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Operationalizing Good Schools in Kentucky

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OPERATIONALIZING GOOD SCHOOLS IN KENTUCKY

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This thesis explores three models of a good school: the Modified Academic Index Model, the Demographically-Adjusted Model, and the Equity Model. The Modified Academic Index Model uses test scores, from the Commonwealth Accountability Testing System 2008 and 2009 academic year, to measure good schools. The Demographically-Adjusted Model uses these test scores while controlling for certain demographic variables. The Equity Model uses standard deviations of these test scores to measure quality schools. Rankings of the 228 public high schools in Kentucky are developed for each model. The rankings of the models are then compared.

CHAPTER I

INTRODUCTION

Quality schools are important for individual, community, and national quality of life. Good schools provide a valuable education for individuals. Such an education offers the best opportunity for students to increase their own life chances as well as those of their children. A student who attains schooling of high merit, especially in the formative years, is more likely to continue his or her studies (Ball 1994). Further, the higher the degree attained the more likely one is to have a higher income, lower health risks, less likelihood of divorce, less likelihood of criminal activity, and increased likelihood of successful children (Behrman and Stacey 1997).

Good schools are also important for neighborhoods and regions as these institutions produce the work force that keep the community and its economy functioning. The existence of schools is especially important for smaller communities (Lyson 2002). According to Barkley, Henry, and Li (2004), changes in technology and communication can lead to either improved quality of life or increased exploitation for community members. This difference depends in large part on the quality of the education received from community schools. The better the student population is educated, the more likely the local work force will be able to compete for highly skilled jobs in the new information economy (Barkley, Henry, and Li 2004).

The demands for a well-trained work force carry over into national competitiveness. The Kentucky Long Term Policy Research Center noted that United States students ranked 24 out of 29 among the Organization for Economic Cooperation and Development nations in terms of their ability to solve problems (Chenoweth 2009). An idea economy is central to having an innovative and adaptive market. Strong research and development enhances technological innovation and these characteristics lead to the development of new and better technologies, more advanced skills in the workplace, and ultimately better jobs. The U.S. needs high-level education to ensure that the idea economy remains in America (rather than transferring overseas).

Yet, what makes a school "good"? One goal of a good school should inarguably be to prepare students for success in society after school. Students should be able to join and contribute to the economy, and high-quality schools are instrumental to this goal. However, various policy makers, scholars, and the public use the term "good schools" in different ways for different contexts (Miller 1992). This inconsistency creates confusion and hampers efforts to improve schooling.

The purpose of this paper is to explore the definition and measurement of "good" schools. Three different conceptualizations, among the many possible, are addressed in this study. Data from the Kentucky Department of Education (2009a) will be used to operationalize three conceptions of Kentucky public high schools: the Modified Academic Index Model, the Equity Model, and the Demographically-Adjusted Model. The Modified Academic Index Model measures "good" schools based on students' standardized test scores. Students' performances on such tests often correlate very strongly with many demographic variables. The Demographically-Adjusted Model controls for several of these factors. The Equity Model evaluates good schools based on how effectively they narrow the achievement gap between economically advantaged and disadvantaged students. A ranking of Kentucky public high schools will be determined for each one of these three models. The data for all three measures consists of the results of the Commonwealth Accountability Testing System (CATS) tests for high school students from the 2008 and 2009 academic year (Kentucky Department of Education 2009a).

CHAPTER II

LITERATURE REVIEW

The literature of interest is concerned with the various ways of interpreting good schools. Also, the ways of assessing students and the difficulties with using standardized tests to assess students and schools is examined. Various models of good schools have been developed to help address problems with assessment. The three models in this paper that are studied have appeared conceptually in the literature. The relevant literature focuses on demographics and social inequalities in the educational setting.

Although these three models have appeared conceptually in the literature, there does not seem to be any sources where these models have been operationalized. Further, Kentucky schools' performances have never been operationalized or ranked according to these measures. This thesis will be the first study that operationalizes all three models and ranks Kentucky schools according to each model.

Measuring for Excellence in Education

Measuring for excellence of schools in the education system is typically achieved through assessing students. Other methods, such as assessing teachers' excellence by their educational achievements or possession of national certification, are also used to measure schools. However, because quality schools are important in helping students realize their potential, assessing students reveals one aspect of a school's status. Assessment via statewide testing has become more popular in recent years. For instance, there were 48 states in 2001 giving statewide assessments compared with 39 states in 1996 (Pellegrino 2001). Further, the money spent on statewide testing programs has grown dramatically from 164 million dollars in 1996 to 330 million dollars in 2000 (Pellegrino 2001).

Students' performance on the CATS assessment is not the only means of measuring Kentucky schools. For example, a school's dropout rate, attendance, retention levels, and the percentage of students who successfully transition to adult life are all factors that contribute to the overall accountability index (Kentucky Department of Education 2010a). However, the contribution of these factors toward school accountability is quite small. Most of a school's index score comes from students' performance on the CATS assessment.

Despite the popularity of using standardized tests for assessment, there are numerous issues concerning the effectiveness and role such evaluations have in education. Pellegrino (2001) identified four problems with this type of assessment: effectiveness of measurement, utility for improving teaching and learning, "snapshots" of performance versus progress over time, and fairness and equity. Regarding effectiveness of measurement, any test is ultimately a measure of students' abilities to perform well on that particular test. As such, standardized tests may not be a proper measure of students' academic abilities. Further, the test may be narrow in scope and unaligned with course curricula. Other difficulties involve whether such testing is actually beneficial for improving learning and teaching. Assessments do not always measure students' progress, but student performance at a particular time. The final critique of Pellegrino's (2001) is that standardized testing is often biased.

Further critiques of standardized testing were studied by the Educational Testing Service (Barton 2004). Criticisms included such problems as teaching to the test at the expense of teaching curricula, bad practices in preparing students for assessments, and the lack of proper ways to assess students. For example, students are typically assessed at the end of the school year. Therefore, such tests are summative evaluations (rather than formative evaluations) that only measure the results of that year's teaching. Formative testing is done throughout the year and it allows for adjustments in instruction. Any difficulties in the students' education indicated by a summative test cannot be addressed that year.

Smaller schools may be more susceptible to certain assessment problems. For example, Brown's (2002) research concluded that schools with less than 500 students are unlikely to offer a wide variety of courses (e.g., French, music, and advanced placement courses). The number of advanced placement courses offered is sometimes used as a measure of the quality of a school (Morse 2010). Further, the student body of a small school are often less diverse, so achievements gaps may be not as applicable (Brown 2002). The performance of students from certain minority groups is also sometimes used as a means of school accountability (Morse 2010). A school without a diverse student body cannot be adequately assessed by this method. Another key problem is that fluctuations in student populations at smaller schools have a strong impact on overall student test scores, especially in elementary schools (Kane and Staiger 2002).

Despite these issues, assessing students via standardized tests is a common method of evaluating schools. By using different models of good schools that address various issues with standardized tests, a more accurate measure of good schools may be obtained. The three conceptions of good schools that are of interest in this investigation are the Modified Academic Index Model, the Equity Model, and the Demographically-Adjusted Model. The Modified Academic Index Model is very similar to the real-estate model conceptualized by Miller (1992), although the literature that exists for this model includes empirical evidence. A study of each model follows in this section.

The Modified Academic Index Model

The Modified Academic Index Model only considers schools' performances on standardized test scores. Therefore, according to this model, a school is defined to be "good" based strictly on test scores. This model is the traditional way that most schools are assessed. However, there are significant issues of concern with using this model as a measure for good schools.

A problem with the Modified Academic Index Model is that it reflects the fact that most of the students who live in wealthy neighborhoods generally perform better in school than students who live in more impoverished areas. "Good" schools are attended mostly by students who come from well-educated families that are of high economic status (Miller 1992). Miller (1992) examines the flaws of the Modified Academic Index Model, which is referred to in his article as the real estate model. Economically disadvantaged students have a variety of factors that inhibit their ability to score well on standardized tests. As Miller (1992) notes, these students can learn despite these obstacles but these hindrances are quite significant:

> So-called bad schools have students who come from low-income or minority neighborhoods or communities. Adults are poorly educated, single-parent families and welfare are common, unemployment is high, and available jobs have low wages, few benefits, and little security. Thus problem schools have poor kids who just do not seem to be able to learn. Those students—the impoverished, non-English speakers, various minorities—are slow and unmotivated. They have

> attention deficits, learning disorders, behavioral and emotional problems, and so on that prevent teachers from being successful with them. Scarce resources compound these problems. (p. 73)

Several demographic factors have correlated with students' academic and standardized test performances. Some of these variables include socioeconomic, gender, and duration of poverty. For example, Levin (2007) noted that socioeconomic conditions have the most influence on student achievement. As for gender differences, females often perform better than males in school (Neff, Nemes, and Smith 1999). However, women earn less than males in the workplace (Bobbitt-Zeher 2007). The effect of poverty on performance can be complex, as families can experience poverty in the short term or the long term. The longer the duration of poverty, the worse scores these students are expected to receive (Lee 2009). More specifically, Lee (2009) studied the effects of the duration of early poverty on children's reading and home environment scores using data from the National Longitudinal Survey of Youth. The findings showed that a longer duration of poverty early in life had significant adverse effects on performance.

Another demographic factor, especially for rural communities, is the existence of a school in the community. Using data from the 1990 census, Lyson (2002) showed that for communities with a population of less than 2500 people, the existence of a school correlated with higher social and economic welfare. Further, schools play a stronger role in smaller communities. It follows that the loss of a school due to consolidation appears to be very damaging to a small community.

In Kentucky, CATS scores are predictable because each year the test correlates with several demographics such as socioeconomic status (SES). Schools whose populations consist of students from wealthy and White families generally perform well

(Roeder 2000). Further, teacher and administrator salaries can be higher in affluent districts (The Education Trust-West 2005). Therefore, good personnel are likely to be attracted to well-off districts.

A great deal of a student's success appears to be dependent on his or her background. For example, poverty and demographics of the student population affects school disorder (Chen and Weikart 2008) and the number of siblings of a student influences his or her school performance (Xu 2008). Further, from an empirical study of students from Louisville, Kentucky schools, Moore (2003) demonstrated that approximately 90 percent of the variance in high school accountability scores was associated with seven demographic variables at the school level.

Not surprisingly, another reason that lower-economic-class students do not perform well on standardized tests is their lack of certain life experiences such as travel and exposure to new ideas, values, and cultures (Gustafson 2002). Such experiences generally require some degree of affluence on the part of the student's family. A significant amount of effort would be necessary for a student from a poor background to overcome this disadvantage.

There is a well-known correlation between educational achievement and poverty (Dyson, Gunter, Hall, Jones, Kalambouka, and Raffo 2009). In short, this correlation implies that people who live in relative conditions of poverty have less educational achievement than people who live in more affluent areas. The connection between poverty and education marginalizes the poor to an even larger extent and perpetuates a cycle of poverty.

Social class realities have a strong influence on student performance. Student achievement on the CATS tests have correlated strongly with numerous demographic variables related to social and economic class (Ennis 2007; McKinney 2007; Moore 2003; Neff, Nemes, and Smith 1999; Saravia 2008). In particular, Neff, Nemes, and Smith (1999) found the following variables influential in student performance: the percent of students with free or reduced lunch, students' race/ethnicity, gender, and county schools. County schools are often located in rural areas, and these schools are likely to be more economically deprived (Neff, Nemes, and Smith 1999).

Further, Saravia (2008) examined Kentucky elementary schools and showed that demographic factors, as well as school culture and family support, significantly affect academic achievement. It was found that the percent of students enrolled in Extended School Services (ESS) was also a significant factor in student achievement. ESS is an after school program that offers tutoring for struggling students. The percent of disabled students was another correlate with student performance (Moore 2003). These two variables are indicators of social class. In addition to the percent of students with special needs, Moore (2003) found six more factors significant with student achievement: gender, SES, ethnicity, student mobility (rate entering and exiting school), family structure (percent of intact families with original parents as opposed to all other combinations), and giftedness. These correlates were not all significant in every regression. However, across the series of dependent variables conducted for both student level and school level for reading and mathematics on the Comprehensive Test of Basic Skills and Kentucky Core Content Tests from grades 3rd though 10th, each of the variables was significant (Moore 2003). Despite the significance of all of these demographics, the Modified Academic Index Model ignores these variables.

The Demographically-Adjusted Model

Another conception of good schools is to assess student achievement taking into consideration demographic groups. In other words, the Demographically-Adjusted Model determines the level of achievement while controlling background variables. Numerous studies examine the correlation between student achievement and various demographic variables. For example, Marks (2008) examined the gender gaps that occur in reading and mathematics. Marks (2008) found that 15-year-old boys often perform better in mathematics than 15-year-old girls. Conversely, girls had better reading scores than their male counterparts (Marks 2008).

Condron (2009) studied the Black-White achievement gap. He used first-grade data to show that school factors exacerbate Black-White achievement gaps while nonschool factors increase social class gaps. The Black-White achievement gap was so pronounced that it had indirect effects toward students' education. For example, Klugman and Xu (2008) investigated the effect that such gaps have on the confidence level of certain demographic groups towards education. They showed a Black-White gap regarding this confidence level that was most prominent among people with lower levels of education, but the gap disappeared among college graduates (Klugman and Xu 2008). However, Ogbu (2003) maintained that the size of the achievement gap was partially due to some African-American students identifying with a marginal position in society. So, the achievement gap may disappear or decline because these students were not participating in higher education.

The effects of other variables on student achievement have been studied as well. Sadler, Tai, and Wyss (2007) studied the effect of class size on achievement. From a large sample of science students from several institutions, they showed that class size does not affect on student achievement unless the class consists of ten or fewer students. Levin (2007) discussed an international conference about achievement gaps in schools of various nations. He noted that an achievement gap existed in all of the countries studied. Further, Levin (2007) reported that SES was the most important factor governing achievement.

The existence of achievement gaps in educational systems is ubiquitous. Perry (2009) examined achievement gaps of several nations. Some of her conclusions noted that countries with more equitable educational systems have more socioeconomically equitable populations, such as Finland and Norway. Further, Perry (2009) suggested that there are no simple solutions to closing the achievement gap and obtaining an equitable system. There are numerous interrelating factors that can increase or decrease the achievement gap (Perry 2009). In particular, achievement gaps are so prominent that it is unlikely that a school can completely close the achievement gap. However, the gap can be realistically lessened.

As demonstrated, demographic variables profoundly affect achievement gaps. To account for these demographic variables that correlate with student achievement, one can examine the performance of students within certain groups. For example, the performance of economically-disadvantaged students at a given school can be compared with the performance of students in the same group at other schools. Various other variables can also be controlled. Measuring student achievement, while controlling for various demographic variables, is the essence of the Demographically-Adjusted Model.

The methodology of the Demographically-Adjusted Model seems to be frequently applied. For example, the approach used by the *U.S. News and World Report* (Morse 2010) to rank America's best high schools is a three-stage process. The first two stages are used to reduce the number of schools that will be ranked. The first stage is similar to the Modified Academic Index Model. A school-wide-aggregate index based on standardized state tests of core subjects is calculated for each school. This index is used to compare schools' performances using a linear regression analysis. Schools that performed significantly higher than the state average are selected (Standard & Poor's School Evaluation Services 2008).

The second stage assesses student scores within certain demographic groups. As such, it is similar to the Demographically-Adjusted Model (Morse 2010). A school-wide-aggregate index is calculated (as in step 1) but within certain disadvantaged groups. This index is modified by weighing the group's population within the overall student body of the school, and the scores are compared using regression analysis (as in the first step). Those schools whose disadvantaged students performed better than the state average of scores of students from the same group are further selected. A third and final step is added in this evaluation. This last step considers the access to challenging coursework that a school provides to its students (Standard & Poor's School Evaluation Services 2008). So, under this guideline, very few small schools would score well due to a lack of course offerings (Brown 2002).

Measuring for Equity in Education

In critiquing the real-estate model, Miller (1992:76) states several assumptions about what he considers a good school. These assumptions include:

1. Virtually all children can learn well.
2. Schools can educate virtually all children well.
3. Educators are responsible for learning outcomes.
4. Good schools are based on value-added growth: how much the school *adds* to what the students bring to the school.
5. Both excellence and equity are part of school evaluation: achievement levels should be high, and the gap between disadvantaged and advantaged students should be minimal or at least decreasing.
6. All schools and students can do better: school improvement becomes a continuing process.

At least half the items on this list are concerned with the equity among students.

Gaps in academic achievement between students of a lower SES and a higher SES have been ubiquitous. Almost every school finds that, on average, students from poorer families make lower grades (Chamberlin 2007). Chamberlin's (2007) quantitative study found a strong, negative correlation between poverty and school performance in an investigation of 357 Colorado middle schools for the years 2001 and 2004. Just as common, students from wealthier families make higher grades. This correlation has a self-perpetuating aspect, as students with lower SES are often expected to perform poorly (Désert, Jund, and Préaux 2009).

The Equity Model

Closing achievement gaps between students of differing SES is an extremely difficult and complex problem, as pointed out by Perry (2009). A survey of some of the difficulties involved in measuring achievement gaps is given by Murphy (2009). He provided some loose guidelines for closing the inequality. These guidelines primarily noted that the SES of students was the critical issue and that there were no easy solutions-- no "silver bullet."

Achievement gaps are largely based on various demographic factors. For example, Marks (2008) studied gender gaps. In particular, he investigated the gender differences in reading and mathematics among 15-year-olds. He concluded that educational policies do affect such gender gaps. VanSciver (2006) studied the need to close the diversity gap in advanced placements courses. In particular, he reported on the successful ways that a certain high school increased the enrollment and student diversity of the advanced placement courses offered.

Programs have been developed to attempt to close the achievement gap. For example, the Teach for America program attempts to improve the educational opportunities of economically disadvantaged students and improve educational equity (Kopp 2008). Kopp (2008) argued that the program has been largely successful in many ways. However, complete solutions are not easy to find as achievement gaps are persistent and complex. For instance, from the results of Condron (2009) on first-grade students, Black-White achievement gaps may increase during the school year while social class achievement gaps are likely to increase during the summer (when school is not in session).

This section is primarily concerned with the achievement gap between lower and higher SES students. The Equity Model investigates the proposition that, if a school can lower this achievement gap based on SES, then such a school should be defined as a better school. It is not acceptable that poorer students are performing at a lower level than their counterparts. This gap should be addressed to ensure that all students are performing at their best level regardless of SES.

The variable that will be used in this thesis to measure SES will be the percent of students who are entitled to free or reduced lunch. Using free or reduced lunch as a variable to measure SES is common. However, there are significant concerns with using the free or reduced lunch variable as a measure of SES. Such issues were investigated by Hardwell and LeBeau (2010) and it was shown that this variable was an imperfect indicator of SES. Nevertheless, a correlation between the free or reduced lunch variable with SES has been well-studied (even if the correlation is limited). In a study of students with emotional disturbances, for example, Brigham, Forness, Siperstein, and Wiley (2010) used free and reduced lunch rates to indicate the poverty levels of student bodies. There was a strong association with free or reduced lunch with student achievement (Burney 2010). Burney's (2010) research considered the effects of several variables on advanced academic achievement among high schools in a Midwestern state. The percentage of students receiving free or reduced lunch was a factor that contributes to a lack of high academic achievement (Burney 2010). To facilitate comparison with these and other studies, the free or reduced lunch variable will be used in this thesis as an indicator of SES.

Students of a low SES that attend college often take college seriously. These students are familiar with financial hardships, and they often enter college with the intent of financial gain. Poorer students are more likely to choose a major in college that is perceived to lead to a well-paid, practical, and profitable job (Ma 2009).

Female students may, in general, score better than males in all grades and subjects (Neff, Nemes, and Smith 1999). However, females are likely to be at a disadvantage in the marketplace when compared with male students, regardless of their educational background, scores, and competency. A study has revealed that college-educated men in their twenties earn 7,000 dollars more per year than college-educated women (Bobbitt-Zeher 2007). This study also suggests that women with the same credentials receive approximately 4,400 dollars less per year than men (Bobbitt-Zeher 2007). This factor looms even stronger as a hurdle for lower SES students who are also female.

This paper argues that, if a school can close the gap between class and standardized test scores, then this closing of the gap is achieved by the efforts of the teachers and administrators—hence, the school. Thus, this school could be considered a good school.

Summary

This literature review inquires how a quality education is measured. This process is generally done by assessing students. However, there are numerous problems inherent with this method (Pellegrino 2001). In particular, there are difficulties with standardized testing (Barton 2004). Nevertheless, standardized testing is the most common method of assessing schools.

There are three models of good schools examined in this thesis: the Modified Academic Index Model, the Equity Model, and the Demographically-Adjusted Model. Achievement gaps among students of various demographic groups are well-studied (Condron 2009; Kopp 2008; Marks 2008). The Equity Model assesses school quality by indicating those schools that have a smaller achievement gap among certain demographic groups. The Demographically-Adjusted Model attempts to control statistically for several demographic factors that correlate with a lack of student achievement such as duration of poverty (Dyson, Gonter, Hall, Joes, Kalambouka, and Raffo 2009; Lee 2009), school culture and family support (Saravia 2008), and the existence of a school in a rural community (Lyson 2002). Specifically, these eight variables will be controlled in this thesis: the percent of students with free or reduced lunch, gender, race/ethnicity, class size, the percent of disabled students, the percent of students in ESS, the percent of students enrolled in vocational classes, and urbanity.

CHAPTER III

RESEARCH METHODS

The three models investigated give different measures of "good" schools. Assessing schools' performances may depend on which model is used to measure the schools. Therefore, a detailed study of these models is performed and a ranking of Kentucky public high schools is given for each model. Three research questions are proposed.

1. How do the rankings of Kentucky public high schools compare according to the Modified Academic Index Model and the Equity Model?
2. How do the rankings of Kentucky public high schools compare according to the Modified Academic Index Model and the Demographically-Adjusted Model?
3. How do the rankings of Kentucky public high schools compare according to the Demographically-Adjusted Model and the Equity Model?

Because the purpose of this study is to identify correlates affecting achievement, the following hypotheses are tested:

H_1: Test scores for Kentucky public high schools correlate positively with school size.

H_2: Test scores for Kentucky public high schools correlate negatively with the percent of disabled students.

H_3: Test scores for Kentucky public high schools correlate negatively with the percent of students receiving ESS.

H_4: Test scores for Kentucky public high schools correlate negatively with the percent of students with free or reduced lunch.

H_5: Test scores for Kentucky public high schools correlate negatively with the percent of male students.

H_6: Rural Kentucky public high schools will perform less well on state test scores than schools classified as urban.

H_7: Test scores for Kentucky public high schools correlate negatively with the percent of students enrolled in a vocational track.

H_8: Test scores for Kentucky public high schools correlate positively with the percent of white students.

H_9: The ranking of Kentucky public high schools based on the Modified Academic Index Model will be significantly different from the ranking of Kentucky public high schools based on the Equity Model.

H_{10}: The ranking of Kentucky public high schools based on the Modified Academic Index Model will be significantly different from the ranking of Kentucky public high schools based on the Demographically-Adjusted Model.

H_{11}: The ranking of Kentucky public high schools based on the Equity Model will be significantly different from the ranking of Kentucky public high schools based on the Demographically-Adjusted Model.

Data

The data for this study were collected by the Kentucky Department of Education (2009a). To assess the performance of Kentucky schools, CATS was developed in 1998. From 1998 to 2009, schools in Kentucky were held accountable by students' performances on CATS tests.

CATS tests were developed to test students' knowledge of the "core content" as determined by the Kentucky Education Reform Act (KERA) of 1990. The Kentucky Core Content Tests represent the standard state-issued assessment for all students attending public schools in the Commonwealth. The material tested varied from grade to grade. CATS was recently abandoned in 2009. Assessment of schools in the state of Kentucky is currently in a transitional period. The new accountability system, Unbridled Learning, is to take effect in 2011 and 2012 (Kentucky Department of Education 2011).

CATS test scores from the 2008 and 2009 school year are used to examine different operationalizations of good schools (Kentucky Department of Education 2009a). Mathematics, science, and social studies scores were tested in the eleventh grade. The unit of analysis is the school and n = 228 Kentucky public high schools that participated in the CATS test during the 2008 and 2009 academic year. Therefore, the data reflect the overall school scores rather than individual student scores.

Raw scores of CATS tests from different subjects and years cannot be directly compared. There are numerous obstacles with comparing exams between different years, subjects, and grades. These problems include variations in the levels of difficulty between exams and that the scales used for exams from different subjects may vary. Therefore, a scaling procedure has been developed to transform raw scores to standardized scores, which can be compared across subjects and years (Kentucky Department of Education 2009b).

The Kentucky Department of Education (2009b) uses a mathematical method called Item Response Theory (IRT) to scale and equate the raw scores. The mathematical model IRT relates a given standardized score on an exam with a corresponding probability of obtaining a correct response on a test question. IRT adjusts the raw scores to a standardized score known as an “Equated Theta Score” (Kentucky Department of

Education 2009b). Therefore, the Equated Theta Score is a measure of student performance that can be easily compared across years, subjects, and grades.

Operationalizing the Models

The scores of the mathematics, science, and social studies components of the CATS tests are taken from the 2008 and 2009 academic year. The raw scores are scaled and equated to compare scores among different subjects and years. The scaled scores of the CATS tests are called Equated Theta Scores.

The scale developed for Equated Theta Scores ranges from x00 to x80 where the prefix represents grade x (Kentucky Department of Education 2009b). For example, grade 11 Equated Theta Scores range from 1100 to 1180. Each score from each subject area is categorized as novice, apprentice, proficient, or distinguished in increasing order. The lowest score in the proficient range is fixed at x40. The lowest score for the apprentice range is fixed at x20. The lowest score for distinguished, however, is not fixed. It varies between grade levels.

Table 1 gives the Equated Theta Scores for junior classes on the school level. The Equated Theta Scores are recorded without the prefix “11.” The table illustrates that the average public school in Kentucky is performing at the apprentice level for juniors in math, science, and social studies. However, one standard deviation away from the mean in all subjects would place a school in the proficient level.

Table 1. Overall Mean and Standard Deviation of Equated Theta Scores based on Unweighted School Means for all Kentucky Public High Schools (N = 228)

	Mean	**Standard Deviation**
Math	34.5657	6.3756
Science	35.9893	5.3359
Social Studies	35.8093	5.5149
Average Theta Score	**35.4548**	**5.3297**

The mean of the Equated Theta Scores of the component subjects (mathematics, science, and social studies) for each student is averaged over the population of the students in a given school to determine the "Average Theta Score" for that school. This variable is the dependent variable for the Modified Academic Index Model.

Modified Academic Index Model

To operationalize schools according to the Modified Academic Index Model, the mean of the Equated Theta Scores from three of the four content areas (mathematics, science, and social studies) of each student is determined. The mean of those scores over all of the students in a given school is taken, and this result gives the Average Theta Score for the school. All three of these content areas are assessed at the junior level. Reading is a also core content subject; however, it is not included in this study because reading is assessed at the sophomore level. All the students in this study are juniors in high school.

Therefore, the Modified Academic Index Model is operationalized by creating an Average Theta Score determined from the three Equated Theta Scores in mathematics, science, and social studies for each student. For example, let *StudentATS* be the average of the three Equated Theta Scores on the student level. Then, for any given high school, the computation of the Average Theta Score (*ATS*) is

$$ATS = \frac{1}{N}(\sum StudentATS)$$

where the sum is over the junior students in that particular school who took the CATS test and ***N*** is the number of such students.

A test of the overall validity of the Average Theta Score is important for the score to serve as a measure of a school's academic performance. A positive correlation between the Average Theta Score and a valid measure of academic performance would establish the validity of the Average Theta Score. The Academic Index is the well-known measure developed by the Kentucky Department of Education (2009b). Therefore, the correlation between this valid measure and the Average Theta Score was studied.

Pearson's *r* test was used to measure the correlation between the Average Theta Score of the 2008 and 2009 academic year and the Academic Index for the 2007 and 2008 school year. There is a well-known correlation between school scores from year to year, so correlating scores from different years is a suitable check for validity (Kentucky Department of Education 2009b). The Pearon's r for the correlation of the two variables was $r = .85$, which suggests a strong and positive correlation. Thus, the Average Theta Score can be interpreted as a valid estimate that is acceptable.

Note that the CATS assessment includes other areas, such as arts and humanities and practical living/vocational studies. However, those subjects are not included in this analysis. Only the core content of mathematics, science, and social studies is included. The Modified Academic Index Model is operationalized according to the overall mean scores. The highest overall mean scores equate to the "best" schools for this operational definition.

Equity Model

The Equity Model is operationalized by the standard deviation (st.dev) of the mean of the three Equated Theta Scores of the subjects of mathematics, science, and social studies for each student. This measure is hereafter termed the "Equity Score." For example, recall that *StudentATS* is the average of the three Equated Theta Scores on the student level. Then the Equity Score (ES) for a given school is

$$ES = st.dev(StudentATS).$$

Standard deviation can be used to indicate the presence of a gap between the CATS test scores of these students (Kentucky Department of Education 2009a). Essentially, a large standard deviation shows large gaps between student scores. The presence of an achievement gap between advantaged and disadvantaged students is well-known (Chenoweth 2009). Schools' performances will be measured according to the size of the standard deviation. Schools with smaller deviations represent schools with smaller achievement gaps, which are better schools under this model.

Demographically-Adjusted Model

The Demographically-Adjusted Model examines the rankings of Kentucky public high schools after adjusting Average Theta Scores for the social dimensions that may shape school performance. CATS data will be used for seven of the variables with the variable names in parentheses:

- the percent of students with free or reduced lunch (Percent Free/Reduced Lunch);
- gender (Percent Male);

- race (Percent White);
- the percent of disabled students (Percent Disabled);
- the percent of students in ESS (Percent Extended School Services);
- the percent of students enrolled in a vocational track (Percent on Vocational Track); and
- school size as measured by junior class size (School Size).

Note that disability includes students with physical, mental, and emotional impairments and specific learning disabilities. Class size is the size of a junior class. Percentage references the percent of such students in a junior class.

CATS tests have been determined to be both valid and reliable (Kentucky Department of Education 2010b). Using the variable free or reduced lunch as a measure of SES is very common. Thus, this variable can be considered valid. However, as indicated previously by Harwell and LeBeau (2010), issues exist concerning the validity of this measure. In particular, free or reduced lunch is an imperfect measure of SES. Eligibility for the free or reduced lunch program does not adequately capture the economic resources that are accessible to students' households (Harwell and LeBeau 2010). A more sophisticated (and complex) measure of SES may be used in the future, which would perhaps be more valid and lead to more accurate results.

An eighth variable that classifies a high school as either urban or rural will also be investigated. The National Center for Education Statistics (2006) uses data from the Common Core of Data to classify the urbanity of a region into eight categories ranging from a large city "1" to a rural region inside a Core Based Statistical Area (CBSA) "8." Schools classified as rural in this study are either rural, inside CBSA "8," or rural, outside

CBSA “7,” or town “6” according to the Common Core of Data of the National Center for Education Statistics (2006). Schools that are from regions that fall into categories “1” through “5” are classified as urban for this study. Thus, for this study, this variable is dichotomous with a score of “0” indicating non-rural (CBSA scores 1-5), and a score of “1” indicating rural (CBSA scores of 6-8). Analysis of covariance procedures will be used to adjust Average Theta Scores based on these eight school dimensions. Here the best schools have the highest overall adjusted mean scores.

The adjusted mean score for each school, hereafter called the “Adjusted Average Theta Score,” is calculated by

$$AdjustedAverageThetaScore = (y_i - y_i') + \bar{Y}$$

where $\bar{Y}$ (=35.4548) is the Average Theta Score over all of the 228 schools in the sample and $y_i - y_i'$ is a residual score. The variable y_i is the Average Theta Score for that school and y_i' is a school’s estimated Average Theta Score. This estimated Average Theta Score y_i' is the predicted Average Theta Score for a school based on a linear multiple-regression model using the eight demographic variables as predictors. The residual score $y_i - y_i'$, then, represents the portion of Average Theta Score that could not be explained by the demographic variables. Therefore, a school’s ranking under the Demographically-Adjusted Model will be independent of those demographic variables. In other words, the Adjusted Average Theta Score represents the part of the original Average Theta Score that could not be explained by the demographic variables.

Table 2 lists the means and standard deviations of each of the eight demographic variables. The means of the first seven variables on the table are taken over all junior classes of the 228 Kentucky public high schools in the 2008 and 2009 school year. The last variable is the percentage of such schools classified as rural. Rural is a dichotomous variable so the mean taken over all 228 Kentucky public high schools is actually the percent classified as rural.

Table 2. Overall Mean and Standard Deviation of Eight Predictor Variables for Classes of Juniors in Kentucky Public High Schools (N = 228)

	Mean (Standard Deviation)
School Size	186.32 (111.86)
Percent Disabled	11.00 (4.61)
Percent Extended School Services	12.62 (16.02)
Percent Free/Reduced Lunch	46.00 (17.35)
Percent Male	50.78 (5.29)
Rural	44.10 (49.76)
Percent on Vocational Track	43.05 (26.09)
Percent White	87.82 (16.27)

Statistical Procedures

To investigate the research questions, each model is operationalized using data from the CATS tests. Kentucky public high schools are then ranked according to each model. The rankings are compared and analyzed using Pearson's *r* test and simple linear bivariate regression.

Pearson's *r* test measures how well two variables are correlated. Pearson's *r* test is applied to compare the ranking developed by the Modified Academic Index Model with the ranking developed by the Equity Model. Since the correlation is based on rankings, Pearson's *r* in this analysis is therefore equivalent to Spearman's Rho (the rank-order correlation coefficient). So, Pearson's *r* is used to compare the ranking developed by the Modified Academic Index Model to the ranking developed by the Demographically-Adjusted Model. Finally, Pearson's *r* is used to compare the ranking developed by the Demographically-Adjusted Model to the ranking developed by the Equity Model. The comparisons of these rankings will be used to investigate hypotheses H_9-H_{11}.

Linear regression is a commonly used method to investigate possible correlations between two variables. Each hypothesis $H_1 – H_8$ is a proposed correlation between two variables. The same data used to study the research questions will be used to examine these hypotheses. A separate linear regression will be applied to study each possible correlation.

One complication with this study concerns the Equity Model. The achievement gap will only be measured from data taken over two years. Therefore, the gap only represents a snapshot in time of schools' performances, and it does not indicate any future trends. No conclusions are made concerning performance over time such as schools lowering or increasing achievement gaps.

The purpose of this research is to explore various measurements of "good" schools. The primary thesis of the study is that the rankings of Kentucky public high schools will vary significantly depending on the model used. This study will use data from the Kentucky Department of Education (2009a). The researcher will not have direct contact with human subjects-- all data were obtained from a pre-existing dataset.

CHAPTER IV

ANALYSES

Hypotheses 1-8 are tested using the Average Theta Score. Then, three separate rankings of Kentucky public high schools are developed to test hypotheses 9-11. Each model attaches a score to each school. The Modified Academic Index Model uses the Average Theta Score**;** the Equity Model uses the Equity Score**;** and the Demographically-Adjusted Model uses an Adjusted Average Theta Score. These scores are used to give three separate measures of "good" schools with a different measure for each model. Hence, three separate rankings of all Kentucky public high schools are given. The rankings are compared using Pearson's *r* test.

The Demographic Hypotheses

Table 3 is the correlation matrix for the eight variables considered in the Demographically-Adjusted Model along with the Average Theta Score. The entries of Table 3 are Pearson's *r*, which measures the linear correlation between two variables. When the *p*-value of an entry is sufficiently small (at least less than .05), the entry is flagged with asterisks. The first row of the matrix gives the correlation between the Average Theta Score and the eight demographic variables. The data from this row are used to test hypotheses 1-8.

Table 3. Correlation Matrix of Average Theta Score based on Unweighted School Means for all Kentucky Public High Schools with each of the Eight Predictor Variables (N = 228)

	Average Theta Score	School Size	Percent Disabled	Percent Extended School Services	Percent Free/Reduced Lunch	Percent Male	Rural	Percent on Vocational Track	Percent White
Average Theta Score	--	.05	-.19***	-.03	-.29***	-.08**	-.06*	-.03	.07*
School Size		--	-.12***	-.02	-.19***	-.08**	-.12***	-.01	-.12***
Percent Disabled			--	.02	.21***	.09**	.06*	.02	.00
Percent Extended School Services				--	.02	.01	.03	.10**	.03
Percent Free/Reduced Lunch					--	.05	.08*	.03	-.04
Percent Male						--	.03	.06*	.05
Rural							--	.11***	.21***
Percent on Vocational Track								--	.09**
Percent White									--

*p < .05. **p < .01. ***p < .001.

H_1 predicted a positive relationship between the Average Theta Score and School Size. The hypothesis of a positive correlation between School Size and CATS test scores stemmed from the idea that smaller schools may often be more rural, and rural schools often lack resources for students to be successful. So**,** it may be believed that smaller schools have lower standardized scores, and thus larger schools have higher test scores. On the other hand, smaller schools may have better student-teacher interaction and a more homogenous student body. Therefore, it could be assumed that school scores would correspond negatively with larger class sizes.

Pearson's *r* for these two variables is .05. This correlation is not significant and therefore the null hypothesis of no relationship is not rejected. Thus, school size does not correlate with school performance (as measured by the Average Theta Score). This lack of correlation implies that students in small schools perform as well on CATS tests as students from large schools. This result means that students' performances on the

CATS tests are independent of School Size; hence school size is also independent. Perhaps a better indicator, not considered here, may be student-teacher ratio.

H_2 asserted a negative association between the Average Theta Score and Percent Disabled. The variable Percent Disabled includes students with physical, learning, and behavioral disabilities. It is reasonable to expect that the latter two categories of students would have lower standardized test scores. Further, these groups are likely to comprise a large percentage of the number of disabled students. Therefore, it was projected that there is a negative correlation between the Average Theta Score and Percent Disabled.

This hypothesis is accepted because Pearson's r for this correlation is -.19 with $p < .001$. This relationship is weak (SAMHSA 2011). Further, according to Karl White (1982), correlations computed from aggregated data should be higher than correlations computed using individuals as the unit of analysis. So we would expect truly significant correlations to be much larger. Still, students identified as disabled include students with learning disabilities. So, this relationship is expected.

H_3 stated a negative correlation between the Average Theta Score and Percent Extended School Services. Extended School Services are services provided by a school, such as tutoring or proctoring, that allow students additional time to complete and improve their coursework. These services are offered separate from the regular school day. Students may enroll in Extended School Services due to a variety of reasons, such as deficiencies in their education, to make-up or retake exams, or simply to better prepare themselves for their coursework. Because many students may be enrolled in an Extended School Service program due to shortcomings in their performances, one can predict a negative correlation between the number of students enrolled in Extended School Service programs and Average Theta Score.

Pearson's r for this relationship is -.03 and this correlation is not significant ($p > .05$). Therefore, the null hypothesis is not rejected. Consequently, one can infer that schools with a large percentage of students enrolled in ESS perform as well on CATS tests as schools with fewer such students. This result may be due to the number of students enrolled in the program just for making up coursework or for enrichment. Also, students in an Extended School Service program may be more invested and engaged in their education so that their involvement raises their score above what it would be without the extra help.

H_4 affirmed a negative relationship between the Average Theta Score and Percent Free/Reduced Lunch. Percent Free/Reduced Lunch consists of the percentage of students who participate in the National School Lunch Program. Only students who come from economically-disadvantaged families are eligible. Therefore, if a school has a large percent of students receiving a free or reduced lunch, then the school has a large percentage of poor students. Due to a variety of reasons (dysfunctional families, lack of resources, and lack of opportunities and life experiences), students from poorer backgrounds are often less engaged in their education. Since the unit of analysis was on the school level and not the student level, it was predicted and confirmed that a weak and negative correlation exists between Average Theta Score and Percent Free/Reduced Lunch.

The hypothesis is accepted because Pearson's r for this correlation is -.29 with $p < .001$. This weak relationship between test scores and students receiving free and reduced lunch is consistent with the well-known achievement gaps between the economically advantaged and disadvantaged students.

H_5 claimed a negative association of the Average Theta Score with Percent Male. Female students are thought to be more focused, mature, and disciplined than their male counterparts. Society creates pressure for gender roles to which high school students are especially susceptible. For example, males are often expected to excel in masculine activities such as sports, work, or military programs. There seems to be much less pressure for males to excel in school. Therefore it is expected that schools with higher percentage of male students would have lower test scores.

This hypothesis is accepted. Pearson's r for this correlation is -.08 with $p < .05$ – another extremely weak relationship. Still, a higher percentage of females in a class imply that the class will often perform better on CATS tests.

H_6 stated a negative correlation between the Average Theta Score and rurality. Here, rural is a dichotomous variable and is used as a marker for rural schools. Such schools may have limited resources to devote to educational enhancement and enrichment. Further, students in such schools are often economically disadvantaged. For these reasons, it is expected that schools classified as rural would have lower test scores.

This hypothesis is accepted. Pearson's r for this association is -.06 with $p < .05$. This weak relationship suggests that rural schools perform poorer on CATS tests than urban schools.

H_7 stated there will be a negative relationship between the Average Theta Score and Percent on Vocational Track. Students on a vocational track often take agricultural courses. Such students are frequently rural or may be disinterested in core content courses. So it was predicted that schools with a large percent of these students would have lower test scores.

Pearson's *r* for this correlation is -.03. Therefore, the null hypothesis of no relationship is not rejected. So, schools with a large percentage of students on a vocational track are likely to perform as well on CATS tests as schools with fewer such students. Perhaps these students are sufficiently motivated and goal-orientated to acquire the appropriate skills in the core content areas. Further, there is a statewide network of vocational schools in Kentucky (Miller and Lynes 2011). Many students, therefore, have an option to take a vocational track or attend a vocational school. So, the percentage of students in a vocational track may not be representative of the percentage of vocational students.

H_8 asserted a positive association of the Average Theta Score with Percent White. White students are often more economically advantaged than students of other demographic groups. There are numerous reasons for this disparity. Nonwhite groups are typically African Americans, which have historically been oppressed. Hispanics, who are often immigrants from Latin American countries, have come to the U.S. for economic reasons. Further, African American and Hispanics are likely most of the nonwhite demographic. Nonwhite groups are apt to be culturally distant from the social norms that are advantageous for test-taking skills.

This hypothesis is accepted. Pearson's *r* for this correlation is .07 with $p < .05$. This weak result is consistent with the well-known achievement gaps between black and white students.

Modified Academic Index Model

The Average Theta Score, computed for each Kentucky public high school, is the dependent variable used in the Modified Academic Index Model. This variable is used to rank all of the Kentucky public high schools in this model. Table 4 ranks the highest and lowest 25 schools using the Modified Academic Index Model. The ranking begins with the highest performing schools based on the Average Theta Score and it ends with the lowest performing schools. For example, Brown High School in Louisville had the highest Average Theta Score of 56.37.

Table 4. Ranking of the Highest 25 and Lowest 25 Kentucky Public High Schools based on the Modified Academic Index Model

1. Brown High School	204. South Floyd High School
2. Dupont Manual High School	205. Bryan Station High School
3. Beechwood High School	206. Metcalfe County High School
4. Highlands High School	207. Allen Central High School
5. Louisville Male High School	208. Magoffin County High School
6. North Oldham High School	209. Doss High School Magnet Career Academy
7. Paintsville High School	210. Fern Creek Traditional High School
8. South Oldham High School	211. Dayton High School
9. Model Laboratory High School	212. Monticello High School
10. Elizabeth Town High School	213. Moore Traditional High School
11. Ballard High School	214. Knox Central High School
12. Eminence High School	215. Sheldon Clark High School
13. Williamsburg City School	216. Central High School (Louisville)
14. Walton-Verona High School	217. Morgan County High School
15. Russell High School	218. Spencer County High School
16. Larry A. Ryle High School	219. Caverna High School
17. Frankfort High School	220. Providence High School
18. Paul Laurence Dunbar High School	221. Leslie County High School
19. Greenwood High School	222. Iroquois High School
20. Lloyd High School	223. Holmes Junior Senior High School
21. Hazard High School	224. Deming High School
22. Somerset High School	225. Lynn Camp High School
23. Jackson City School	226. Valley Traditional High School
24. Mayfield High School	227. Shawnee High School Magnet
25. Williamstown High School	228. Western Math Science Technology Magnet High School

The lowest performing school was Western Math Science Technology Magnet High School in Louisville with a score of 22.00. A complete ranking of Kentucky public high schools using the Modified Academic Index Model is provided in Appendix A.

Equity Model

Recall that the standard deviation of the Average Theta Score, computed for each Kentucky public high school, is the operational definition of the Equity Score. The Equity Score is used to rank all of the Kentucky public high schools for the Equity Model. Schools with smaller standard deviations of the Equated Theta Scores have smaller achievement gaps among their students. Therefore, the schools with lower standard deviations perform higher based on the Equity Model. Table 5 ranks the highest and lowest 25 schools using the Equity Model. The ranking begins with the highest performing schools based on the standard deviation of the Equated Theta Scores and it ends with the lowest performing schools. For example, Jenkins Middle High School (the highest performing school according to this model) in Jenkins has a standard deviation of 11.88. The lowest performing school was Henry Clay High School in Lexington with a standard deviation of 20.60.

Table 5. Ranking of the Highest 25 and Lowest 25 Kentucky Public High Schools based on the Equity Model

1. Jenkins Middle High School	204. Lee County High School
2. Cordia High School	205. Somerset High School
3. Betsy Layne High School	206. Madisonville North Hopkins HS
4. Brown High School	207. Lawrence County High School
5. Perry County Central High School	208. Russellville High School
6. Western Math Science Technology Magnet High School	209. Holmes Junior Senior High School
7. Providence High School	210. Central Hardin High School
8. Deming High School	211. Henderson County Senior HS
9. Hickman County High School	212. Carroll County High School
10. Central High School (Louisville)	213. Marion County High School

11. Louisville Male High School	214. Bowling Green High School
12. Allen Central High School	215. Dawson Springs High School
13. Williamstown High School	216. Paducah Tilghman High School
14. Raceland-Worthington High School	217. Caldwell County High School
15. Newport High School	218. Woodford County High School
16. Silver Grove School	219. Elizabethtown High School
17. East Ridge High School	220. Barbourville High School
18. Dayton High School	221. Tates Creek High School
19. Fairview High School	222. Franklin County High School
20. Pineville High School	223. Owen County High School
21. Butler Traditional High School	224. Danville High School
22. Lyon County High School	225. Lafayette High School
23. Butler County High School	226. Paul Laurence Dunbar High School
24. Valley Traditional High School	227. Fulton City High School
25. Dupont Manual High School	228. Henry Clay High School

A complete ranking of Kentucky public high schools using the Equity Model is provided in Appendix B.

Four high schools were in the top twenty-five on both the Modified Academic Index Model and the Equity Model: Louisville Male High School, Brown High School, Williamstown High School, and Dupont Manual High School. Only one school was in the bottom twenty-five of both models: Holmes Junior Senior High School. The scarcity of such examples suggests a lack of correlation between the Equity Model and the Modified Academic Index Model. This possibility is examined at length in a following section.

Demographically-Adjusted Model

The Adjusted Average Theta Score, computed for each Kentucky public high school while controlling for demographic variables, is the operational definition of a "good" school used in the Demographically-Adjusted Model. The variables School Size, Percent Extended School Services, and Percent on Vocational Track did not have a significant correlation with Average Theta Score. Therefore, these particular variables will not be considered in the multivariate analysis. In other words, these three variables will not be controlled in the Demographically-Adjusted Model.

The five variables used in the multivariate analysis are Percent Disabled, Percent Free/Reduced Lunch, Percent Male, Percent White, and Rural. The first four variables are for junior classes of the 2008 and 2009 academic year and come from the CATS data set (Kentucky Department of Education 2009a). Rural classifies a school as rural or urban.

Table 6 is the multivariate analysis of the five demographic variables used in the Demographically-Adjusted Model. Multiple R for the multivariate analysis is $R = .62$. Thus, these demographic factors as a whole are very influential and the model as a whole is statistically significant ($F = 27.05$, $p < .05$). Since $R = .62$, the five demographic variables explain 38 percent (= $.62^2$ x 100) of the variability in the Average Theta Scores.

Table 6. Multiple Regression of the Five Predictor Variables for Classes of Juniors in Kentucky Public High Schools (N = 228)

Variable	**B (Standard Error)**	**Beta**	**Significance**
Percent Disabled	-18.06	-.16	**
Percent Free/Reduced Lunch	-14.79	-.48	***
Percent Male	-9.57	-.10	*
Rural	-.74	-.07	Not Significant
Percent White	4.39	.13	*

*$p < .05$. **$p < .01$. ***$p < .001$. F (F-test) = 27.05. *df* (degree frequency) = (5,222).

Table 7 ranks the highest and lowest 25 schools using the Demographically-Adjusted Model. The ranking begins with the highest performing schools based on the Adjusted Average Theta Score and it ends with the lowest performing schools. For example, Brown High School in Louisville had the highest Adjusted Average Theta

Score of 52.59. The lowest performing school was Spencer County High School in Taylorsville with a score of 24.31.

Table 7. Ranking of the Highest 25 and Lowest 25 Kentucky Public High Schools based on the Demographically-Adjusted Model

1. Brown High School*■ 2. Mayfield High School■ 3. Dupont Manual High School*■ 4. Buckhorn High School 5. Frederick Fraize High School 6. Eminence High School■ 7. Williamsburg City School■ 8. Beechwood High School■ 9. Elizabethtown High School■ 10. Highlands High School■ 11. Williamstown High School*■ 12. Louisville Male High School*■ 13. Whitley County High School 14. Paintsville High School■ 15. Pineville High School 16. Southwestern High School 17. Owen County High School 18. Owensboro High School 19. Lloyd High School■ 20. Walton-Verona High School■ 21. East Ridge High School 22. West Jessamine High School 23. South Oldham High School■ 24. Harlan High School 25. Trigg County High School *** A school that scored in the top twenty-five on all three models.** **■ A school that scored in the top twenty-five on the Modified Academic Index Model and the Demographically-Adjusted Model.**	204. Western Math Science Technology Magnet High School● 205. Scott County High School 206. Jenkins Middle High School 207. Greenup County High School 208. Metcalfe County High School● 209. John Hardin High School 210. Dayton High School● 211. Bullitt East High School 212. Hopkinsville High School 213. Valley Traditional High School● 214. Morgan County High School● 215. Knox Central High School● 216. Berea Community High School 217. North Bullitt High School 218. Leslie County High School● 219. Pleasure Ridge Park High School Magnet Career Academy 220. Providence High School● 221. Caverna High School● 222. Fern Creek Traditional High School● 223. Livingston Central High School 224. Burgin High School 225. Bullitt Central High School 226. Raceland-Worthington High 227. Deming High School● 228. Spencer County High School● **● A school that scored in the bottom twenty-five on the Modified Academic Index Model and the Demographically-Adjusted Model.**

A complete ranking of Kentucky public high schools using the Demographically-Adjusted Model is provided in Appendix C.

Four schools were ranked in the top twenty-five of all three models: Brown High School, Louisville Male High School, Williamstown High School, and Dupont Manual

High School. These schools, therefore, would be considered good schools according to any of the three models. No schools were in the bottom twenty-five on all three rankings.

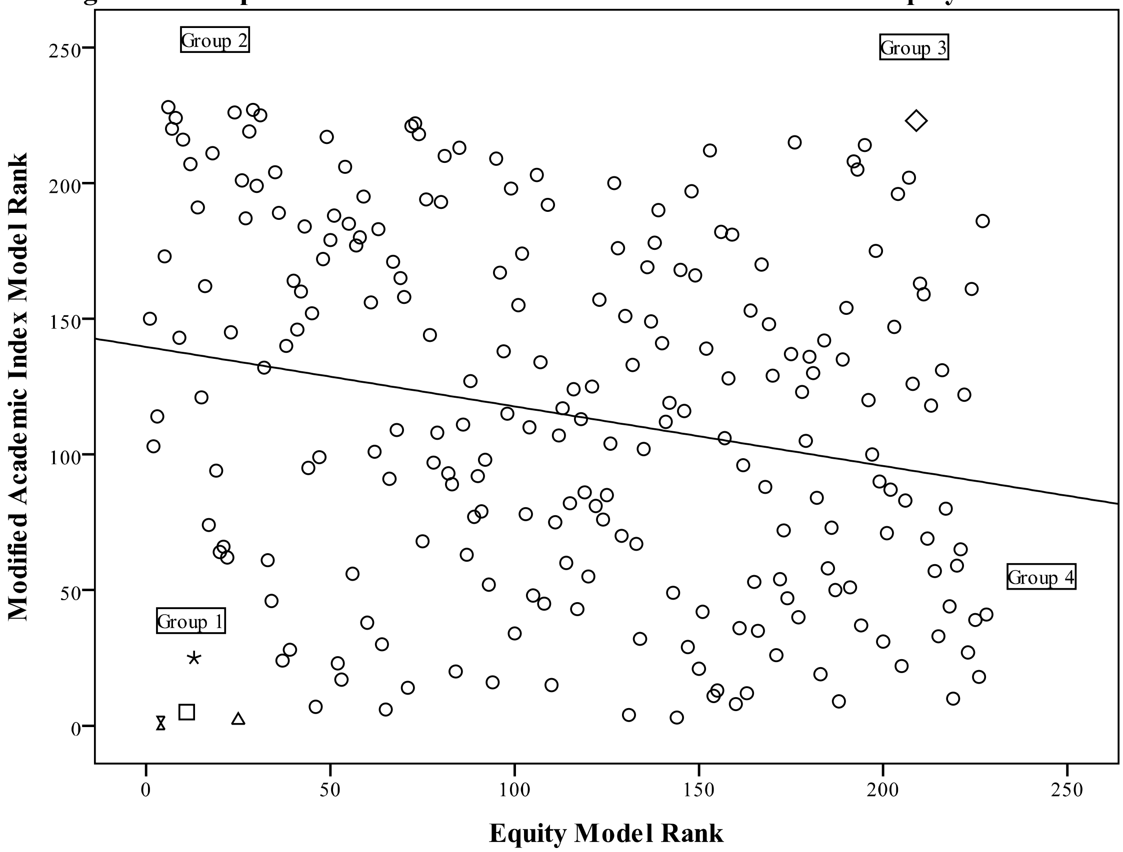
Comparing the Models

Pearson's *r* is used to compare each ranking commonality among the three models of school performance. A scatter graph is used to illustrate these comparisons. Certain schools of interest are indicated on each of the scatter graphs.

Comparison of the Modified Academic Index Model and Equity Model

Figure 1 is a scatter graph with the ranking from the Equity on the x-axis and the ranking from the Modified Academic Index Model on the y-axis. This figure illustrates a low and negative relationship between the Modified Academic Index Model and the Equity Model, which is reflective in the small value of Pearson's *r* (r = -.22, $p < .001$). H_9 stated that there was a significant dissimilarity between the Modified Academic Index Model and the Equity Model rankings. Therefore, this hypothesis is accepted. Although there is a weak correlation, the negative relationship suggests a very dissimilar ranking pattern.

Figure 1. Comparison of the Modified Academic Index Model and Equity Model



The ovals in Figure 1 indicate extremities. Group 1 consists of schools that ranked highest on both models. Students test scores are homogenous and high. Four schools are distinguished in Group 1: Brown High School in Louisville (denoted by an hourglass), Louisville Male High School in Louisville (denoted by a square), Williamstown High School in Williamstown (denoted by a star), and Dupont Manual High School in Louisville (denoted by a triangle). These schools scored among the highest in the Modified Academic Index Model and the Equity Model. Therefore, Brown High School, Louisville Male High School, Williamstown High School, and Dupont Manual High School have very high Average Theta Scores and small achievement gaps.

Apparently rich and poor students perform well at these schools regardless of their socioeconomic status.

Considering specific demographics of these four schools, most of the students at these schools are White. Three of the four schools have a low percentage of students receiving a free or reduced lunch. Williamstown High School is the exception with around 52 percent of their students receiving a free or reduced lunch. However, Williamstown High School has the highest percentage of White students (97 percent). School Size varied. Two of the schools had a small junior class, and the other two schools had a very large junior class. This variation supports the contention mentioned previously that school size has little influence on a school's performance.

Group 2 consists of schools that rank high on the Equity Model and rank low on the Modified Academic Index Model. Thus, these schools have small achievement gaps but low Average Theta Scores. Students' test performances are homogenous and low.

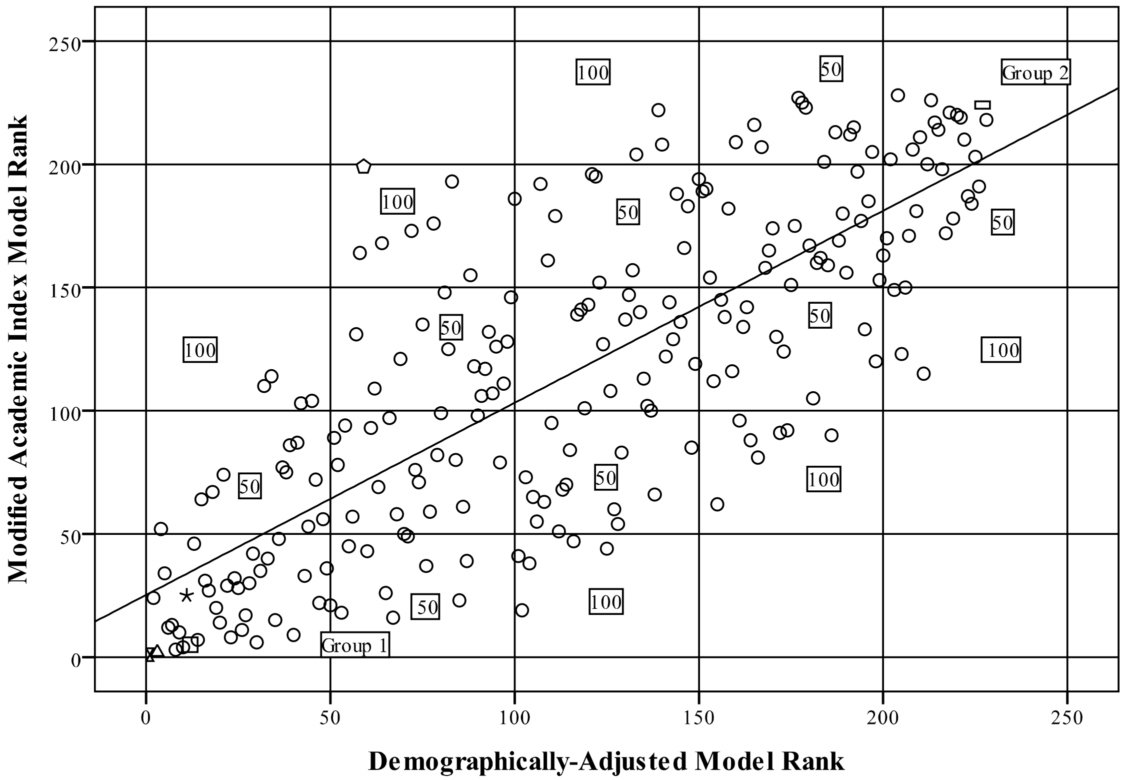
Group 3 denotes schools that rank low on both models. These schools have large achievement gaps and low test scores. Students' test scores in Group 3 are heterogeneous and low. One school stands out in Group 3: Holmes Junior Senior High School in Covington (denoted by a diamond). Holmes Junior Senior High School is the only school to score in the bottom twenty-five of both the Modified Academic Index Model and the Equity Model. This school has approximately 75 percent of their students receiving free or reduced lunch. So, it can be assumed that the student population at this school is largely economically disadvantaged.

Group 4 illustrates schools that rank low on the Equity Model (larger standard deviations) but very high on the Modified Academic Index Model. These schools have high test scores and large achievement gaps. Therefore, student test scores are high and heterogeneous.

Comparison of the Modified Academic Index Model and Demographically-Adjusted Model

Pearson's *r* for the relationship between the Modified Academic Index Model ranking and the Demographically-Adjusted Model ranking is $r = .78$ and $p < .001$. Thus, there is a very strong and positive relationship between these two rankings. Figure 2 demonstrates the strong and positive relationship between the rankings obtained from the Modified Academic Index Model and the Demographically-Adjusted Model. H_{10} asserted that there was a significant distinction between these two rankings. This hypothesis is not accepted. However, notice that there is still a great amount of shifting among the rankings of the schools when compared on the Modified Academic Index Model and the Demographically-Adjusted Model.

Figure 2. Comparison of the Modified Academic Index Model and Demographically-Adjusted Model



Because the correlation is strong and positive, there are several schools in Group 1 and Group 2 of Figure 2. Further, there are no schools in the extreme upper-left and lower-right (unlike in Figure 1). As an example of this strong correlation, Brown High School in Louisville (denoted by an hourglass) is in the top-ranked school for both models. Altogether, fourteen schools are in the top twenty-five of both these rankings. Twelve schools are in the bottom twenty-five of both these rankings. Many schools only have a slight shift in their ranking. For example, Deming High School in Mount Olivet (denoted by a rectangle) ranked 224th on the Modified Academic Index Model and 227th on the Demographically-Adjusted Model. Group 2 includes schools that performed poorly on both the Modified Academic Index Model and Demographically-Adjusted Model. Schools in Group 2 have low test scores even after controlling for demographics.

Brown High School appeared in Group 1 of Figure 2 and Figure 1. Therefore, it was at or near the top in all three rankings. The other distinguished schools, Williamstown High School (denoted by a star), Louisville Male High School (denoted by a square), and Dupont Manual High School (denoted by a triangle), appeared in Group 1 of Figure 1 and Figure 2. So, these four schools are near the top in all three rankings.

Despite the strong correlation, there is still a great amount of shifting in terms of rank on the two different models. In Figure 2, the grid squares labeled with 50's contain schools whose rankings in the two models differ by 50 or more places. Similarly, the grid squares labeled with 100's contain schools whose rankings in the two models differ by 100 or more places. One school shifted by 140 places. In Figure 2, this school appears to be an outlier. This school is Owsley County High School in Booneville (denoted by a pentagon). Owsley County High School's ranking shifted dramatically from 199th on the Modified Academic Index Model to 59th on the Demographically-Adjusted Model. This shift implies that the scores are very low, but the lowness of the scores can be accounted for by the demographic make-up of the student body. This school has 84 percent of its student population receiving a free or reduced lunch. It is a small school with a high percentage of students enrolled in Extended School Services and a vocational track. Also, there are a relatively high percentage of disabled students. Owsley County High School ranked 30th on the Equity Model, which demonstrates that students' scores are low and homogenous.

Table 8 shows the shifting that occurs between the rankings of the Modified Academic Index Model and the Demographically-Adjusted Model. The rankings of 54 schools (approximately 24 percent) shifted at least 50 places when controlling for demographics. Five schools moved upward 100 places.

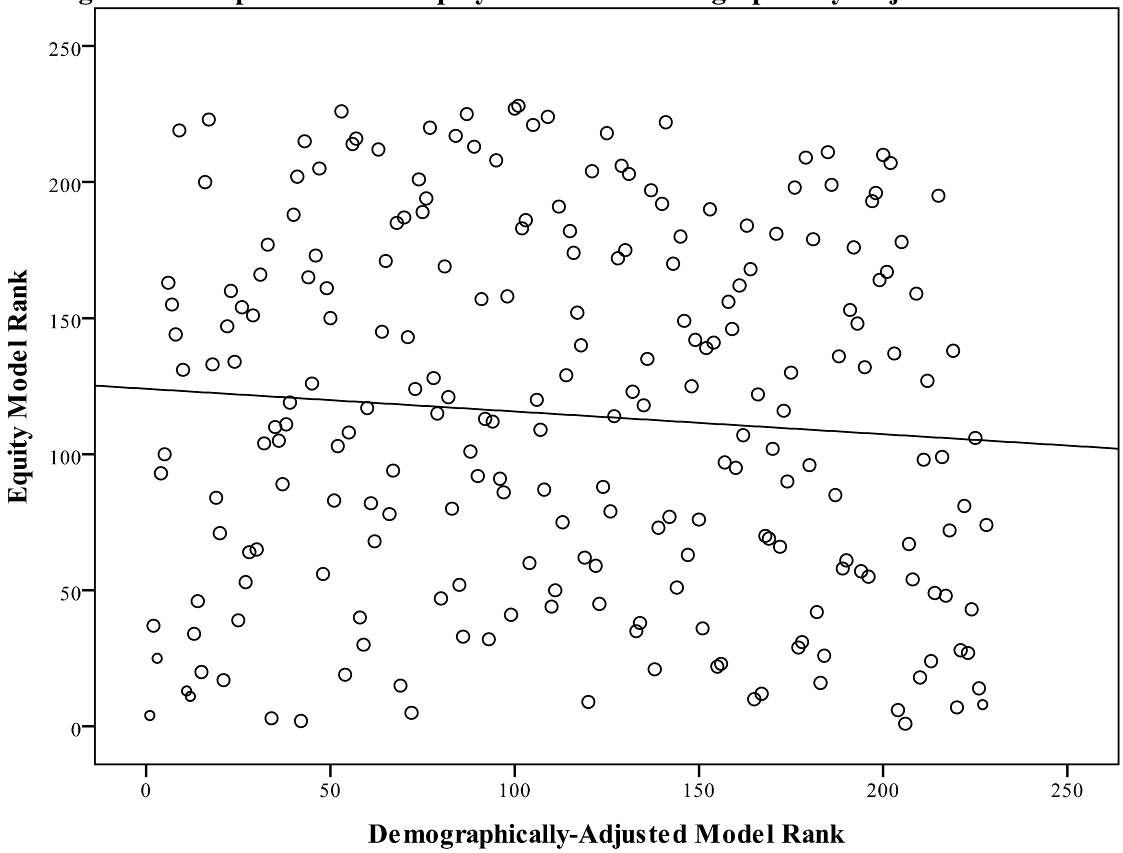
Table 8. Comparison of Differences in Rankings between the Modified Academic Index Model and the Demographically-Adjusted Model

Difference	**Number of Schools**	**Percent of Schools**
Down 100 or more	0	0.0
Down 50-99	27	11.8
Down 0-49	90	39.5
Up 1-49	84	36.8
Up 50-99	22	9.7
Up 100 or more	5	2.2
	228	100.0

Comparison of the Equity Model and Demographically-Adjusted Model

When associating the Demographically-Adjusted Model ranking and the Equity Model ranking, $r = -.08$ and $p = .201$. Hence there is not an association between these two rankings. Therefore, the ranking of schools based on the Equity Model is independent of (unrelated to) the ranking of schools based on the Demographically-Adjusted Model. While it is true that a few schools ranked high in both scales (six schools were in the top twenty-five of both of these rankings) and, conversely, a few schools scored low on both scales, overall, the two scales are independent. Thus, predicting a school's ranking in one measure from the ranking in the other measure is not possible.

Figure 3. Comparison of the Equity Model and Demographically-Adjusted Model



The rankings from the Equity Model and the Demographically-Adjusted Model have the lowest value for Pearson's r of all the comparisons, and Figure 3 illustrates essentially no link between these two rankings. Thus $H_{11,}$ claiming a significant difference between the two rankings, is accepted, i.e. they are not correlated.

CHAPTER V

CONCLUSIONS

This study operationalized three models of a good school: the Modified Academic Index Model, the Demographically-Adjusted Model, and the Equity Model. Each operationalized model was used to develop a unique ranking of the 228 public high schools in Kentucky. These three rankings were compared using Pearson's *r*. The data used were CATS test scores from the 2008 and 2009 school year.

The Modified Academic Index Model gives the most frequently-used ranking of schools. It is a simple and traditional method based on standardized test scores: the higher the scores, the better the school. As demonstrated in this thesis, simply controlling for demographics allows for another ranking. Although there is a strong correlation between these two rankings, there is a significant difference among the two models (such as Owsley County High School). The Equity Model is a different conceptualization that may be used to critique schools. The Equity Model measures the achievement gap between the economically advantaged and disadvantaged students. The ranking obtained by the Equity Model is distinct from the previous two rankings; there is no significant correlation between the ranking of the Equity Model and the Demographically-Adjusted Model. There is a low, but negative, correlation between the Equity Model and the Modified Academic Index Model. Even between the rankings developed by the Modified Academic Index Model and the Demographically-Adjusted Model (where a strong relationship existed between the two rankings), there was still a substantial amount of shifting.

For example, 48 percent of the schools ranked in the top twenty-five according to the Modified Academic Index Model did not remain in the top twenty-five according to the Demographically-Adjusted Model. Further, 24 percent of the schools had their rankings shift at least 50 places between these two models. The rankings of the Demographically-Adjusted Model and the Equity Model were very different; the two rankings shared only 24 percent of the top twenty-five schools. The biggest difference in the top twenty-five schools was between the rankings developed from the Modified Academic Index Model and the Equity Model. Only four schools were in the top twenty-five of both these rankings, which is 16 percent.

Findings suggest that certain demographic factors are significant in students' performances on CATS test scores. In particular, the percent of disabled students, the percent of students receiving a free or reduced lunch, percent of male students, and percent of non-White students in a school tended to negatively influence test scores. When a school is rural, test scores were also likely to be lower.

The research of this study is limited to certain variables that have inherent weaknesses. In particular, the variable Percent Free/Reduced Lunch is used to measure students' SES. However, this variable is an inadequate measure of SES as eligibility for the program is an imperfect indicator of a student's economic status. The classification of students' SES is much more complex than provided by this single variable. Students may come from a household of seemingly high economic status but the student may not have access to the resources that generally accompany a high SES. For example, if the family does not value education, the student is unlikely to receive the opportunities that such resources can provide. Also, a family may live paycheck to paycheck despite a high income.

The Free/Reduced Lunch variable only classifies students into three types: free, reduced, or not enrolled. Students' SES can be vastly different within any of these categories, especially for students who are not enrolled in the program. So, a limitation for this study is that this variable is a crude measure of SES. A more refined measure of SES would provide stronger and more pronounced results than the findings in this study.

Similarly, the variable Rural could be strengthened. It is a dichotomous variable where a school is categorized as rural or not rural. A more developed measure of "rural" could be used.

Another limitation of this research is that none of the variables considered the structure of the family (two parent homes versus single parent homes) or parental involvement in students' education. A variable to measure parental involvement could surpass the influence of many demographic variables.

Future studies could investigate alternative models. Subsequent rankings of the schools and their possible correlations could be studied too. The influence of other demographics and variables could be examined more thoroughly than that done in the Demographically-Adjusted Model. (In particular, a measure of parental involvement would be of interest.) Further, the work in this study could be reevaluated with a more refined measure of SES.

The Modified Academic Index Model is a standard measure of schools' performances. The ranking obtained by the Demographically-Adjusted Model correlates strongly with the ranking obtained by the Modified Academic Index Model. However, the models are very distinct because schools change their rank position on the two indexes. Since the Demographically-Adjusted model takes into account demographics, it is a more accurate measure of a school's academic performance. Any valid assessment of a school's performance should take into account that school's demographic composition.

The Equity Model demonstrated considerable weakness as a measure. It contributed essentially no information that was not found in the Demographically-Adjusted Model. The Equity Model appeared to be subject to severe restrictions of range for very affluent and very poor schools.

A weakness in the dataset is that student selection is not taken into account. Several of the schools that performed the best are highly selective in terms of admission and are not typical public schools. For example, three of the four schools that are in the top 25 in all three indexes are highly-selective magnet schools in the Jefferson County Public School system. This fact raises the question as to whether the impressive results of these schools are due to the work of the faculty and staff, or, simply the result of only letting in exceptional students.

This study only examined one year of test score data from Kentucky's accountability assessment system. However, a major component of this system is that schools' scores are compared to themselves over time. Future research might also examine the quality of schools using gain scores as opposed to single year measurement.

The notion of what constitutes a "good" school is an intuitive one. However, even when using such a standard and (presumably) objective set of data as the CATS test scores, this study has shown that the notion of "good" schools depends heavily on the precise definition of "good." In particular, this study has demonstrated that different models of what constitutes a "good" school provide vastly different rankings of the schools. Furthermore, these rankings may or may not correlate. Therefore, there are many models one could use to measure schools and hence how to define a "good" school. How a particular school is ranked depends significantly on the model. Future studies should investigate other models of good schools.

APPENDIX A

Complete Modified Academic Index Model Ranking
1. Brown High School*▲■♦ 2. Dupont Manual High School*▲■♦ 3. Beechwood High School■ 4. Highlands High School■ 5. Louisville Male High School*▲■♦ 6. North Oldham High School 7. Paintsville High School■ 8. South Oldham High School■ 9. Model Laboratory High School 10. Elizabethtown High School■ 11. Ballard High School 12. Eminence High School■ 13. Williamsburg City School■ 14. Walton-Verona High School■ 15. Russell High School 16. Larry A. Ryle High School 17. Frankfort High School 18. Paul Laurence Dunbar High School 19. Greenwood High School 20. Lloyd High School■ 21. Hazard High School 22. Somerset High School 23. Jackson City School 24. Mayfield High School■ 25. Williamstown High School*▲■♦ 26. Pikeville High School 27. Owen County High School 28. Trigg County High School 29. West Jessamine High School 30. Muhlenberg North High School 31. Southwestern High School 32. Harlan High School 33. Dawson Springs High School 34. Frederick Fraize High School 35. Ballard Memorial High School 36. Corbin High School

37. Oldham County High School
38. Boone County High School
39. Lafayette High School
40. East Jessamine High School
41. Henry Clay High School
42. Atherton High School
43. Pike Central High School
44. Woodford County High School
45. Heath High School
46. Whitley County High School
47. Daviess County High School
48. Adair County High School
49. Glasgow High School
50. Graves County High School
51. Murray High School
52. Buckhorn High School
53. Ohio County High School
54. Eastern High School
55. Allen County-Scottsville High School
56. Larue County High School
57. Bowling Green High School
58. Hancock County High School
59. Barbourville High School
60. Ludlow High School
61. Paris High School
62. Lyon County High School
63. Boyd County High School
64. Pineville High School♦
65. Tates Creek High School
66. Butler Traditional High School
67. Owensboro High School
68. Crittenden County High School
69. Carroll County High School
70. Lone Oak High School
71. South Laurel High School
72. Rockcastle County High School
73. Apollo High School
74. East Ridge High School♦
75. Lewis County High School
76. Monroe County High School
77. Pulaski County High School
78. Garrard County High School
79. Mason County High School
80. Caldwell County High School
81. Dixie Heights High School
82. Bardstown High School

83. Madisonville North Hopkins High School
84. Boyle County High School
85. Franklin-Simpson High School
86. Russell County High School
87. Cumberland County High School
88. Campbell County High School
89. Hart County High School
90. Anderson County High School
91. Simon Kenton High School
92. George Rogers Clark High School
93. Shelby Valley High School
94. Fairview High School
95. Barren County High School
96. Western Hills High School
97. Prestonsburg High School
98. Washington County High School
99. Breckinridge County High School
100. Rowan County Senior High School
101. Gallatin County High School
102. Marshall County High School
103. Cordia High School
104. Middlesboro High School
105. Conner High School
106. Warren East High School
107. Calloway County High School
108. Madison Southern High School
109. Clinton County High School
110. Bell County High School
111. Warren Central High School
112. North Laurel High School
113. Pendleton County High School
114. Betsy Layne High School
115. Bullitt East High School
116. Madison Central High School
117. Green County High School
118. Marion County High School
119. Taylor County High School
120. Scott High School
121. Newport High School
122. Franklin County High School
123. Scott County High School
124. Webster County High School
125. Bath County High School
126. Russellville High School
127. McLean County High School
128. Belfry High School

129. Logan County High School
130. Shelby County High School
131. Paducah Tilghman High School
132. Reidland High School
133. Nelson County High School
134. Trimble County High School
135. Knott County Central High School
136. Grant County High School
137. Muhlenberg South High School
138. Meade County High School
139. Augusta Independent School
140. Carlisle County High School
141. Todd Country Central High School
142. Bourbon County High School
143. Hickman County High School
144. Estill County High School
145. Butler County High School
146. Casey County High School
147. Christian County High School
148. Letcher County Central High School
149. Paul G Blazer High School
150. Jenkins Middle High School
151. Bracken County High School
152. Johnson Central High School
153. Mercer County High School
154. Union County High School
155. Waggener Traditional High School
156. Edmonson County High School
157. Grayson County High School
158. East Carter County High School
159. Henderson County Senior High School
160. Harrison County High School
161. Danville High School
162. Silver Grove School
163. Central Hardin High School
164. Jackson County High School
165. Elliott County High School
166. Powell County High School
167. Central High School (Madisonville)
168. Fulton County High School
169. North Hardin High School
170. Montgomery County High School
171. Greenup County High School
172. North Bullitt High School
173. Perry County Central High School
174. Fleming County High School

175. Clay County High School
176. Menifee County High School
177. Nicholas County High School
178. Pleasure Ridge Park High School Magnet Career Academy
179. Breathitt County High School
180. Henry County High School
181. John Hardin High School
182. Campbellsville High School
183. Fairdale High School Magnet Career Academy
184. Burgin High School
185. Lincoln County High School
186. Fulton City High School
187. Livingston Central High School
188. Wayne County High School
189. Bellevue High School
190. Jeffersontown High School Magnet Career Academy
191. Raceland-Worthington High School
192. Wolfe County High School
193. McCreary Central High School
194. Phelps High School
195. West Carter County High School
196. Lee County High School
197. Seneca High School Magnet Career Academy
198. Berea Community High School
199. Owsley County High School
200. Hopkinsville County High School
201. Southern High School Magnet Career Academy
202. Lawrence County High School
203. Bullitt Central High School
204. South Floyd High School
205. Bryan Station High School
206. Metcalfe County High School●
207. Allen Central High School
208. Magoffin County High School
209. Doss High School Magnet Career Academy
210. Fern Creek Traditional High School●
211. Dayton High School●
212. Monticello High School
213. Moore Traditional High School
214. Knox Central High School●
215. Sheldon Clark High School
216. Central High School (Louisville)
217. Morgan County High School●
218. Spencer County High School●
219. Caverna High School●
220. Providence High School●

221. Leslie County High School●
222. Iroquois High School
223. Holmes Junior Senior High School♥
224. Deming High School●
225. Lynn Camp High School
226. Valley Traditional High School●
227. Shawnee High School Magnet Career Academy
228. Western Math Science Technology Magnet High School●

*** A school that scored in the top twenty-five on all three models.**

■ A school that scored in the top twenty-five on the Modified Academic Index Model and the Demographically-Adjusted Model.

● A school that scored in the bottom twenty-five on the Modified Academic Index Model and the Demographically-Adjusted Model.

▲ A school that scored in the top twenty-five on the Equity Model and the Modified Academic Index Model.

♥ A school that scored in the bottom twenty-five on the Equity Model and the Modified Academic Index Model.

♦ A school that scored in the top twenty-five on the Equity Model and the Demographically-Adjusted Model.

APPENDIX B

Complete Equity Model Ranking
1. Jenkins Middle High School 2. Cordia High School 3. Betsy Layne High School 4. Brown High School 5. Perry County Central High School 6. Western Math Science Technology Magnet High School 7. Providence High School 8. Deming High School 9. Hickman County High School 10. Central High School (Louisville) 11. Louisville Male High School 12. Allen Central High School 13. Williamstown High School 14. Raceland-Worthington High School 15. Newport High School 16. Silver Grove School 17. East Ridge High School 18. Dayton High School 19. Fairview High School 20. Pineville High School 21. Butler Traditional High School 22. Lyon County High School 23. Butler County High School 24. Valley Traditional High School 25. Dupont Manual High School 26. Southern High School Magnet Career Academy 27. Livingston Central High School 28. Caverna High School 29. Shawnee High School Magnet Career Academy 30. Owsley County High School 31. Lynn Camp High School 32. Reidland High School 33. Paris High School 34. Whitley County High School 35. South Floyd High School 36. Bellevue High School

37. Mayfield High School
38. Carlisle County High School
39. Trigg County High School
40. Jackson County High School
41. Casey County High School
42. Harrison County High School
43. Burgin High School
44. Barren County High School
45. Johnson Central High School
46. Paintsville High School
47. Breckinridge County High School
48. North Bullitt High School
49. Morgan County High School
50. Breathitt County High School
51. Wayne County High School
52. Jackson City School
53. Frankfort High School
54. Metcalfe County High School
55. Lincoln County High School
56. Larue County High School
57. Nicholas County High School
58. Henry County High School
59. West Carter County High School
60. Boone County High School
61. Edmonson County High School
62. Gallatin County High School
63. Fairdale High School Magnet Career Academy
64. Muhlenberg North High School
65. North Oldham High School
66. Simon Kenton High School
67. Greenup County High School
68. Clinton County High School
69. Elliott County High School
70. East Carter County High School
71. Walton-Verona High School
72. Leslie County High School
73. Iroquois High School
74. Spencer County High School
75. Crittenden County High School
76. Phelps High School
77. Estill County High School
78. Prestonsburg High School
79. Madison Southern High School
80. McCreary Central High School
81. Fern Creek Traditional High School
82. Shelby Valley High School

83. Hart County High School
84. Lloyd High School
85. Moore Traditional High School
86. Warren Central High School
87. Boyd County High School
88. McLean County High School
89. Pulaski County High School
90. George Rogers Clark High School
91. Mason County High School
92. Washington County High School
93. Buckhorn High School
94. Larry A. Ryle High School
95. Doss High School Magnet Career Academy
96. Central High School (Madisonville)
97. Meade County High School
98. Bullitt East High School
99. Berea Community High School
100. Frederick Fraize High School
101. Waggener Traditional High School
102. Fleming County High School
103. Garrard County High School
104. Bell County High School
105. Adair County High School
106. Bullitt Central High School
107. Trimble County High School
108. Heath High School
109. Wolfe County High School
110. Russell High School
111. Lewis County High School
112. Calloway County High School
113. Green County High School
114. Ludlow High School
115. Bardstown High School
116. Webster County High School
117. Pike Central High School
118. Pendleton County High School
119. Russell County High School
120. Allen County-Scottsville High School
121. Bath County High School
122. Dixie Heights High School
123. Grayson County High School
124. Monroe County High School
125. Franklin-Simpson High School
126. Middlesboro High School
127. Hopkinsville High School
128. Menifee County High School

129. Lone Oak High School
130. Bracken County High School
131. Highlands High School
132. Nelson County High School
133. Owensboro High School
134. Harlan High School
135. Marshall County High School
136. North Hardin High School
137. Paul G Blazer High School
138. Pleasure Ridge Park High School Magnet Career Academy
139. Jeffersontown High School Magnet Career Academy
140. Todd County Central High School
141. North Laurel High School
142. Taylor County High School
143. Glasgow High School
144. Beechwood High School
145. Fulton County High School
146. Madison Central High School
147. West Jessamine High School
148. Seneca High School Magnet Career Academy
149. Powell County High School
150. Hazard High School
151. Atherton High School
152. Augusta Independent School
153. Monticello High School
154. Ballard High School
155. Williamsburg City School
156. Campbellsville High School
157. Warren East High School
158. Belfry High School
159. John Hardin High School
160. South Oldham High School
161. Corbin High School
162. Western Hills High School
163. Eminence High School
164. Mercer County High School
165. Ohio County High School
166. Ballard Memorial High School
167. Montgomery County High School
168. Campbell County High School
169. Letcher County Central High School
170. Logan County High School
171. Pikeville High School
172. Eastern High School
173. Rockcastle County High School
174. Daviess County High School

175. Muhlenberg South High School
176. Sheldon Clark High School
177. East Jessamine High School
178. Scott County High School
179. Conner High School
180. Grant County High School
181. Shelby County High School
182. Boyle County High School
183. Greenwood High School
184. Bourbon County High School
185. Hancock County High School
186. Apollo High School
187. Graves County High School
188. Model Laboratory High School
189. Knott County Central High School
190. Union County High School
191. Murray High School
192. Magoffin County High School
193. Bryan Station High School
194. Oldham County High School
195. Knox Central High School
196. Scott High School
197. Rowan County Senior High School
198. Clay County High School
199. Anderson County High School
200. Southwestern High School
201. South Laurel High School
202. Cumberland County High School
203. Christian County High School
204. Lee County High School
205. Somerset High School
206. Madisonville North Hopkins High School
207. Lawrence County High School
208. Russellville High School
209. Holmes Junior Senior High School
210. Central Hardin High School
211. Henderson County Senior High School
212. Carroll County High School
213. Marion County High School
214. Bowling Green High School
215. Dawson Springs High School
216. Paducah Tilghman High School
217. Caldwell County High School
218. Woodford County High School
219. Elizabethtown High School
220. Barbourville High School

221. Tates Creek High School
222. Franklin County High School
223. Owen County High School
224. Danville High School
225. Lafayette High School
226. Paul Laurence Dunbar High School
227. Fulton City High School
228. Henry Clay High School

APPENDIX C

Complete Demographically-Adjusted Model Ranking
1. Brown High School 2. Mayfield High School 3. Dupont Manual High School 4. Buckhorn High School 5. Frederick Fraize High School 6. Eminence High School 7. Williamsburg City School 8. Beechwood High School 9. Elizabethtown High School 10. Highlands High School 11. Williamstown High School 12. Louisville Male High School 13. Whitley County High School 14. Paintsville High School 15. Pineville High School 16. Southwestern High School 17. Owen County High School 18. Owensboro High School 19. Lloyd High School 20. Walton-Verona High School 21. East Ridge High School 22. West Jessamine High School 23. South Oldham High School 24. Harlan High School 25. Trigg County High School 26. Ballard High School 27. Frankfort High School 28. Muhlenberg North High School 29. Atherton High School 30. North Oldham High School 31. Ballard Memorial High School 32. Bell County High School 33. East Jessamine High School 34. Betsy Layne High School 35. Russell High School 36. Adair County High School 37. Pulaski County High School

38. Lewis County High School
39. Russell County High School
40. Model Laboratory High School
41. Cumberland County High School
42. Cordia High School
43. Dawson Springs High School
44. Ohio County High School
45. Middlesboro High School
46. Rockcastle County High School
47. Somerset High School
48. Larue County High School
49. Corbin High School
50. Hazard High School
51. Hart County High School
52. Garrard County High School
53. Paul Laurence Dunbar High School
54. Fairview High School
55. Heath High School
56. Bowling Green High School
57. Paducah Tilghman High School
58. Jackson County High School
59. Owsley County High School
60. Pike Central High School
61. Shelby Valley High School
62. Clinton County High School
63. Carroll County High School
64. Fulton County High School
65. Pikeville High School
66. Prestonsburg High School
67. Larry A. Ryle High School
68. Hancock County High School
69. Newport High School
70. Graves County High School
71. Glasgow High School
72. Perry County Central High School
73. Monroe County High School
74. South Laurel High School
75. Knott County Central High School
76. Oldham County High School
77. Barbourville High School
78. Menifee County High School
79. Bardstown High School
80. Breckinridge County High School
81. Letcher County Central High School
82. Bath County High School
83. McCreary Central High School

84. Caldwell County High School
85. Jackson City School
86. Paris High School
87. Lafayette High School
88. Waggener Traditional High School
89. Marion County High School
90. Washington County High School
91. Warren East High School
92. Green County High School
93. Reidland High School
94. Calloway County High School
95. Russellville High School
96. Mason County High School
97. Warren Central High School
98. Belfry High School
99. Casey County High School
100. Fulton City High School
101. Henry Clay High School
102. Greenwood High School
103. Apollo High School
104. Boone County High School
105. Tates Creek High School
106. Allen County-Scottsville High School
107. Wolfe County High School
108. Boyd County High School
109. Danville High School
110. Barren County High School
111. Breathitt County High School
112. Murray High School
113. Crittenden County High School
114. Lone Oak High School
115. Boyle County High School
116. Daviess County High School
117. Augusta Independent School
118. Todd County Central High School
119. Gallatin County High School
120. Hickman County High School
121. Lee County High School
122. West Carter County High School
123. Johnson Central High School
124. McLean County High School
125. Woodford County High School
126. Madison Southern High School
127. Ludlow High School
128. Eastern High School
129. Madisonville North Hopkins High School

130. Muhlenberg South High School
131. Christian County High School
132. Grayson County High School
133. South Floyd High School
134. Carlisle County High School
135. Pendleton County High School
136. Marshall County High School
137. Rowan County Senior High School
138. Butler Traditional High School
139. Iroquois High School
140. Magoffin County High School
141. Franklin County High School
142. Estill County High School
143. Logan County High School
144. Wayne County High School
145. Grant County High School
146. Powell County High School
147. Fairdale High School Magnet Career Academy
148. Franklin-Simpson High School
149. Taylor County High School
150. Phelps High School
151. Bellevue High School
152. Jeffersontown High School Magnet Career Academy
153. Union County High School
154. North Laurel High School
155. Lyon County High School
156. Butler County High School
157. Meade County High School
158. Campbellsville High School
159. Madison Central High School
160. Doss High School Magnet Career Academy
161. Western Hills High School
162. Trimble County High School
163. Bourbon County High School
164. Campbell County High School
165. Central High School (Lousiville)
166. Dixie Heights High School
167. Allen Central High School
168. East County Carter High School
169. Elliott County High School
170. Fleming County High School
171. Shelby County High School
172. Simon Kenton High School
173. Webster County High School
174. George Rogers Clark High School
175. Bracken County High School

176. Clay County High School
177. Shawnee High School Magnet Career Academy
178. Lynn Camp High School
179. Holmes Junior Senior High School
180. Central High School (Madisonville)
181. Conner High School
182. Harrison County High School
183. Silver Grove School
184. Southern High School Magnet Career Academy
185. Henderson County Senior High School
186. Anderson County High School
187. Moore Traditional High School
188. North Hardin High School
189. Henry County High School
190. Edmonson County High School
191. Monticello High School
192. Sheldon Clark High School
193. Seneca High School Magnet Career Academy
194. Nicholas County High School
195. Nelson County High School
196. Lincoln County High School
197. Bryan Station High School
198. Scott High School
199. Mercer County High School
200. Central Hardin High School
201. Montgomery County High School
202. Lawrence County High School
203. Paul G Blazer High School
204. Western Math Science Technology Magnet High School
205. Scott County High School
206. Jenkins Middle High School
207. Greenup County High School
208. Metcalfe County High School
209. John Hardin High School
210. Dayton High School
211. Bullitt East High School
212. Hopkinsville High School
213. Valley Traditional High School
214. Morgan County High School
215. Knox Central High School
216. Berea Community High School
217. North Bullitt High School
218. Leslie County High School
219. Pleasure Ridge Park High School Magnet Career Academy
220. Providence High School
221. Caverna High School

222. Fern Creek Traditional High School
223. Livingston Central High School
224. Burgin High School
225. Bullitt Central High School
226. Raceland-Worthington High School
227. Deming High School
228. Spencer County High School

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