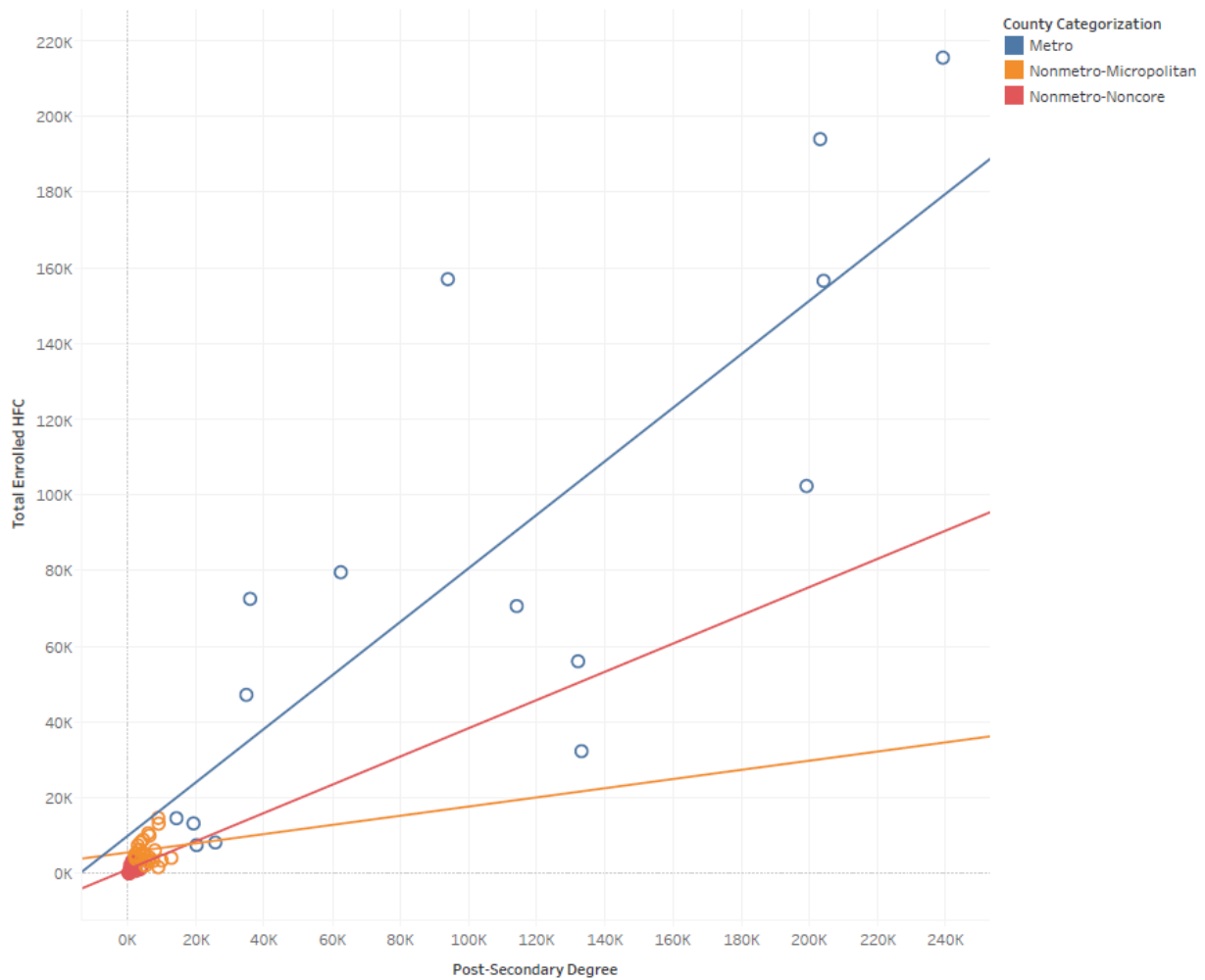
County Categorization	Population Density (per sq mi)	Total Enrolled HFC
Metro	0	0
Metro	100	10
Metro	150	15
Metro	200	20
Metro	250	25
Metro	300	30
Metro	350	35
Metro	400	40
Metro	450	45
Metro	500	50
Metro	550	55
Metro	600	60
Metro	650	65
Metro	700	70
Metro	750	75
Metro	800	80
Metro	850	85
Metro	900	90
Metro	950	95
Metro	1000	100
Metro	1050	105
Metro	1100	110
Metro	1150	115
Metro	1200	120
Metro	1250	125
Metro	1300	130
Metro	1350	135
Metro	1400	140
Metro	1450	145
Metro	1500	150
Metro	1550	155
Metro	1600	160
Metro	1650	165
Metro	1700	170
Metro	1750	175
Metro	1800	180
Metro	1850	185
Metro	1900	190
Metro	1950	195
Metro	2000	200
Metro	2050	205
Metro	2100	210
Metro	2150	215
Metro	2200	220
Metro	2250	225
Metro	2300	230
Metro	2350	235
Metro	2400	240
Metro	2450	245
Metro	2500	250
Metro	2550	255
Metro	2600	260
Metro	2650	265
Metro	2700	270
Metro	2750	275
Metro	2800	280
Metro	2850	285
Metro	2900	290
Metro	2950	295
Metro	3000	300
Metro	3050	305
Metro	3100	310
Metro	3150	315
Metro	3200	320
Metro	3250	325
Metro	3300	330
Metro	3350	335
Metro	3400	340
Metro	3450	345
Metro	3500	350
Metro	3550	355
Metro	3600	360
Metro	3650	365
Metro	3700	370
Metro	3750	375
Metro	3800	380
Metro	3850	385
Metro	3900	390
Metro	3950	395
Metro	4000	400
Metro	4050	405
Metro	4100	410
Metro	4150	415
Metro	4200	420
Metro	4250	425
Metro	4300	430
Metro	4350	435
Metro	4400	440
Metro	4450	445
Metro	4500	450
Metro	4550	455
Metro	4600	460
Metro	4650	465
Metro	4700	470
Metro	4750	475
Metro	4800	480
Metro	4850	485
Metro	4900	490
Metro	4950	495
Metro	5000	500
Metro	5050	505
Metro	5100	510
Metro	5150	515
Metro	5200	520
Metro	5250	525
Metro	5300	530
Metro	5350	535
Metro	5400	540
Metro	5450	545
Metro	5500	550
Metro	5550	555
Metro	5600	560
Metro	5650	565
Metro	5700	570
Metro	5750	575
Metro	5800	580
Metro	5850	585
Metro	5900	590
Metro	5	

Enrolled & No HS Diploma



No High School Diploma vs. Total Enrolled HFC. Color shows details about County Categorization. The view is filtered on County Categorization, which keeps Metro, Nonmetro-Micropolitan and Nonmetro-Noncore.

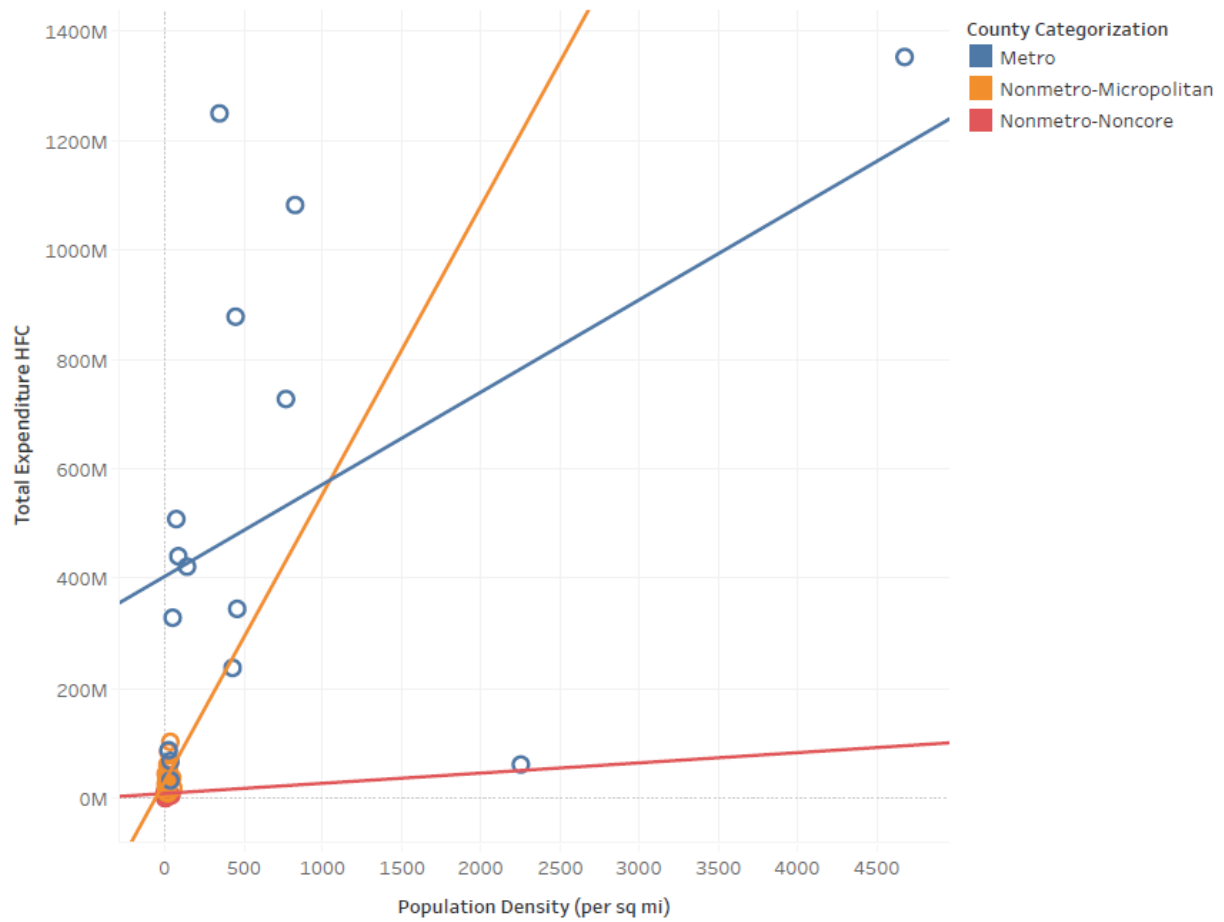
Enrolled & Post-Secondary Degree



Post-Secondary Degree vs. Total Enrolled HFC. Color shows details about County Categorization. The view is filtered on County Categorization, which keeps Metro, Nonmetro-Micropolitan and Nonmetro-Noncore.

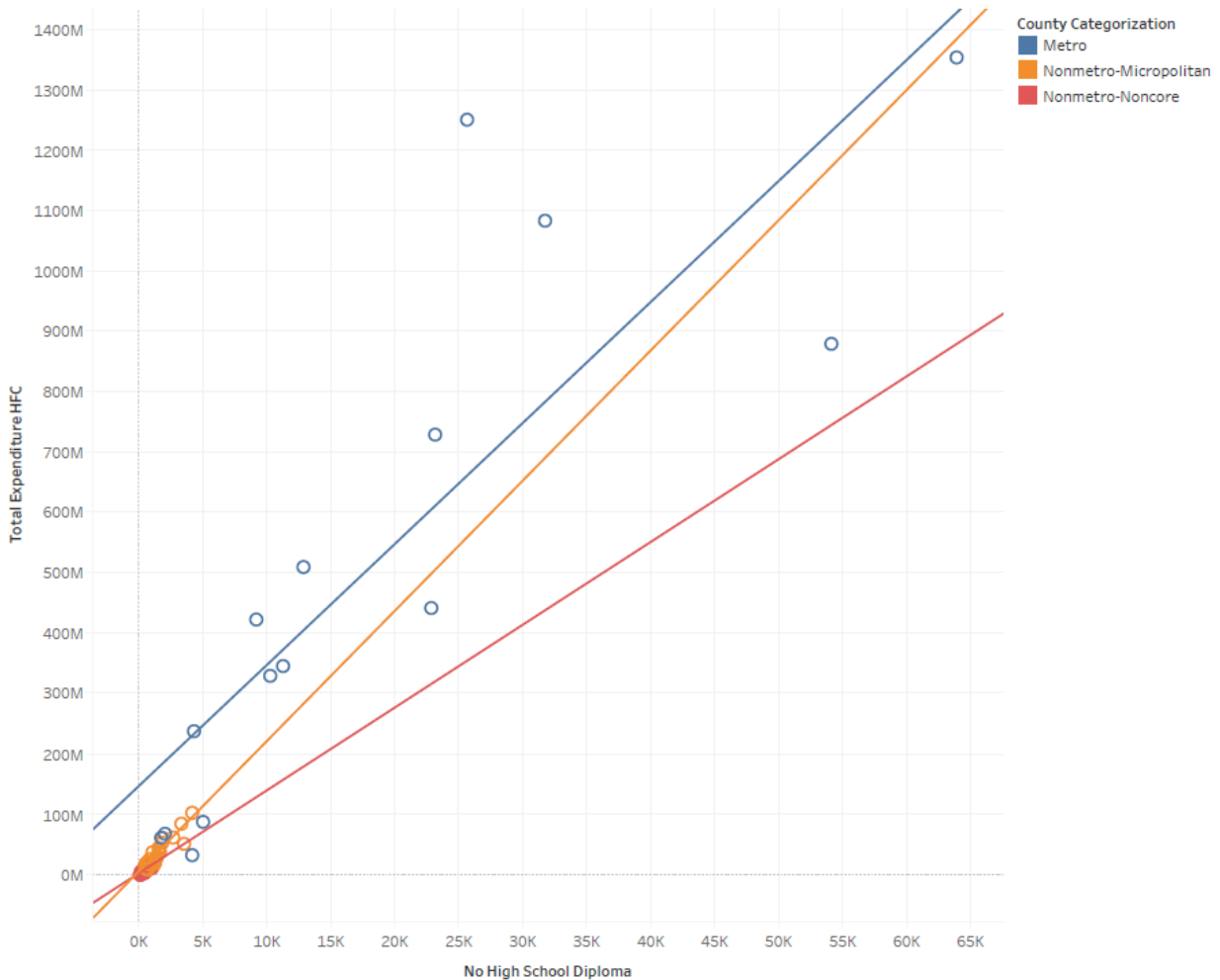
The Total Expenditure regression analysis showed the most significant variables based on P-values were Population Density (0.0242) and High School Diploma (0.0066). The correlation matrix showed that the variables with the greatest amount of correlation were Metro (0.7162), Total Population (0.9689), Population Density (0.6181), No High School Diploma (0.9204), High School Diploma (0.9721), and Post-Secondary Degree (0.9262). The variables Population Density and High School Diploma were chosen for the visualizations as they were the only variables to show both strong significance and correlation.

Expenditure & Population Density



Population Density (per sq mi) vs. Total Expenditure HFC. Color shows details about County Categorization. The view is filtered on County Categorization, which keeps Metro, Nonmetro-Micropolitan and Nonmetro-Noncore.

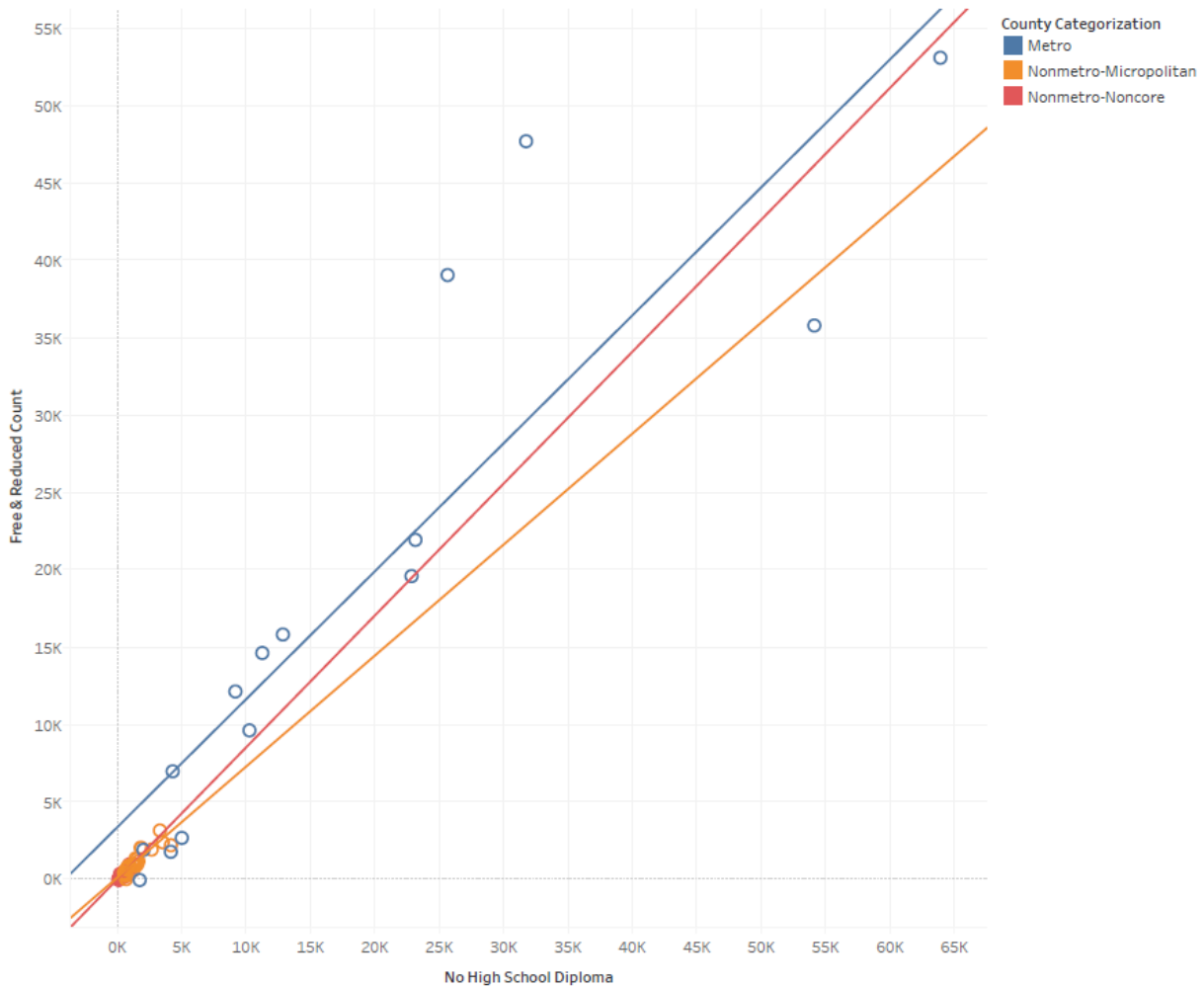
Expenditure & High School Diploma



No High School Diploma vs. Total Expenditure HFC. Color shows details about County Categorization. Details are shown for County. The view is filtered on County Categorization, which keeps Metro, Nonmetro-Micropolitan and Nonmetro-Noncore.

Finally, the Free and Reduced regression showed that the only significant variable was No High School diploma with a P-value of 0.000028. In regards to the correlation matrix, the variables that showed a correlation above 0.5 were Metro (0.6876), Total Population (0.9512), Population Density (0.6310), and No High School Diploma (0.9435), High School Diploma (0.9504), and Post-Secondary Degree (0.9060). The variable No High School Diploma was the only variable used to develop a scatter plot as it was the only variable to have a significant P-value and strong correlation to the Free & Reduced count.

Free and Reduced & No HS Diploma



No High School Diploma vs. Free & Reduced Count. Color shows details about County Categorization. The view is filtered on County Categorization, which keeps Metro, Nonmetro-Micropolitan and Nonmetro-Noncore.

The three consistently significant variables across the analyses were Total Population, Population Density, and Education levels more specifically No High School Diploma. Total Population was not included in the visualizations where it was deemed significant as it was determined that there is a high probability that the counts for Total Enrollment and Free and Reduced would increase as Total Population Increases. Population Density met the criteria to be significant but consistently had lower significance and correlation to the dependent variables. Education levels were an interesting variable as each level had varying significance with each of the dependent variables. The variable No High School Diploma was significant for two of the

three dependent variable analyses and proved to be the most significant variable for said analyses.

Summary

Though many variables were used in the analysis and visualization of this topic, more variables are needed to adequately measure need versus distribution throughout Colorado counties. The reason for the lack of variables being used in the analysis and visualizations is that there are not enough publicly available data sets that we're able to be included in the study. The results of the different methods of analysis used in this study have been mostly inconclusive as there is not enough data(variables) in the models to be able to propose a strong solution for the issues in social service resource distribution. Although there is not a proposed solution to the issue of resource distribution in this particular submission, this research project may have played important groundwork for a breakthrough study in which the inequalities of resource disbursement are exposed and an appropriate solution is made available.

References

- Cedar Lake Ventures, Inc. (2022, April 23). Educational Attainment in Colorado. From StatisticalAtlas.com: <https://statisticalatlas.com/state/Colorado/Educational-Attainment>
- Cromartie, J. (2019, October 23). What is Rural? From USDA: <https://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx>
- Olson, L. M. (2020). An Analysis of the Demographic Predictors of the Use of a Louisiana Parenting Helpline. *Child Welfare*, 98(5), 53–74.

Datasets

- United States Census Bureau. (2020). Race (P1) [Data set]. <https://data.census.gov/cedsci/table?q=population>
- Colorado Department of Labor & Employment. (2022). Personal Income in Colorado [Data set]. <https://data.colorado.gov/Labor-and-Employment/Personal-Income-in-Colorado/2cpa-vbur>
- Cedar Lakes Ventures, Inc. (2022). Educational Attainment in Colorado [Data set]. <https://statisticalatlas.com/state/Colorado/Educational-Attainment>
- Colorado Department of Education. (2021). 2021-2022 Preschool (Pk) Through 12th Grade Free and Reduced Lunch Eligibility By District And County [Data set]. <https://www.cde.state.co.us/cdereval/pupildcurrent>
- Colorado Department of Health Care Policy & Financing. (2020). *County Fact Sheets* [Data set]. <https://hcpf.colorado.gov/county-fact-sheets>
- National Association of Counties. (2020). *County Explorer* [Data set]. <https://ce.naco.org/>