

## A GIS Study Identifying the Range of Standardized Test Scores of High School Students in the United States Based on Teacher Quality

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### Abstract

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*Today, the quality of teachers is becoming a big concern for the success of students. Schools and their communities have always sought out the best teachers they could get in the belief that their students' success depends on it. In fact, teacher quality is the most important school-related factor influencing students' achievement. In order to measure the effectiveness of teacher quality on public high school students' achievement, this study will offer implications by using geographic information systems (GIS). This GIS-based study will explore the relationship between the quality of the teacher and students' success across the nation. The rate of highly qualified teacher (HQT) will be used as a measurement of teacher quality. The high school students' average SAT score will be used as a measurement for students' success. This study will also explore other factors that might affect students' scoring rate.*

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**Keywords:** Teacher quality, student achievement, SAT score, HQT, GIS.

### Introduction

Teaching is arguably one of the most important jobs in society. Teaching is not only about passing knowledge to students, but also being aware of effective ways to transfer this knowledge. Obtaining knowledge and skills are not enough in educational settings (Kindle & Schmidt, 2011). In fact, teacher quality is identified as the most important school influence on student learning.

The definitions of teacher quality are grouped according to whether they focus on the qualifications of the teacher as a reflection of competence (degree, certification, subject matter credential, experience), the personal or psychological qualities of a teacher (such as love of children, honesty, compassion, fairness), the pedagogical standards that a teacher exhibits (use of certain teaching strategies, classroom management skills, establishment of a positive classroom climate), or the teacher's demonstrated ability to raise student learning (successful or effective teaching) (Strong, 2011).

Since teacher quality has become a top concern of educational policy, many studies have shown the correlation between student performance and the quality of the teacher. Recently, researchers have looked for changes in students' test scores according to the teacher they were assigned as a measure of the quality of the teacher (National Center for Education Statistics, 2004). It was indicated that a highly effective teacher is one whose students show the greatest gains from one year to the next (National Center for Education Statistics, 2004). It is believed that high teaching quality impacts student learning performance in a significant way.

Therefore, to determine the relationship between student performance and teacher quality, this research will use the geographic information systems (GIS) as a visualization and analysis tool to investigate the effects of teacher quality on standardized tests scores -SAT- of high school students in the United States (U.S.).

This study will also explore other factors that might affect students' standardized test scores other than teacher quality.

## Literature Review

### Standardized Testing

Standardized tests have been a part of American education since the mid-1800s. In 2002, a new Act called *No Child Left Behind Act* (NCLB) was passed and made standardized tests mandatory for all 50 states in the United States (Menken & Solorza, 2014). A standardized test is a test form that requires all test takers to answer the same questions, or a selection of questions from a common bank of questions, in the same way. The tests may include math problems, verbal or spatial content, and content requiring prior knowledge of a subject (Ballard & Bates, 2008). Standardized testing is used to compare individual scores to others at the same grade level (The Glossary of Education Reform, 2015). There are many different types of standardized test, but this study will focus on the SAT test.

The SAT test, most often taken by junior and senior high school students, is one of the standardized tests which is a measure of student performance. The main purpose of the SAT is to measure literacy and writing skills that are needed for students' academic success in college (Atkinson & Geiser, 2015). The exam includes reading, writing and language, math, and essay composition. The duration of the SAT exam is three hours and 50 minutes. Basically, SAT test assesses how well the students analyze and solve problems by using skills they learned in school and will need in college. SAT score is known as an important element regarding college choices, college acceptances, and scholarship awards (Brand, 2016). Students with higher SAT scores (above 1097) are two and a half times more likely to attend a research university than students with mid-range scores (Brand, 2016).

### Teacher Quality

It is not easy to define who is a good teacher, especially for those in charge of hiring, training and retaining a qualified teaching force (Center of Public Education, 2005). According to the Center of Public Education (2005), the most compelling evidence for the importance of teaching came initially from economists who adapted value-added models (VAM). Many states and school districts have adopted VAM as part of educational accountability systems (American Statistical Association, 2014). The main goal of this model is to estimate the effects of individual teachers or schools on student achievement (American Statistical Association, 2014). In other words, VAM is a teacher evaluation method that measures the teacher's contribution in a given year by comparing the current test scores of their students to the scores of those same students in previous school years. Therefore, the VAM model is used as a measure of the effect of teachers on student learning.

Research has illustrated that the achievement of school children depends substantially on the teachers to which they are assigned (Haertal, 2013). In fact, teachers have a larger effect than principals, facilities, textbooks, class size, technology, and all other school-related factors than can be measured (Carlo, 2010). A study in 2004, indicated that teachers accounted for about 13% of the variance in student mathematics test score gains and about 7% of the variance in reading test score gains (Nye, Konstantopoulos, & Hedges, 2004). According to Carlo (2010), the blueprint of Obama Administration's education indicated that 60% of student achievement outcomes are explained by students themselves and family background characteristics. Schooling factors explain roughly 20%, most of this (10-15 percent) being teacher effects, whereas the rest of the variation (20%) is unexplained (error) (Carlo, 2010). Although teachers only contribute 15% to student achievement, teachers are still important. Some people might suggest that increasing teacher quality will only generate tiny improvements, but teachers are arguably the most influential factors related to the schools.

About 93% of studies on student testing, including the use of standardized tests, found a "positive effect" on student achievement (Phelps, 2012). However, the United States slipped from 18th in the world in math on the Program for International Student Assessment (PISA) to 31st place in 2009 (Coulson, 2009; Walker, 2010), with a similar drop in science and no change in reading score. The U.S. Department of Education stated that if teachers cover subject matter required by the standards and teach it well, students will master the material on which they will be tested. A study showed that students performed better on standardized tests when they perceive the appropriate learning environment (Chu, Babenko, Cui, & Leighton, 2014). Establishing an appropriate classroom climate is one of the pedagogical standards that a high quality teacher exhibits (Strong, 2011).

Families, schools, and their communities have always sought out the best teachers they could get, with the belief that their students' success depends on it. However, it should be kept in mind that teachers are not the only factor that affect students' test scores. Other factors might include students themselves, family background, income level, low funding, illness, school location and many others. In fact, there are many debates on whether teachers should be evaluated based on their student test score or not. Opponents maintain that the test scores are neither fair nor objective, and it does not measure teacher quality. Most often people think the school's staff is effective when students score high in standardized tests while others believe the school's staff as ineffective when students score low in standardized tests (Ro, 2014).

### **Federal and States Policies**

There are many federal policies that have been developed to improve the standards of teaching in schools. The government has acted by embracing The Academic Partnerships Lead Us to Success, A-PLUS Act (Burke, 2015). This aims to enable states to opt out of the programs that fall under *No Child Left Behind Act*, NCLB (Burke, 2015). The policies have incorporated the NCLB Act, which operates under the belief that everyone has the potential to learn, and learning is not exclusive to some students. This law, passed in 2002, requires that students demonstrate progress on standardized tests as a means for the federal government to hold states, school districts, and individual schools accountable for the funding they receive (Menken & Solorza, 2014). States were required to bring all students to the "proficient level" on state tests. Schools that continued to miss achievement targets could face state intervention. States can choose to shut these schools down, turn them into charter schools, take them over, or use another significant turnaround strategy (Klein, 2015). NCLB has resulted in dramatic changes to U.S. schooling. Furthermore, Under the NCLB law, every teacher has to be "highly qualified" in each subject taught (Burke, 2015). A highly qualified teacher, under NCLB law, means that a teacher is certified and has demonstrated proficiency in the subject matter and showed competency in the subject taught (Klein, 2015). With the NCLB Act, teachers will apply their qualities and views of self-worthiness to increase their quality of teaching in the education systems. In 2015, the NCLB Act was replaced with another act which is called The Every Student Succeeds Act (ESSA). ESSA Act kept most of NCLB standards, but added more regulations to assure students success and teachers quality.

### **GIS Application**

Using GIS allows researchers to closely analyze how relationships between variables can vary across geographic area (Hogrebe & Tate, 2012). Since there are many arguments about whether teachers have an impact on student test score level or not, the use of GIS system will help to explore the spatial relationships within and between the data (Schultz, 2014). These relationships highlight differences and the importance of teacher quality in contributing to variability within the region in this study. Using GIS in this study will give a unique perspective on how educational data are distributed across the region and will compare the variation in students' test score in relation to teacher quality. According to Choi (2010), GIS is an ideal tool for capturing geospatial relationships, and revealing the patterns of the relationship between the factors. Therefore, the use of GIS application in this study will help to explore the relation between high school students' SAT score and the quality of the teacher to determine the relation.

### **Research Question**

What factors affect the standardized test scores, specifically, SAT Scores, of high school students in public schools in the U.S.? (1) Teacher quality (e.g. experience, training, disposition, classroom management skills, establishment of a positive classroom climate, etc.). (2) Other factors that might affect student score, such as school location, school regulations, demographics, population density and poverty

### **Methodology**

#### **GIS Model**

Not much literature related to the quality of the teacher and students' test score based on GIS research is available. However, a GIS model could be designed as described below (Figure 1).

First of all, to investigate the research question mentioned above, students' standardized test scores for the SAT would be chosen as the measure of student success. The range of test scores would be identified and mapped to determine where high/low scores occurred. Ideally, data would be obtained that would show average tests scores by state.

Second, level of degree, certification or licensure and knowledge of the subject would be used as measures of teacher quality. These three measurements can indicate a “highly qualified teacher, HQT”. HQT measure will provide a ranking of teacher quality for states from which the test scores come. The state-reported percentage of core academic classes in all secondary schools in the state taught by teachers that were highly qualified. Under the law of Elementary and Secondary Education Act (ESEA), as amended by NCLB, states should have a “highly qualified teacher” in every classroom. Under ESEA Law, a highly qualified teacher is one who (1) has a bachelor's degree, (2) has full state certification or licensure, and (3) has demonstrated subject matter competency in the subject they teach. Core academic classes include English, reading/language arts, mathematics, science, foreign languages, civics and government, economics, arts, history, and geography.

In this model, the input data include (1) Dataset containing the test scores (SAT) by states; (2) Dataset of average teachers’ qualifications embedded onto the map of the U.S. showing state boundaries; and (3) High school students test takers rate by state. The output should include maps of the U.S. displaying acquired data, such as (1) labels of indicators that are being monitored, such as test scores, and teachers’ qualifications, (2) Data embedded on the map represented in different colors by each state

### **Data**

The data for this study includes the mainland of the United States and their corresponding public secondary schools for school year 2014-2015. Public secondary schools (high school) were selected to represent the relation between SAT score and teacher quality. A decision was made as to which type of variability to study- variability across all states in the United States or variability across the mainland in the United States. The present study focused on the mainland variability and attempted to describe important characteristics of the region. These characteristics included public high school students, SAT scores, teachers, and teacher qualifications.

The data were collected from different resources. Data related to high school students’ average SAT scores and the rate of high school student test takers were collected from College board. Meanwhile, the data related to HQT rate was collected from the Department of Education. From the data given by the Department of Education, the average rate for qualified teachers among all states ranged between 75%-100%. The average SAT score nationwide ranged between 1309-1816. According to the College Board the average score for SAT score is 1490.

All of the data was coded and processed in ArcGIS 10.1. Maps of output information were created to illustrate the spatial distribution of the variables. Quantitative feature was used to examine the clustering of the teacher variables. However, in the maps, SAT scores were presented in graduated color meanwhile the rate of high school test takers and qualified teacher were presented in graduated size symbols. Test takers and qualified teacher rates were classified to low, med, and high to make it easier to the readers to distinguish the difference between each state.

In evaluating data, it was important to define the scope of the mainland in the United States. The mainland was divided to three categories (1) states with lowest test takers rate (2) states with medium test takers rate (3) states with highest test takers rate. All the states in U.S. mainland were involved in the study except Wisconsin because there was not enough data provided regarding the rate of HQT.

The reason of dividing mainland to three categories was because of the huge difference of test takers rate among states. The states located in the central U.S. mainland had very low test takers rate (2% - 30%) while the states located in the Eastern side of U.S. mainland had medium test takers rate which is between (31% -60%). The Western states of U.S. mainland had the highest test takers rate, between (61% - 100%).

Test takers rate illustrated a huge impact on a state’s average SAT scores. It is difficult to compare states with low test takers rate with states that have very high test takers rate because there will be bias by participation rate. The lower test takers rate a state will have, the higher the SAT score. States tend to send primarily their best students and have the highest scores. This results in bias. In fact, one study used advanced statistical methods to adjust the participation rate to get the real ranking of highest SAT score of states. Before the adjusted method, North Dakota ranked #1 of the highest SAT score, but it has the nation's lowest participation at 2% (Zhang, 2016). However, after the data were adjusted Massachusetts ranked #1 because it had a high rate of test takers (83%) and had the highest SAT score compared to other states with similar test takers rate (Zhang, 2016). From the researcher’s point of view, it is inappropriate to compare the quality of teachers for states that have 2% of participation with other states that have above 80%.

In other words, if a state's SAT participation is low, the state will only have the best students taking it, making the score artificially high. Likewise, if a state requires the SAT, it will have 100% participation but also include the worst SAT takers, making the score artificially low (Zhang, 2016).

## Results

Table 1 shows Pearson Correlation for the SAT score and the HQT rate. These statistics are calculated for all the 50 states of U.S. mainland excluding Wisconsin since there is not enough data provided. The District of Columbia, DC is included in this study.

A moderate positive correlation was found ( $r(50) = .344, p < .05$ ). This finding indicates that states which scored higher on SAT test got higher HQT rate. Further, R-squared ( $R^2$ ) yielded a coefficient of determination of .118, indicating that 11.8% of the variance in high school students' SAT test scores could account for the variance in HQT rate or vice versa. However, this table shows a moderate correlation and next section will discuss possible reason.

The GIS visualization map in Figure 2 shows that there is a huge variety in test takers rate among states which might explain the result of moderate correlation in Table 1. For example, Central states had the lowest test takers rate and got the highest SAT score, while the Eastern states had the highest test takers rate and lower SAT score. Western states had a medium rate of test takers. This division on the map makes it difficult to see the impact of the quality of teachers. Usually, when there is a comparison, it is more appropriate to compare items that are matching to each other. As it is shown in Figure 2, we cannot compare the central states with the either Eastern or Western because of the huge difference in the test takers rate. Thus, the mainland of the U.S. states was divided into three sections, (1) the Eastern states which have highest test takers rate, (2) the Western states which have medium test takers rate, and (3) the Central states which have lowest test takers rate.

To obtain a better presentation, a normalization process for the SAT score and HQT rate was conducted in Figure 3. By comparing all the states, it is surprising to see that some states had low HQT rate, but got high SAT score, such as Louisiana and Utah. Meanwhile, there are other states got high HQT rate, but had low SAT score, such as Idaho, Maine and Texas. This might indicate other factors which could affected this relation between SAT score and HQT rate. These factors might include test takers rate, income level, funding and others. It is believed that test takers rate has a huge impact on SAT score and HQT rate because when dividing the U.S. map to the three regions, the results were really interesting.

Figure 4 shows that most states had HQT rate no matter what the average of SAT score is. For example, Maine had low SAT score average, but had high HQT rate. Louisiana had high SAT score rate, but had low HQT rate. The small test takers sample size for Central states is impacting the data which makes it difficult to determine if there is a relationship between teacher quality and average SAT score for high school students.

In Figure 5, All states with higher SAT scores have high HQT rate. Wisconsin was excluded from this region because there is no data provided regarding HQT rate. Also, Indiana and Texas were not used in this map although they are located in the Central region because the researcher was trying to include only the states with low test takers rate. However, this figure shows that the low HQT rate occurs only in states with the lowest scores while all states with high SAT score had high HQT rate. Furthermore, states with medium SAT score had different range HQT rate between high and medium. It appears that there is a relation between SAT score and teacher quality. This map of Central states showed that higher HQT rates were found in states with higher SAT scores, while lower HQT rates were found in states with lower SAT scores.

However, New Mexico and Alabama do not explore the relation. Both have low SAT score, but have high rate of HQT. Maybe there are other factors that affecting students' SAT score, such as poverty level. In fact, Alabama has the fourth highest childhood poverty rate (19.2%) in the United States (Dunigan, 2016). New Mexico has the highest rate of child poverty in the United States (30%) (Nott, 2016). In fact, there are more than 25 % of the state's students do not graduate from high school on time (Nott, 2016).

When the mainland was divided into three regions, more relations between teacher quality and SAT score started to appear. In Figure 6, it seems that Oregon and Arizona scored high in SAT score with a range between 1504-1547, and had high HQT rate despite the other states. California and Nevada scored lower in SAT test and had lower rate of HQT. Moreover, Washington state has Medium SAT score and HQT rate. This map suggests a strong relationship between SAT score and HQT rate.

In Figure 7, the map of Eastern region of U.S. shows some relations between SAT score and HQT rate as well. All states with high SAT score (darkest green color) had high HQT rate, such as Virginia, New Hampshire, Vermont and Massachusetts. States with lower SAT score, such as Maryland, New York, New Jersey, Florida and North Carolina got medium rate of HQT. Also, the District of Columbia, DC, has lowest SAT score and lowest HQT rate. In fact, DC has lowest SAT score (1309) and the lowest HQT rate (75%) among all states in the U.S. mainland.

The data on this figure (Figure 7) suggests that HQT rate impacts SAT Scores at a regional level except for Maine which got low SAT score and high HQT rate. This suggests that there might be other factors impacting the relation, such as poverty level, school systems planning for the test, funding, teacher turnover, and salary. Maybe Maine has different standards for hiring teachers.

The map in Figure 8 shows the poverty level in the U.S. The darker color on the map represents the higher level of poverty meanwhile the lighter color represents the lower rate of poverty. The previous regional maps of Central and Eastern states showed that Alabama, New Mexico, Georgia and Maine all had high rate of HQT, but still got low SAT score which might indicate another factors affecting the SAT score. However, this map shows how these states have a high poverty level which might indicate the reason of the low SAT score. According to the World Bank Organization (2016), poverty not only means the lack of money, but also the inability to go to school or the inability to read. If students cannot read, they will not get the high score. Lacour and Tissington (2011) indicate that poverty directly affects students' academic achievement due to the lack of resources available for student success. There are numerous studies have documented the correlation between low socioeconomic status and low achievement. A study conducted by the Department of Education in 2001 indicated that students who live in poverty scored below norms in all years and grades tested (Lacour & Tissington, 2011). Moreover, the study showed that schools with the highest percentages of poor students scored significantly worse than other schools. To get a further clear image, Figure 9 shows that how states with low percentage in poverty got high average SAT score and high HQT rate, such as Vermont, New Jersey, and Virginia. Other states got medium rate of poverty level and got medium rate SAT score and HQT rate, such as New York, Maine, and Pennsylvania. This evidence suggests that poverty level for the state can be a factor that affecting student achievement. In fact, the level of income can be another new study that can be done in the future to determine student success.

## Discussion

Overall, this study indicates that states with higher SAT scores maintained higher HQT rate. Conversely, the study showed that states with lower SAT scores had lower HQT rate. The result of this study answered the research question in a positive way. However, there are some implications that need to be discussed. The first implication, there were several states, such as Alabama, New Mexico, and Maine and others did not show this relation between student achievement and the quality of teacher likely because of the factor of poverty level. These states scored low on SAT score, but they had high rate of HQT. The poverty level was a barrier to student success rather than the quality of the teacher.

According to NCLB Act (ESSA Act now), all students no matter what is their race, income level, background, and the zip code where they live deserve a better educational quality. However, by looking to those states which did not show the relation between teacher quality and students' success because of poverty, it can be seen that NCLB ACT did not work for all states. Moreover, NCLB Act required that each classroom should have a highly qualified teacher, but the three regional states showed some states had low numbers of highly qualified teacher thus, they got lower SAT scores. Although the purpose of NCLB's highly qualified teacher was to create a higher-quality teaching force and to ensure equitable learning opportunities for all students, this analysis demonstrates that not all states maintained the high quality of the teachers.

Another implication is that there is no single standard of teacher quality evaluation used nationwide. From Figure 4, it can be noticed that most states rated high for highly qualified teacher regardless of SAT score. This indicates biases that each state creates its own teacher evaluation form which might include or exclude standards that are not found in other states' evaluation form. These variable standards might either increase or decrease the rate of highly qualified teacher. Another bias is that some states with low scores or HQT rate might inflate their actual numbers of highly qualified teachers to protect its reputation. Obviously, parents, legal guardians, and families are less likely to send their kids to study in a state that is known for its low reputation in educational quality.

The data shows that the lowest rate of HQT reported to the U.S. Department of Education for 2014 was 75%. Most of the states have HQT rates between 90% -100%, but some states have low score of SAT test. Although, all states require licenses and certificates in order to earn a full teaching position, yet there are many states that allow districts to hire uncertified teachers if they are unable to fulfill staffing needs. NCLB required teachers to be certified in order to be designated as “highly qualified”. This could explain why some states rated high for HQT rate, but got low SAT score. Those states might not include their uncertified teachers in their annual report as not highly qualified.

This study explored the relationship between teacher quality and student success after the U.S. map was divided into three regions based on the rate of test takers. It shows that states got higher SAT scores when the rate of HQT was high, and got lower SAT scores when the rate of HQT was low. However, before dividing the U.S. map to Central, East, and West regions, it was difficult to explore the relation because of the huge difference in test takers among these states.

Many of these findings are important for policy making, some limitations exist. First, HQT rate serves as a proxy for teacher quality. Although this data was useful in making associations between student success and teacher quality, it only examined two factors, which are not adequate on which to base a strong conclusion. Other factors related to teacher quality, such as teacher’s education background, years of experience, and knowing the subject matter should be used for further study to explore a stronger relationship. However, since there is a lack of data, it is difficult to include more factors in this study. Furthermore, more studies need to be conducted regarding what makes a teacher “effective”.

It is interesting to see that the central states of the U.S. map have really low percentage of test takers. What is the reason behind that? Do these states have other policies that require students to take a different exam? If the answer is yes, it would be interesting because people will determine which test to take depends on where they live in the U.S. it seems that students in Eastern and Western states are more likely to take SAT, but not for central states. Also, the eastern and the western states seem to be more favorable to international students which might explain the higher test takers rate comparing to the central states. However, exploring the educational policy behind the requirement of taking the SAT exam or not for the three regions can be a future study.

## **Conclusion**

Many studies have identified teacher quality as the most important school influence on student learning and performance. Teacher quality can be identified by looking at the qualifications of the teacher, their personal or psychological qualities, the pedagogical standards that a teacher exhibits, or by the teacher’s demonstrated ability to raise student learning. Since teachers are the system’s principal resource, policy makers and researchers are looking for solutions to improve education and utilize approaches that focus on teachers. To help policy makers and researchers find and utilize those approaches, a GIS approach was conducted as a visualization and analysis tool to identify the range of standardized test scores, from the SATs, of high school students in the U.S. to determine where students are having the highest performance within various states. Such an approach to this research might identify the best approaches that can be implemented across school systems in different states to assure high teacher quality and greater student success.

To explore the relationship between teacher quality and student success, this study used high school students’ SAT scores to measure student success while highly qualified teacher rate was used to measure teacher quality. This study used NCLB’s definition to identify who is a highly qualified teacher. According to the department of education, NCLB Act defined highly qualified teacher as one who has a bachelor's degree, state certification or licensure, and has demonstrated subject matter competency in the subject they teach.

The findings from this study were relevant to other studies which explore the relationship between students’ SAT scores and teacher quality by using other methods rather than GIS. In this study, teacher quality has been shown to be important for high school students to get higher SAT score. Having a highly qualified teacher is vitally important, as students spend the majority of their day with their classroom teacher. Teachers are typically responsible for teaching the majority of subject content to students, so having a teacher who is effective and highly qualified helps to ensure that students are receiving their content instruction from someone who is knowledgeable. However, this study explored other factors that also might affect students’ success rather than the quality of the teacher, such as poverty level.

Furthermore, the NCLB definition of highly qualified teacher is not being applied professional for some states. Hiring uncertified teachers is hiding the true number of highly qualified teachers present in the classroom. By employing teachers that are not meeting the requirement of NCLB’s definition, states may be artificially inflating their numbers of highly qualified teachers. States need to report the number of provisionally/temporarily certified teachers they employ, so that the general public has a more accurate information of who is teaching their kids. Over all, it appears that HQT rate does have an impact on the overall SAT scores.

**Figures:**

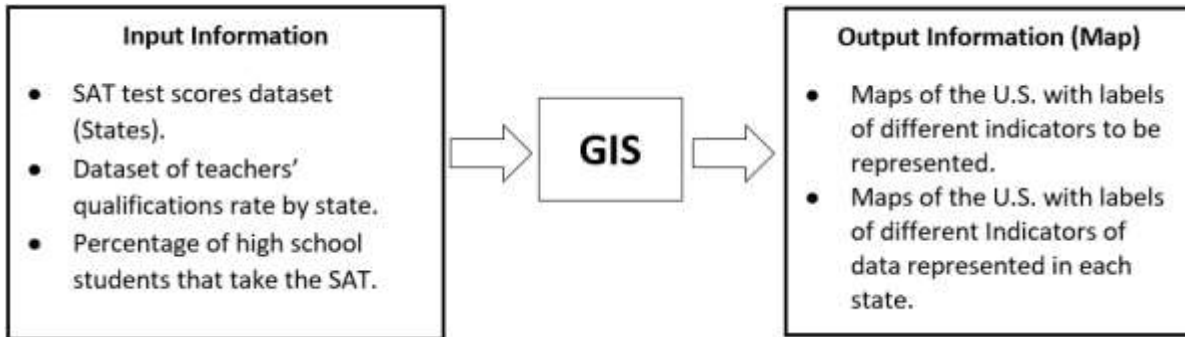


Figure 1. GIS application model

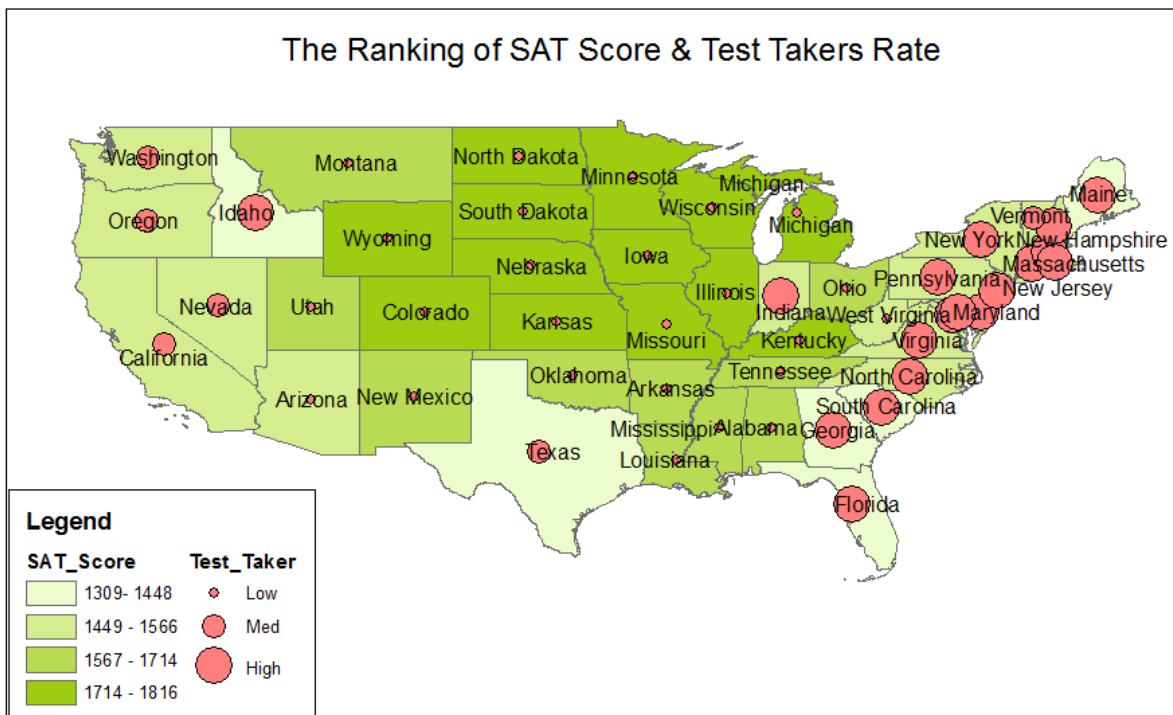


Figure 2. SAT Score and Test Takers Rate



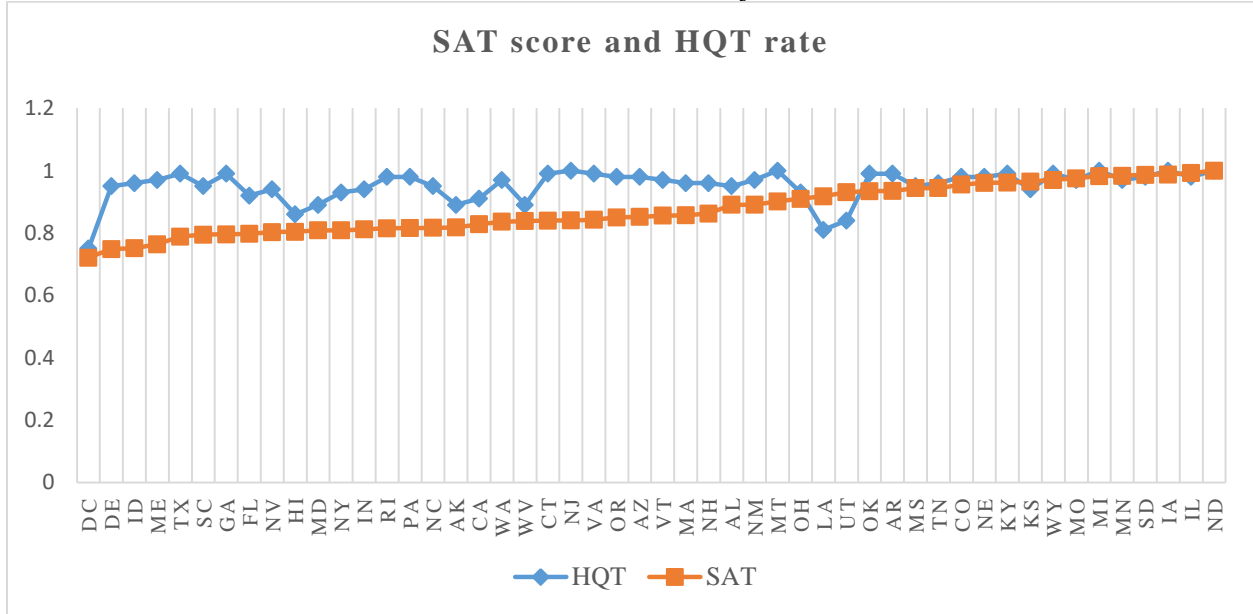


Figure 3. The relation between SAT score and HQT rate

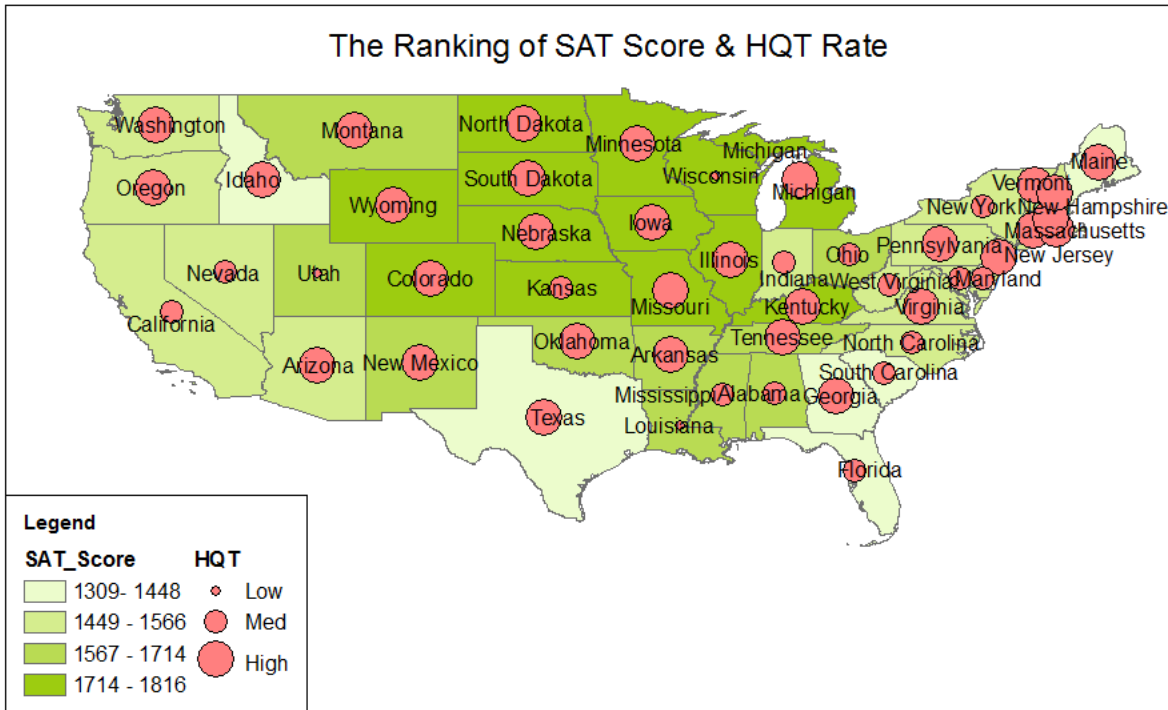


Figure 4. The Ranking of SAT score and HQT rate in the mainland of the U.S.

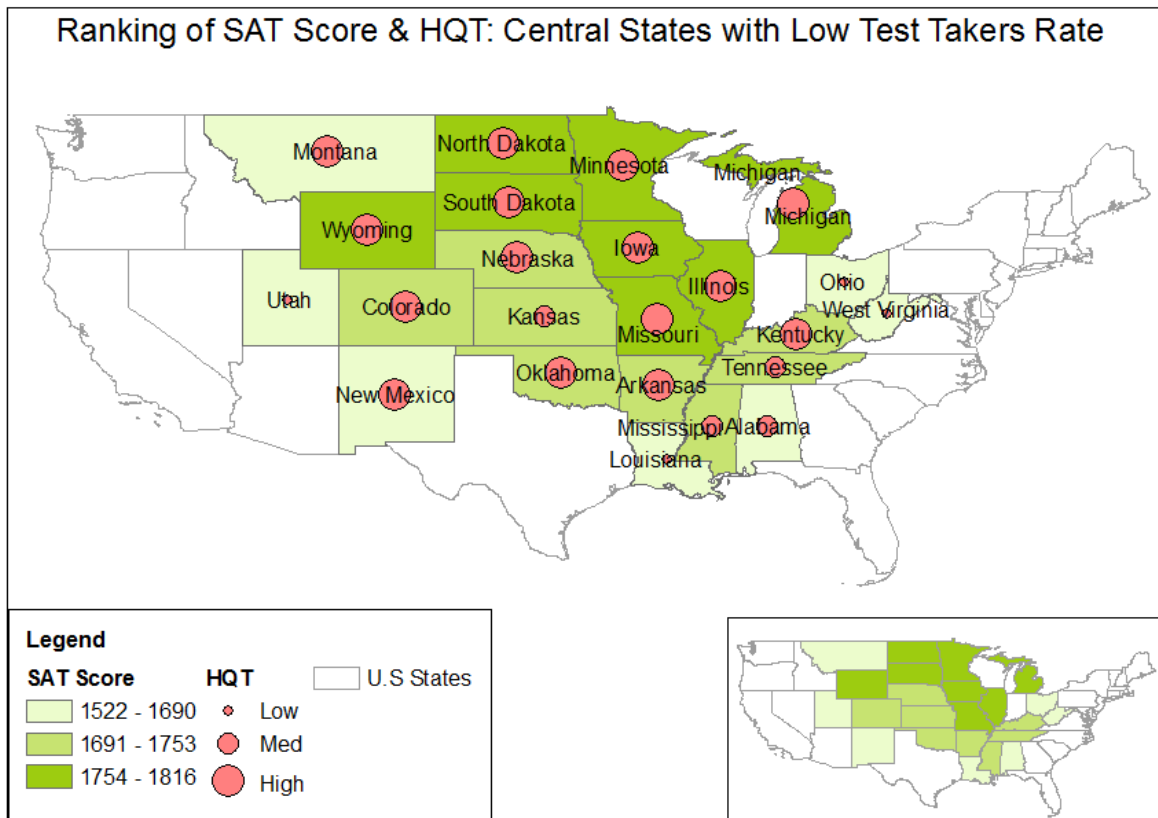


Figure 5. The Ranking of SAT score and HQT rate in Central states

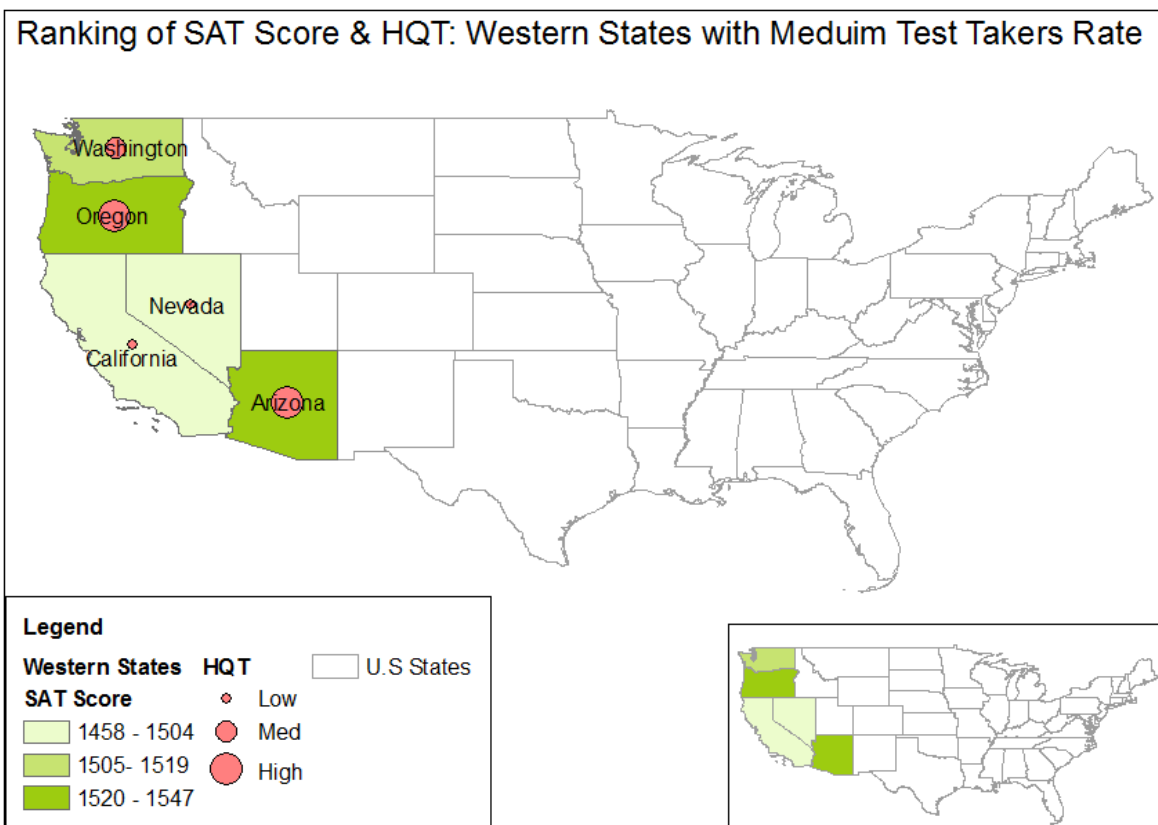


Figure 6. The Ranking of SAT score and HQT rate in Western states (medium test takers rate)

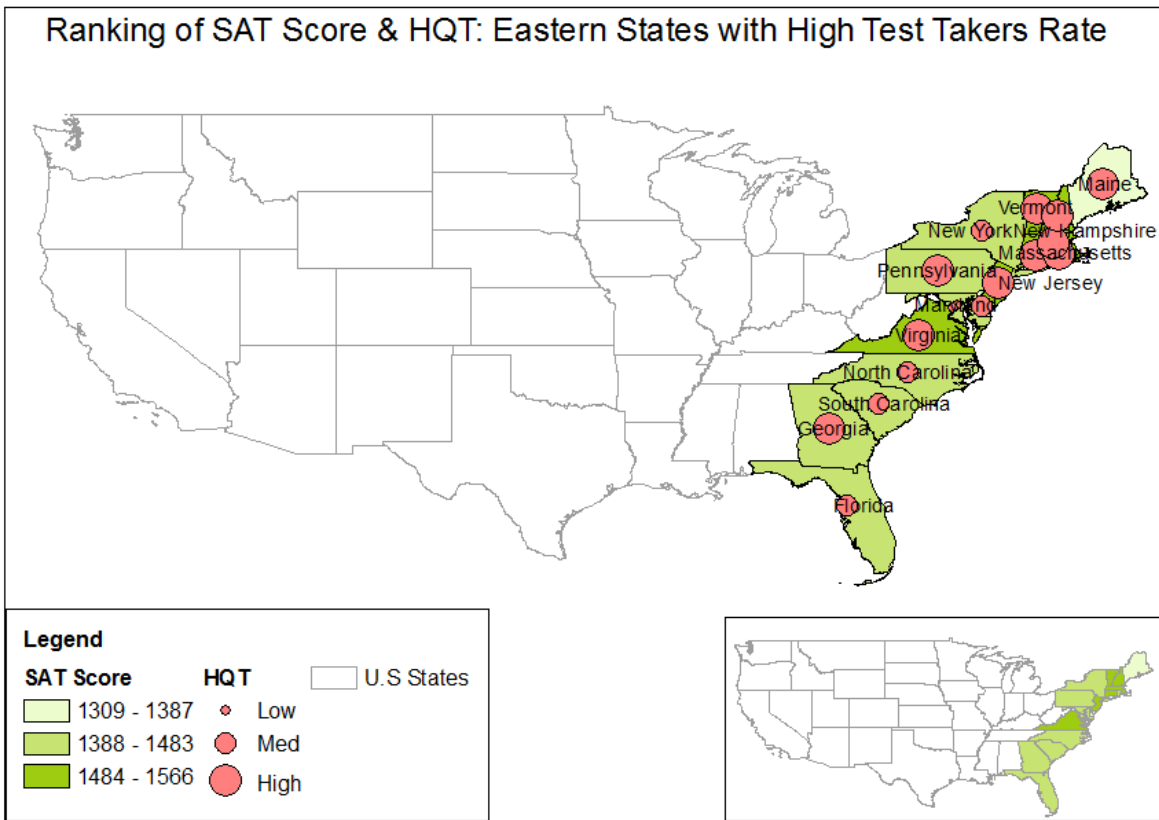


Figure 7. The Ranking of SAT score and HQT rate in Eastern states (high test takers rate)

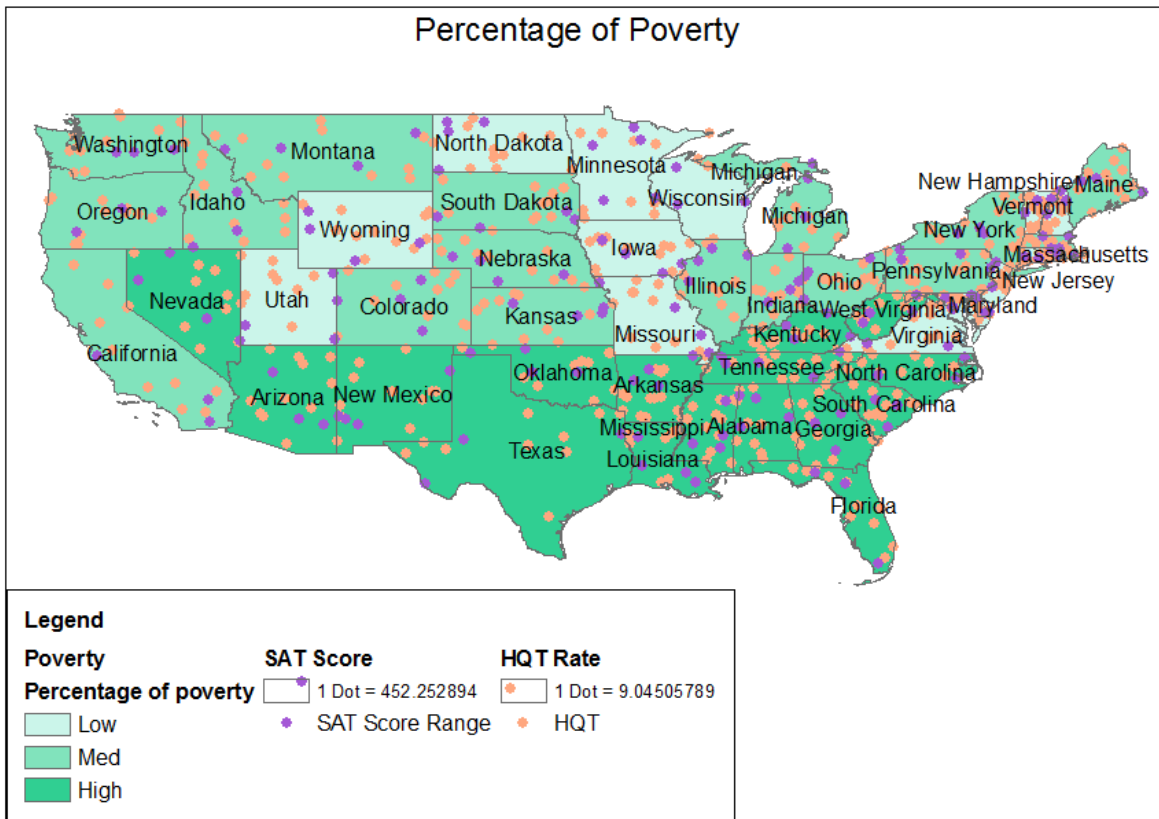


Figure 8. A U.S. Map Showing the Poverty Rate

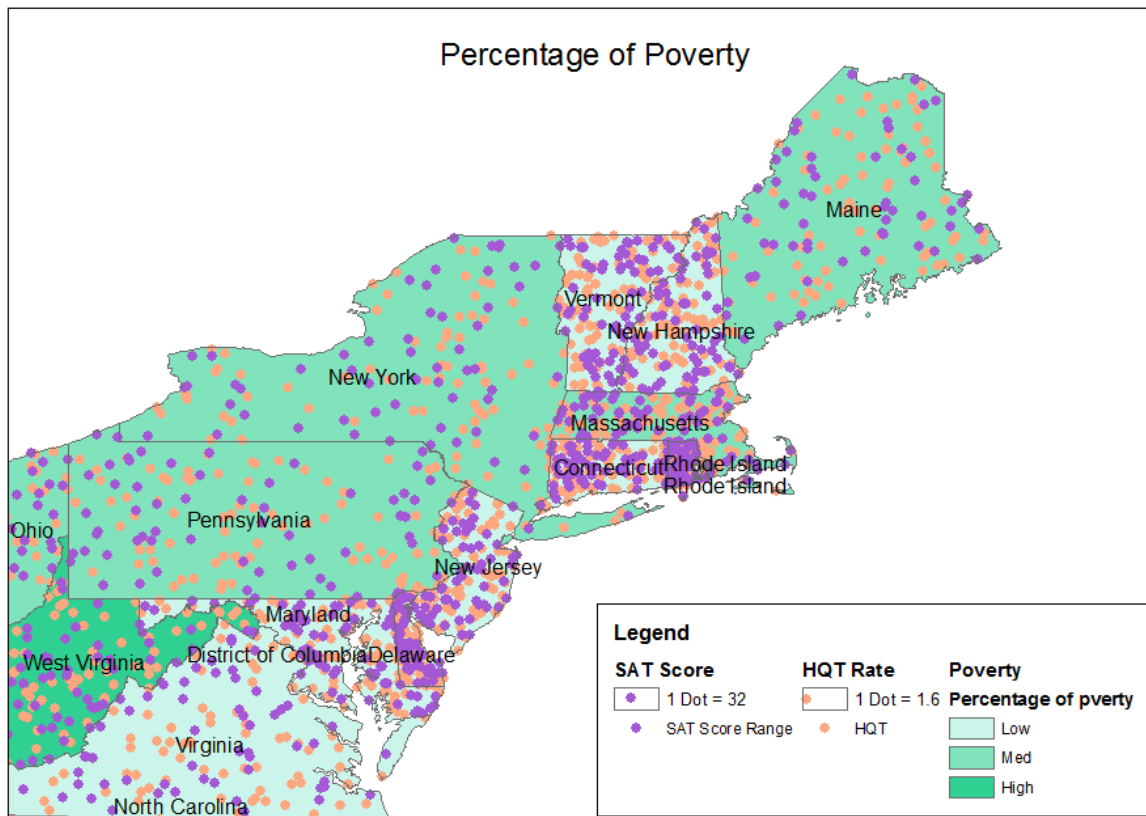


Figure 9. A closer look to the poverty level for some states

Table 1 *Pearson Correlation between examinees’ English national test scores and their TS*

		SAT Score	HQT Rate
SAT Score	Pearson Correlation	1	.344*
	Sig. (2-tailed)		.014
	N	50	50
TS	Pearson Correlation	.344*	1
	Sig. (2-tailed)	.014	
	N	50	50

\*Correlation is significant at the 0.05 level (2-tailed).

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