

# RACIAL AND SOCIOECONOMIC DISTRIBUTION OF PUBLIC GREEN RIBBON SCHOOLS

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## 1 ABSTRACT

*This study aims to investigate whether all students, regardless of racial and socioeconomic status, have equal access to the Green Ribbon Schools. Research on the benefits of green school programs are positively correlated with green spaces, particularly with enhanced attention and improved academic performance. The Green Ribbon award honors schools that are environmentally conscious and focus on sustainability. States that nominate more than two schools must have one school that serves at least 40% of students from disadvantaged backgrounds. The purpose of this study is to determine whether the awarded public Green Ribbon Schools are equally distributed among disadvantaged populations. The list of ED Green Ribbon public schools for the years 2013 through 2015 was collected from the Department of Education. Racial/ethnic and socioeconomic data was collected from the Elementary/Secondary Information System. The study found that the majority of awarded public Green Ribbon Schools did not serve at least 40% disadvantaged students. The majority of Green Ribbon Schools (61%) are primarily attended by White students. Just under 50% of Green Ribbon Schools serve at least 40% socioeconomically disadvantaged students. The chi-squared test found that race/ethnicity and socioeconomic status of the students were not equally distributed for the Green Ribbon Schools ( $\chi^2 = 30.60$ ,  $p < 0.0005$ ). This study is important because it shows that disadvantaged populations are less likely to get an education that may allow their students to learn about sustainability. The recognition process of bestowing Green Ribbon awards can become more conscious in reaching schools that serve disadvantaged populations.*

### 1.1 Keywords

School Environments, Environmental Justice, Green Ribbon Schools, Children

## 2 INTRODUCTION

In September 2011, the Obama administration announced the inception of the Green Ribbon Schools with the first awardees being awarded in 2012. The program began after roughly 80 nonprofit organizations requested that the USDED honor schools for their achievement in sustainable facilities, above average health practices, and effort in environmental education (USDED 1, 2017). As of 2017, a total of 340 Kindergarten through 12th grade schools, 56 districts, and 34 post-secondary schools were honored (USDED 2, 2017). Over the entirety of the program 42 states, and Washington, DC, had at least one school honored. Eight states- Arkansas, Maine, Nevada, South Carolina, South Dakota, Texas, Utah, and Wyoming- have yet to participate in the program.

The United States Department of Education (USDED) runs the Green Ribbon Schools program which awards schools, districts, and institutions of Higher Education that reach high standards of sustainability and environmental education (USDED 1, 2017). The program is based on three fundamental pillars: reduced environmental impact and costs, improved health and wellness, and effective environmental and sustainability education. However, these pillars lack any mention of serving disadvantaged populations, which is a key component of environmental justice, an important part of sustainability and environmental education.

The USDED states that their goals for the program are to increase economic health and stability as well as student achievement. The goals of the program are to help schools to create jobs and save money under the reduced environmental impact and costs Pillar. The USDED aims for this program to increase student engagement and knowledge in STEM fields which is ultimately helpful for college and career preparedness. The goal of the third pillar, effective environmental and sustainability education, is to teach students civic skills in order to help them grow into responsible world citizens.

As a relatively new program, there is much research left to be done regarding Green Ribbon Schools, particularly if the program reaches the goals set out by the USDED and how the program affects the students that attend awarded schools. As a recognition award, there are not many tangible benefits to the schools for participating in the program. Rather, the schools are given a sense of pride in their accomplishment of being denoted as one of the United States' top institutions in sustainability and become part of the community of fellow Green Ribbon Schools.

The USDED often claims that this program successfully serves disadvantaged populations (USDED 2017; USDED, 2016; USDED, 2015; USDED, 2014; USDED, 2013; USDED, 2012). The goal of this paper was to determine whether the awarded Green Ribbon Schools proportionally serve students of color and of lower socioeconomic status.

### 2.1 Literature Review

Despite the lack of research on ED Green Ribbon Schools in particular, there is a wide array of research that has been completed on green schools' and green school programs' benefits to students. We care about this because the overall goal of our research is to determine whether all students, regardless of racial and socioeconomic status, have equal access to these benefits. The current research that has been completed has demonstrated positive effects correlated with green spaces, particularly with attention, improved academic performance, incorporation of outdoor education, and overall well-being.

Kaplan and Kaplan's Attention Restoration Theory (1989) found that after a prolonged time devoted to direct attention, people experience fatigue, which causes irritation, a lack of concentration, and agitated behavior. This is particularly relevant to school children, who are required for long periods of time to engage in direct attention. Kaplan and Kaplan found that exposure to natural environments helps people to practice holding attention, allows for reflection, improves concentration, reduces mental fatigue (1989). The ability of green spaces to help with attention has been confirmed in several other studies (Berman, Jonides, & Kaplan, 2008; Mårtensson, Boldemann, Söderström, Blennow, Englund, & Grahm, 2009; Taylor & Kuo, 2009; Taylor & Kuo, 2004). In a comparison of natural vs urban environments, two experiments were presented by Berman, Jonides, & Kaplan (2008) which showed that both taking a walk in nature or viewing pictures of nature can help to improve directed-attention abilities. In Taylor & Kuo's national study (2004), it was found that green outdoor activities reduced symptoms of ADHD significantly more than activities in other settings. Their findings were consistent even taking into consideration possible other confounding variables like age, gender, socioeconomic status, and region. Thus, exposure to green spaces again is seen to help with attention issues, even in cases of diagnosed Attention-Deficit/Hyperactivity Disorder.

Recent studies have indicated a positive correlation between increased green space on school grounds and improved academic performance. In 2014, Wu et al. conducted a study on the association between green space on school grounds and cognitive function, as measured by academic performance. The conclusion of this study was that there was a positive correlation between the students' exposure to green spaces on their school grounds and higher academic performance. The positive correlation between increased green space on school grounds and improved academic performance is also demonstrated by a study done by Matsuoka (2010). In Matsuoka's 2010 study, data from high school students in Michigan were analyzed to see if there was a correlation between availability of nearby nature and the students' academic achievement and behavior. It was found that students with greater access to nature and who were able to spend more time outside had higher standardized test scores, higher graduation rates, and were more likely to plan on attending four-year colleges. In a study done by Kweon et al. (2016), it was found that the students in schools with more trees received a higher percentage of proficient or advanced scores in Mathematics and Reading standardized tests even after controlling for school size, student teacher ratio, and free lunch enrollment. Not all landscapes had the same positive effects; "featureless landscapes" such as large lawns or athletic fields had negative, rather than positive, impacts on academic performance. With the insights provided by recent studies on the positive correlation between increased green space on school grounds and improved academic performance, it can be assumed that a benefit of Green Ribbon Schools would be an improvement in academic performance as well.

Green schools and green school programs incorporate outdoor education in order to reap the benefits associated with green spaces. Kweon, Ellis, & Storie (2016) provided several case studies on how green schools and green school programs have begun to incorporate outdoor education into their curriculum; they document the benefits associated with these school's incorporation of outdoor education. The schools used in this case study incorporate outdoor education through various means including: teaching students how the school's storm water and wastewater treatments work, education on ecosystems through direct observation of the school's landscapes, and teaching students basic plant science through running their own vegetable gardens and including students in the process of growing and harvesting the produce.

The benefits of green space on school grounds do not stop at merely academic benefits, green schools and green school program also are correlated with overall wellbeing. A study on the association between outdoor environments of day care centers and the children's health concluded that outdoor environments do influence health and wellbeing (Söderström, Boldemann, Sahlin, Mårtensson, Raustorp, & Blennow, 2013). Day care centers with "high-quality outdoor environments" were associated with health benefits such as: leaner bodies, longer sleep at night, better overall well-being, and higher mid-morning saliva cortisol levels.

The research done on the benefits of green spaces and on green schools' and green school programs' benefits for students can be applied to potential benefits of ED Green Ribbon Schools. It is important to consider the benefits that could be gained by students attending ED Green Ribbon Schools because the goal of this paper is to determine whether those benefits are equally accessible, regardless of racial and socioeconomic status. Students should not be restricted because they belong to a disadvantaged population. They should have equal access to improved attention, academic performance, overall well-being, and a chance to learn about the environment through the incorporation of outdoor education.

### **3 METHODS**

In this section we will discuss data collection for the Green Ribbon Schools and the associated demographics. The data analysis was conducted via Excel and a statistical program, "R."

#### **3.1 Data Collection**

To determine if the Green Ribbon Awards were disproportionately awarded to non-disadvantaged populations, a database was created of the Green Ribbon Schools and variables associated with advantaged and disadvantaged populations: racial/ethnic and socioeconomic distributions. A disadvantaged school was defined as one which serves at least 40% students from a disadvantaged background. This definition is based on the criteria of the U.S. Department of Education for when a state nominates more than two schools or districts ("Green Ribbon School," 2016). While the Green Ribbon program awards both individual schools and districts, this study focused solely on individual schools. Data

were collected for the awarded schools from 2012 to 2014; the number of awarded schools per year and per state are shown in Table 1 and Figure 1. 35 states have at least one school that has been awarded Green Ribbon Award, while 15 states do not.

### 3.2 School Demographics

Racial/ethnic distributions and socioeconomic distributions were used as indicators of advantage. The Elementary/Secondary Information System (ELSi) was used to synthesize the information on the Green Ribbon Schools. ELSi is a database of public and private schools in the United States provided by the National Center for Education Statistics (NCES). The data provided in ELSi was taken from two sources- the Common Core of Data (CCD) for public schools and the Private School Survey (PSS) for private schools. The CCD is a survey that is conducted by the Department of Education while the PSS is conducted by the Bureau of the Census.

After compiling preliminary data on the awarded schools, it was clear that there was not sufficient data available to analyze private school data. As the two surveys have different metrics it would not be appropriate to combine the datasets. Many private schools also did not provide data about their schools to the PSS; thus, only public school information was evaluated.

### 3.3 Data Analysis

The compiled Green Ribbon School information was analyzed for trends, quantitative information, and for a chi-squared test for independence. The number of students of each race/ethnicity had to be converted to percent of each race/ethnicity per school. From there Excel was used to determine the descriptive statistics such as mean, median, range, etc. Graphs of both racial/ethnic distributions and socioeconomic distributions were created to visualize and analyze the trends in the data.

In order to perform a chi-squared test for independence, the program "R" was used. R is an open source computational system that allows for accurate statistical computing. R was used to analyze the interaction between race/ethnicity and socioeconomic status. A chi-squared test was used to determine if a significant association exists between two variables. If an association was present, it could be concluded that race/ethnicity and socioeconomic status were related for Green Ribbon Schools. The typical chi-squared test requires certain assumptions to be met such as no expected values less than one and less than 20% of the expected values can be less than five. The data analyzed in this paper did not meet either of those assumptions given the wide variance in race/ethnicity and socioeconomic status. Monte Carlo principles were used to run our chi-squared test in R since they allow data that does not meet the assumptions of a normal chi-squared test.

## 4 Results

This section will discuss the racial/ethnic distribution, socioeconomic distribution, and the interaction between the racial/ethnic and socioeconomic distribution. The results show that the majority of awarded public Green Ribbon Schools did not serve at least 40 percent disadvantaged students

### 4.1 Racial/Ethnic Distribution

While breaking down the racial and ethnic distribution of the schools, this paper focused on the three main represented races and ethnicities: White, African American, and Hispanic. The majority of Green Ribbon Schools (61%) are primarily attended by White students. Figure 1 shows that, on average, the Green Ribbon Schools only have 15.5% Hispanic students and 13.7% African American students. It should be noted that there is a large range represented in the data as seen in Table 1. The lowest percent of each race/ethnicity is 0% and the highest percentages are all above 80%. In fact, percentage of Hispanic students has the smallest range, even at the quite large range of 0 to 82% (Table 1). Figure 2 shows the distribution of the schools according to their percentage of students of each race/ethnicity. The overall trend shows that the majority of schools have less than 10% Hispanic and African American students and more than 90% White students. As percentage of students goes up, the number of schools goes up for White students and down for both Hispanic and African American students.

## 4.2 Socioeconomic Status

The majority of Green Ribbon Schools (51%) are not financially disadvantaged. Financial disadvantage is based on the percent of students who qualify for the federal Free and Reduced Lunch Program. For the purpose of analysis in this paper, the schools were determined to serve primarily financially disadvantaged students if >40% of the schools' students qualified for either free or reduced lunch prices. We chose 40% as the threshold because the U.S. Department of Education Green Ribbon Schools mandates that if a state wants to nominate more than two schools or districts, "at least one must serve at least 40 percent of students from a disadvantaged background (2016)." Figure 3 shows the percentage of schools by whether they are classified as not financially disadvantaged, 0-40%, or are classified as financially disadvantaged, >40%. By this definition, only 49% of the Green Ribbon Schools served primarily financially disadvantaged students. Figure 4 shows the distribution of schools by percentage of students who qualify for either free or reduced lunch. The most schools fall between 20-30% of students qualifying for either free or reduced lunch.

## 4.3 Interaction between Race/Ethnicity and Socioeconomic Status

The statistics program R was used to analyze whether the intersection of Race/Ethnicity and Socioeconomic Status is merely due to chance. When the socioeconomic disadvantage of a school was determined by whether more than 40% of students qualified for Free and Reduced Lunch Prices, the p-value of the chi-squared test was <0.0005. This determined that Race/Ethnicity and Socioeconomic status are related factors, and it is not just due to chance that the majority of schools are White and Not Disadvantaged.

## 5 Conclusion

This study's goal was to determine whether the majority of awarded public Green Ribbon Schools did or did not serve at least 40 percent disadvantaged students in order to find out if there is equal access to students of disadvantaged populations. There have been many studies discussing the benefits of green schools and green school programs, so we wanted to know if the government awarded ED Green Ribbon Schools, which presumably have these benefits, were accessible to students, regardless of race/ethnicity and/or socioeconomic status. This study found that the ED Green Ribbon Schools currently are not equally accessed by disadvantaged populations as advantaged populations, with the majority of ED Green Ribbon Schools (61%) primarily serving White students and not even 50% of ED Green Ribbon Schools serving a minimum of 40% socioeconomically disadvantaged students.

This study is important because in order for a problem to be solved, the problem must first be recognized. The positive effects of green schools and green school programs such as enhanced attention, improved academic performance, fosters outdoor education, and overall well-being, should be accessible regardless of race/ethnicity and/or socioeconomic status. With this knowledge, the recognition process of bestowing Green Ribbon awards can become more conscious in reaching out to schools that serve more disadvantaged populations. By acknowledging that the current ED Green Ribbon School program does not do enough to ensure the access of these benefits to disadvantaged populations, the Department of Education can begin to work toward a more inclusive program.

### 5.1 Figures and tables

**Table 1. Number of public schools per year including the schools with insufficient data.**

Year	Total Number of Schools	Number of Schools with Missing Data
2012	60	1
2013	54	3
2014	39	3
Total	153	7

**Table 2. Quantitative Data for Race/Ethnicity Percentages.**

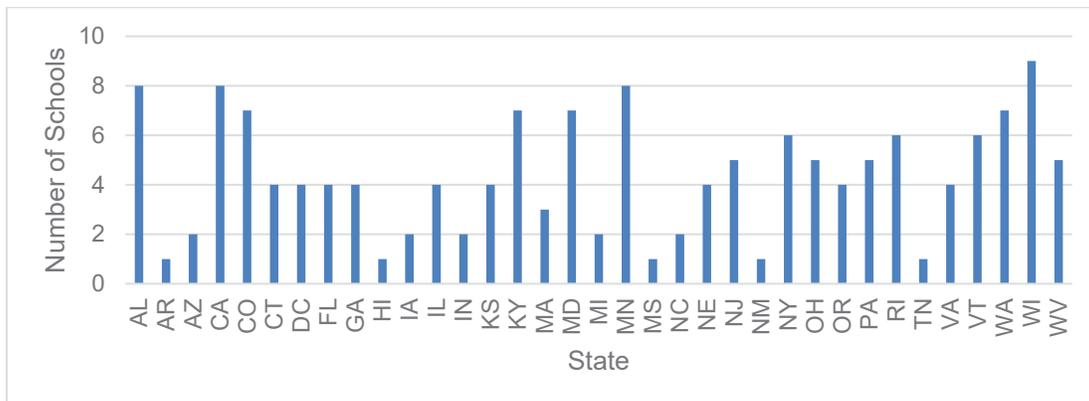
	<i>%Hispanic</i>	<i>%African American</i>	<i>%White</i>
Mean	15.56	13.68	61.43
Median	6.77	3.85	69.5
Mode	0	0	0
Standard Deviation	19.34	21.65	30.05
Range	82.11	99.74	99.44
Minimum	0	0	0
Maximum	82.11	99.74	99.44

**Table 3. Quantitative Data for Free and Reduced Lunch Prices.**

	<i>FRLP%</i>
Mean	41.39
Standard Error	2.39
Median	41
Mode	15
Standard Deviation	28.08
Range	100
Minimum	0
Maximum	100

**Table 4.  $\chi^2$  Test for Distribution of Race/Ethnicity and Socioeconomic Factors ( $\chi^2 = 30.60$ ,  $df=7$ ,  $p\text{-value} < 0.0005$ ).**

Socio-economic	Majority Race/Ethnic				Total Count (%)
	White Count (%)	African American Count (%)	Hispanic Count (%)	No Racial Majority Count (%)	
Disadvantaged	36 (46.75)	13(16.88)	10(12.99)	18(23.38)	77(100)
Not Disadvantaged	58(86.57)	0(0)	0(0)	9(13.43)	67(100)
Total	94(65.28)	13(9.03)	10(6.94)	27(18.75)	144(100)



**Figure 1. Number of public schools per state including the schools with insufficient data**

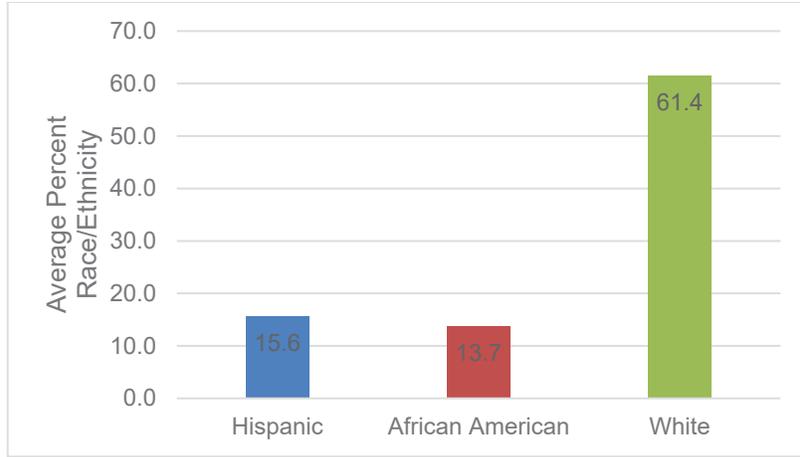


Figure 2. Average Percent of Students based on Race/Ethnicity (n=146)

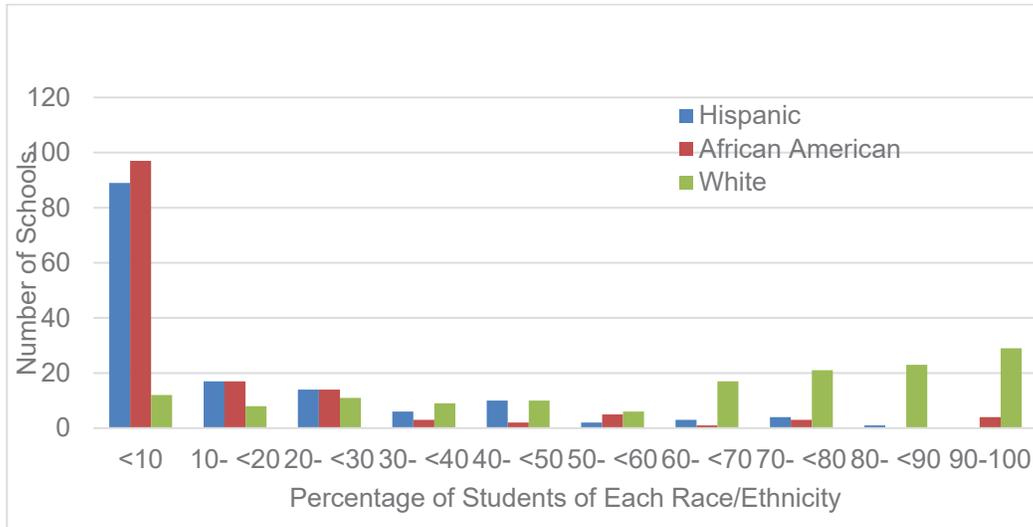
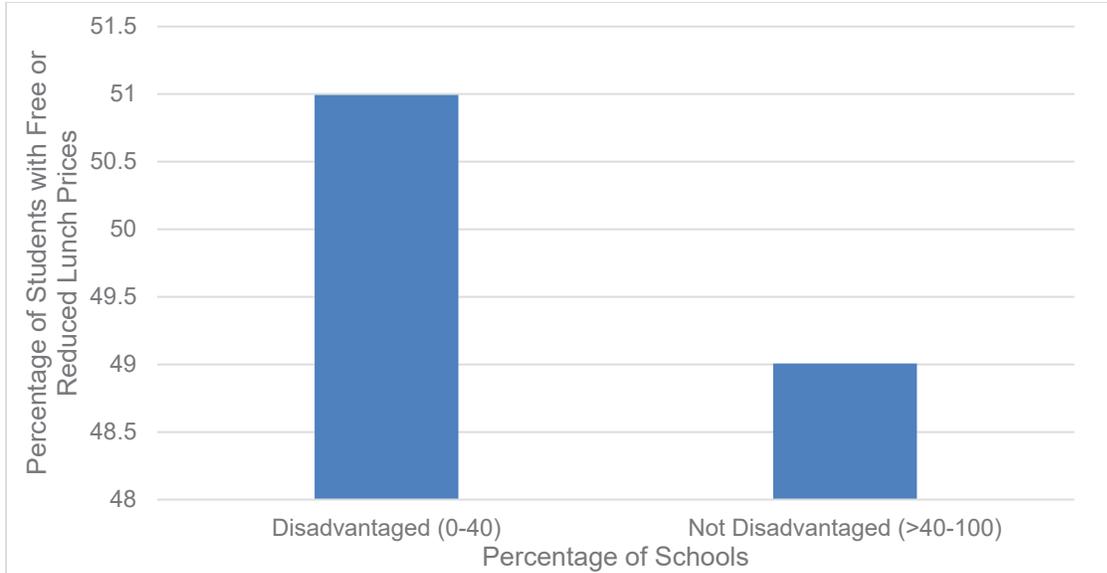
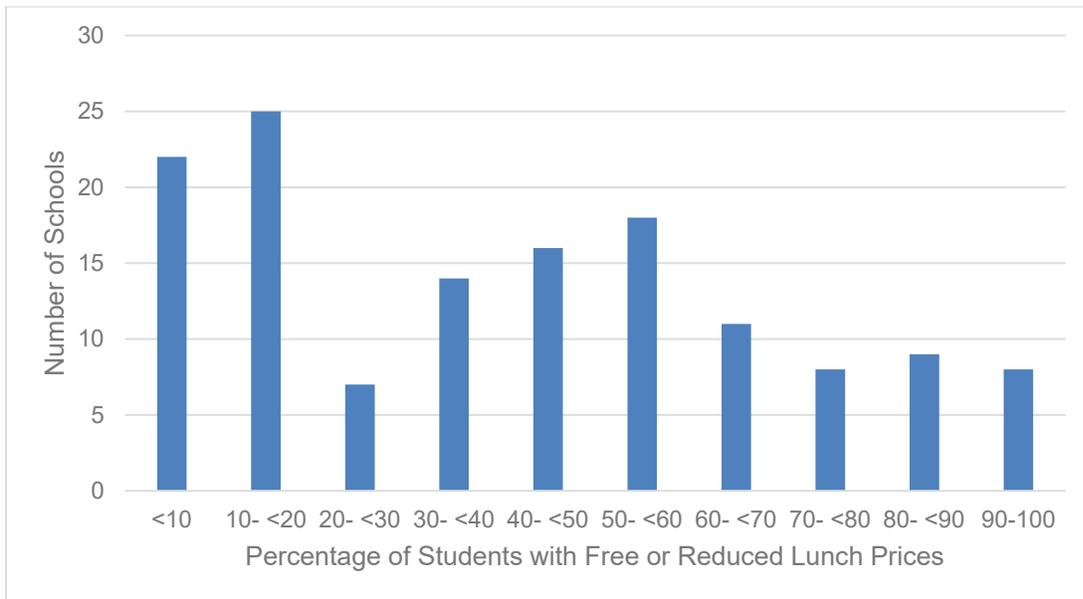


Figure 3. Frequency of Percentage of Students of Each Race/Ethnicity (n=146)



**Figure 4. Percentage of Students that Qualify for Free or Reduced Lunch Prices (n=138).**



**Figure 5. Frequency of Percentage of Students that Qualify for Free or Reduced Lunch Price (n=138).**

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