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An Examination of High-School Size, Socioeconomic Status, and Advanced Level Educational Opportunities in Pennsylvania Public High Schools: A Quantitative Study

Mark J. Madson

AN EXAMINATION OF HIGH-SCHOOL SIZE, SOCIOECONOMIC STATUS, AND ADVANCED LEVEL EDUCATIONAL OPPORTUNITIES IN PENNSYLVANIA PUBLIC HIGH SCHOOLS: A QUANTITATIVE STUDY

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Mark J. Madson

Indiana University of Pennsylvania

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Indiana University of Pennsylvania
School of Graduate Studies and Research
Department of Professional Studies in Education

We hereby approve the dissertation of

Mark J. Madson

Candidate for the degree of Doctor of Education

____________________ ______________________________
Patricia Smeaton, Ed.D.
Professor of Professional and Secondary Education, Co-Chair
East Stroudsburg University

Crystal Machado, Ed.D.
Associate Professor of Professional Studies in Education, Co-Chair
Indiana University of Pennsylvania

Douglas Lare, Ed.D.
Professor of Professional and Secondary Education
East Stroudsburg University

ACCEPTED

Randy L. Martin, Ph.D.
Dean
School of Graduate Studies and Research

Title: An Examination of High-School Size, Socioeconomic Status, and Advanced Level Educational Opportunities in Pennsylvania Public High Schools: A Quantitative Study

Author: Mark J. Madson

Dissertation Co-Chairs: Dr. Patricia Smeaton
Dr. Crystal Machado

Dissertation Committee Member: Dr. Douglas Lare

The purpose of this quantitative study was to examine the relationship between high-school size, socioeconomic status (SES), and educational opportunities. The study examines whether our public education system is providing students an education of equal opportunity along with equal access to these opportunities. Data from public high schools (N=473) in Pennsylvania were collected. Total enrollment in grades 9-12 and the Market Value Personal Income/Aid Ratio (MV PI/AR) were used as independent variables. The dependent variables included offerings and enrollment in Advanced Placement (AP) courses, honors courses, and interscholastic athletics. Descriptive, summary, and inferential statistics were utilized for analyses. Bivariate correlations were computed for all interval/ratio independent and dependent variables. In addition, multinomial and linear regression analyses were conducted. Results revealed that the size of the high school in connection with its SES strongly influences educational opportunities. The ability for students to access and enroll in specific educational opportunities available to them varies significantly based on size and SES. This research indicated that although high-school size is a strong predictor of AP course offerings and enrollment, SES is the strongest predictor. This study can help decision makers in schools of various size and SES to improve access and participation in important educational experiences for students as well as indicate the need for further examination into how specific schools can provide increased opportunities to students.

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CHAPTER I

OVERVIEW OF STUDY

The recent global economic crisis shined a spotlight on the role of government and the costs associated with providing public services. Public education is no exception to the increased interest in government costs and accountability. One of the greatest challenges in public-school systems is ensuring a fiscally responsible, high-quality, equal education for all students. The idea that a free and equal public education should be available to all students has been fundamental in our society for decades. Scholars of education such as Jefferson, Rousseau, Mann, and Dewey promoted systematic school reform with this in mind (Cubberly, 1922; Sobe, 2011). However, as governors and state legislatures look for ways to trim budgets, school districts from coast to coast are challenged to find ways to cut costs (Howley, Johnson, & Petrie, 2011). Pennsylvania is among the states currently looking at educational reforms during these tumultuous economic times, just as many school administrators face large budget deficits each year, threatening the notion of a free, equal public education for all.

As part of the on-going debate over spending and accountability in education, school administrators and legislators need information related to how school reform efforts such as school consolidation, ever-increasing testing mandates, and public-school funding concerns affect students and their access to curricular and co-curricular offerings. Currently, literature shows that advanced level course work (Geiser & Santelices, 2004; Keng & Dodd, 2008), socioeconomic status (Denault, Poulin, & Pederson, 2009; Sirin, 2005), parental involvement (O’Bryan, Braddock, & Dawkins, 2008), and student participation in co-curricular activities (Byrd & Ross, 1991; Eccles & Barber, 1999) frequently result in higher student performance as measured by GPA and standardized test scores. However, in Pennsylvania, competency exams in the core areas of English, science, math, and social studies have put extra emphasis on those areas, potentially leading to budgetary cuts to athletics, the arts, and other co-curricular activities. As a result, school boards are looking for avenues to cut spending with the least impact to students. This study will use Advanced Placement (AP) and honors course offerings and enrollment as well as interscholastic athletic offerings and enrollment as the basis for analysis. Both have been shown to provide benefits to students. The purpose of this study is to examine the extent to which socioeconomic status and school size impact the opportunity for students to access certain educational opportunities. In addition, when size and SES are factored in, the study examines how much students are accessing these opportunities. This chapter will present the historical background, the purpose, the research questions, and the significance of the study. In addition, it will detail the design of the study, discuss the study's delimitations and limitations, and define the terms used.

Background of the Study

In less than a century, the number of school districts nationwide has decreased by almost two-thirds (National Center for Education Statistics, 2003). In 1920, there were 271,000 school districts in the United States compared to 93,000 in 2003 (Berry, 2004). In addition, the number of school buildings nationwide dropped from 158,000 to 97,000 from 1937 to 2009 (PSBA, 2009). In contrast, during the 20 years from 1987-2007, the average student enrollment in high schools grew by 13%, from 711 to 816 students (NCES, 2011). Yet, states such as Arizona, Arkansas, Indiana, Kansas, Maine, Nebraska, New York, Vermont, and Pennsylvania are seeking to consolidate school districts even further. As Howley, Johnson, and Petrie (2011) showed in a meta-analysis of school district consolidation nationwide, state legislatures are studying whether economies of scale can be achieved through consolidation.

Pennsylvania's educational history is marked by school consolidation efforts dating back to the 1950s. In 1950 there were 2,530 school districts in Pennsylvania. As of 2009, there were 500 (PSBA, 2009). In 2009, then-Governor Ed Rendell proposed a commission to study and create a plan to reduce the number of school districts from 500 to 100. The Governor's plan never gained any traction in the state legislature or within the Pennsylvania Department of Education (PDE), thus it was not implemented (PSBA, 2009). However, school districts in Pennsylvania continue to examine potential mergers and the impact a merger will have on their schools. The information regarding school size is important to identify as it may affect students in terms of the opportunities offered to them.

Leading scholars in the field have yet to come to consensus about the ideal size for a school. Part of the reason for the ambiguity surrounding the ideal school size is the complexity of the issue. The experts' opinions are based on what they see as the most important outcome of schooling. For example, some would say that student achievement is of utmost importance, while other scholars may feel that course variety or activities are. Using the National Center for Education Statistics Survey (NCES) and student test scores in reading and math, Lee and Smith (1997) found that a high school with 600 to 900 total students would yield the most benefits to students in regard to achievement. Their study included 9,812 students from across the country in public, non-denominational private, and Catholic schools. However, Lay (2007) maintains that a high school of 300 to 400 students provides the greatest benefits for students in terms of participation in co-curricular activities. Lay utilized data for the study from the National Household Education Survey (NHES). This was a 1999 telephone survey of parents and students on civic involvement. A total of 3,010 responses were analyzed.

In addition to achievement, Rooney and Augenblick (2009), Duncombe and Yinger (2005), Howley, Johnson, and Petrie (2011), and Post and Stambach (1999) confirmed that community expectations, demographics, location, and community politics play a part in the issue of the ideal size of a school. Research has yielded changing outcomes over the years. Until the 1970s, the research generally pointed to larger high schools having greater achievement outcomes and more efficient operations (Howley, Johnson, & Petrie, 2011). However, research over the past two decades has indicated that smaller high schools are better for achieving student outcomes and efficient costs (Lay, 2007; Lee & Smith, 1997). As school funding and budgetary concerns in schools become more important, additional research about high-school size and its effects on student outcomes is necessary.

One such area of research would be to look at academic offerings. When analyzing course offerings for students, Monk and Haller (1993) utilized the course and school files from the High School and Beyond Survey of 1990. They found that the greater the number of students in the school the higher the number of courses offered. In addition, Lay (2007) found that the size of a school will directly impact the number of opportunities (athletics, performing arts, clubs) that students can access and will also influence the rate of participation. Research indicates that students who participate in co-curricular activities gain a greater sense of self-esteem, reach higher achievement levels, continue their education after high school in greater numbers, and cooperate more (Coladarci, 2006; Lay 2007). Coladarci (2006) examined student achievement in reading and math of 8th grade students in Maine. His research included 216 schools. He found student achievement and self-esteem are connected to participation in co-curricular activities. In a recent look at school size in Pennsylvania, the Pennsylvania School

Boards Association (PSBA) Education Research and Policy Center (ERPC) summarized recent attempts to quantify the current school size research by stating:

> While there is ample research based grounded literature addressing the question of appropriate school size for elementary and secondary schools, it seems unfortunate there are no definitive studies indicating exactly how large or small a school building should be in order to most appropriately meet the needs of all students. (PSBA, 2011, p. 1)

Furthermore, Lay (2007) states, "In the field of education, school organization is at least as important as curriculum for general educational outcomes, but most political scientists have not looked at the effects of such structural factors as school size on political socialization” (p. 790).

The literature over the last 100 years has found positive and negative outcomes for students attending large, medium, and small high schools. Each range of size classification can be linked to potential benefits. This study classifies high schools into four categories consistent with other research in the field. A small school is defined as having enrollments of fewer than 400 students, while small-medium schools consist of 401-800 students. The two larger classifications are medium-large schools, with enrollments of 801-1,600 students, and large schools, with enrollments of over 1,600 students (Lindahl & Cain, 2012). Leithwood and Jantzi (2009) conducted a meta-analysis of 280 studies reviewing the effects of high-school size on numerous factors. Their study included 57 examinations that were conducted after 1990. Large schools were found to provide a greater variety of classes, a more diverse student population, less stereotyping of students (Leithwood & Jantzi, 2009), more specialized teaching staff, and lower costs by purchasing in bulk (Lay, 2007).

However, there is also literature to support the claim that large high schools can have negative effects on students. These effects include contributing to depersonalization, alienation, and ultimately higher truancy and dropout rates (Ehrich, 2000). In addition, large schools have been found to have more student discipline issues, violence, and bullying than small schools. Shapiro (2009) also found that only 12% of students in large high schools take advantage of specialized courses available to them.

As with large high schools, the literature is mixed with regard to small high schools. Some research supports the benefits of small high schools. Evidence shows that small schools are better overall for students and less costly to maintain and operate (Coladarci, 2006). Coladarci found that small schools have a positive effect on math and reading state assessments. Overall, smaller schools are generally considered to have better student performance, attendance rates, test scores, extracurricular participation, and graduation rates (PSBA, 2011). In addition, smaller schools have a better parent participation rate and have been seen to close the achievement gap for minority students in urban settings (PSBA, 2011).

Leithwood and Jantzi (2009) found benefits in large high schools and also found benefits in small schools. Small schools can provide a more student-centered approach in which students and faculty get to know each other better. Also, smaller schools can provide a culture where the faculty takes a greater responsibility for student learning. The recent research on the positive effects of small schools replicates older studies that had similar findings.

The research is just as mixed when looking at costs associated with high-school size. The majority of research supports the claim that large schools will be less expensive to build and operate. Economies of scale are more likely to be achieved in larger schools (Lindahl & Cain, 2012). A larger facility should result in reduced costs per pupil and construction costs as opposed to building and maintaining smaller facilities (PSBA, 2011). Constructing multiple smaller buildings instead of building one larger structure will increase costs by 4.7% (Azari-Rad, Hamid, Philips, & Prus, 2002). Furthermore, small schools have higher per-pupil expenditures (Iatorala, 2008). Although the majority of cost analysis research concludes that larger schools are less expensive, there is evidence to refute this claim. In examining over 3,000 construction projects from 1898 to 2003, Howley (2008) found building a school for 128 to 600 students is no more expensive than building large schools with 601 to 999 students. Howley (2008) found that although small schools are less costly per square foot, they showed little difference in per pupil expenditures when looking solely at school size. He found little difference in the overall cost of operating a large school versus a small school. In fact, Howley (2008) found no difference in the costs of buildings with 138 to 600 students and those with 601 to 999 students.

However, Duke, DeRoberto, and Trautvetter (2009) examined costs related to size using different criteria. As opposed to the traditional look at per-pupil costs, they studied per-graduate costs through a meta-analysis of recent and older research on cost factors. Through this lens, they found that although small schools have a slightly higher cost per pupil compared to large schools, small schools showed an overall cost effectiveness due to the greater percentage of on-time graduates. Because of the mixed methods and types of research conducted related to size, there is yet to be definitive answers surrounding costs. This demonstrates the need for decision makers to look beyond costs when deciding which is the right school size.

Furthermore, there is a growing body of work indicating that high schools of "medium" size are most successful overall. Lee and Smith (1997) found that schools enrolling 600 to 900 students scored higher on state assessments in math and reading than both smaller and larger schools. In addition, the climate and conditions for student success were likely better in medium-sized schools with 900 or fewer students (U.S. Department of Education, 2009). However, Tajalli and Opheim (2005) found the size of the high school has no effect on performance. This is in contrast to a more recent study conducted by Werblow and Duesbury (2009), which found math gains greatest in large or small schools.

The mixed results of school size research are not new to researchers. In the early 1990s, Ornstein (1990) studied school size and its effects on student achievement. This study controlled for SES and found that small schools had the lowest achievement and larger schools were less effective overall, leading to the conclusion that mid-size schools show the greatest positive gains in student achievement. Ornstein (1990) found that school size alone does not give the whole picture about student opportunities and outcomes.

Students attend schools of various size, structure, and economic conditions. Research suggests outcomes relating students and school size may depend upon the SES of the students in the school (Tajalli & Opheim, 2005). The National Center for Education Statistics broadly defines SES as “one’s access to financial, social, cultural, and human capital resources” (NCES, 2014 p. 4). SES is a common variable in educational research as it classifies students into categories based on economics for comparisons. Traditionally, students from economically disadvantaged backgrounds have done poorly in school compared to those of higher socioeconomic background (Sirin, 2005). SES is one of the most widely used factors in educational research to compare achievement of students (Sirin, 2005). Students with a low SES have been shown to have lower achievement on standardized assessments (Coleman, et al., 1996).

Through a meta-analytic review of the research on student achievement and SES, Sirin (2005) found a medium to strong connection. In general, students from economically disadvantaged backgrounds tend to underperform on achievement tests nationally (Sirin, 2005). Sirin's analysis consisted of reviewing the research conducted on SES from 1990 to 2000. These studies included over 100,000 students and 6,000 schools. Sirin found that individual SES at the family level has a strong correlation with academic performance, but school level SES has an even stronger association. Instructional materials, teacher experience, student-teacher ratio, and parental involvement are factors that are found to be greater in high-SES schools than low-SES schools (Sirin, 2005).

Traditionally, SES has been broadly defined as the aggregate of a child's parental educational attainment, occupation, and income (NCES, 2014). The most frequent indicator for SES has been derived from the National School Lunch Program (NSLP). This measure of free or reduced lunches is the most commonly used indicator for SES in educational research (NCES, 2014). However, there has been a recent call to expand the measure of SES for students to include neighborhood and school resources (NCES, 2014). This allows researchers to look beyond the NSLP and use other identifiers that include the entire community and the school surroundings. Duncombe and Yinger (2005) utilized a comprehensive approach to SES through local real estate indicators and state aid calculations.

Educational Opportunities

In addition to student performance, the size effects of schools on students can be measured in various ways. As school leaders examine all the political factors facing school districts, administrators will be faced with evaluating core curriculum as well as co-curricular offerings. Schools offer a wide range of academic options for students. One of the options high schools offer, Advanced Placement (AP) courses, offers students college-level work prior to their going to college (Doughtery, Mellor, & Jian, 2006). AP programs can enrich students' high-school experience and offer opportunities to take challenging college-level courses with motivated classmates and highly skilled teachers (College Success, 2013). Students who earn college credit through AP exams have consistently outperformed other students in college (Geiser & Santelices, 2004). In addition, schools that offer AP programs provide students an enhanced school profile (Keng & Dodd, 2008). Ninety-one percent of college admissions offices consider a student's high school AP program in the admission process (Sathre & Blanco, 2006). Furthermore, AP programs in high school have been shown to help to narrow the achievement gap based on socioeconomic status (Mass Insight Education and Research Institute, 2010). Finally, AP programs can enrich the high-school experience for students, as their teachers are more experienced and can create a more challenging academic environment (Finley, 1984).

Research indicates a positive correlation between both co-curricular activities and student achievement and positive relationships between sports participation and student achievement (Frederick & Eccles 2006). Furthermore, students participating in other co-curricular activities, such as band, have significantly higher mean GPAs than students not participating (Kinney, 2008). In addition to achievement gains, research indicates a positive correlation between participating in co-curricular activities and student discipline. A recent study by Taliaferro, Rienzo, and Donovan (2010) using data from the Centers for Disease Control and Prevention's Youth Risk Behavior Surveys showed that athletic participation not only has a positive impact on student performance but also that students in co-curricular activities have fewer disciplinary issues in school and are less likely to engage in risky behaviors.

When examining how school variables affect student outcomes, the size and structure of schools are important. The size and configuration of a school building are as important as any other factor when looking at student success (Lay, 2007). However, examining school size variables alone does not account for all the differences students experience while in school. This study will combine the effects of size and SES in an effort to provide important information lacking in the literature regarding the combined effects of these two variables on student opportunities. This type of analysis has not been undertaken for Pennsylvania high schools. Much of the research focuses on either size or SES when examining student outcomes, not using both as variables. Using a comprehensive approach to SES indicators allows the researcher to measure SES through a school or community perspective (Duncombe & Yinger, 2005). The use of Market Value/Personal Income Aid Ratio (MV/PI AR) for the SES measure makes this study unique in identifying the appropriate overall wealth of a school district as opposed to using free or reduced students lunch numbers.

Purpose of the Study

The purpose of this study was to determine the relationship between high-school size, SES, and educational opportunities (advanced academics and interscholastic athletics) for high-school students in Pennsylvania. The study compares AP and Honors courses as well as interscholastic athletic offerings with the size of the high school as well as the socioeconomic status of the school district. The study accounted for SES through the Pennsylvania Department of Education's calculation of the Market Value/Personal Income Aid Ratio. In addition, per-student enrollments in these offerings were examined.

Research Questions

This study answered the following questions:

1. What is the relationship between the size of a high school, the socioeconomic status of its population, and the number of advanced educational opportunities offered to students?

a. What is the relationship between school size, SES, and Advanced Placement (AP) courses offered in math, science, social studies, and English?

b. What is the relationship between school size, SES, and AP courses offered in other academic areas?

c. What is the relationship between school size, SES, and honors courses offered?

2. What is the relationship between the size of a high school, the socioeconomic status of its population, and students enrolling in advanced educational opportunities?

    a. What is the relationship of school size, SES, and student enrollment in AP courses in math, science, social studies and English?

    b. What is the relationship of school size, SES, and student enrollment in AP courses in other academic areas?

    c. What is the relationship of school size, SES, and student enrollment in all honors courses offered?

3. What is the relationship between the size of a high school, the socioeconomic status of its population, and the number of athletic opportunities (official school sports) available to students across genders?

4. What is the relationship between the size of a high school, the socioeconomic status of its population, and the number of students participating in athletic opportunities available across genders?

Significance of the Study

This study examined the relationship that the size and SES of a high school has on its students in regard to educational opportunities. The research provides school boards and administrators in Pennsylvania concrete analyses of the effects school size has on educational opportunities (academics and athletics) when compared to other districts of similar SES. As noted by PSBA (2011), there is no definitive research on what is exactly the right size. Pennsylvania is considered to be one of the most rural states in America and its total student population is declining, yet individual school building enrollment continues to increase (Hillman, 2003).

Recently, several Pennsylvania school districts have conducted feasibility studies examining how consolidation would impact them. These feasibility studies are an attempt to determine whether the burden on taxpayers can be reduced through a form of consolidation. School districts will continue to look at consolidation, and this study examined at length several factors that influence those decisions. A review by Standard and Poor's (2007) stated that consolidation can provide more services and expanded programming. This study gives legislatures, school boards, and administrators a more complete picture of policy implications regarding funding, enrollment decisions, and possibly incentives to consolidate.

The use of MV/PI AR as the SES factor makes this study unique. SES is traditionally measured by the NSLP's free or reduced lunch percentages (NCES, 2014). However, using only free or reduced lunch percentages may be a skewed indicator. MV/PI AR provides a more accurate picture of a district's relative wealth compared to free or reduced lunch data (Duncombe & Yinger, 2011). While there may be no definitive measure of SES, using MV/PI AR aligns with a current call to expand SES measures to include community and school factors (NCES, 2014). Furthermore, this study does not use any large national database sets for examination. The data came directly from PDE.

This was one of the first studies to conduct an in-depth, quantitative examination of the advanced level course opportunities and athletics offered to students based on the size of the high school and socioeconomic status factored independently and together. To advance the knowledge base in the field of school size research, this study will provide a deeper examination of factors that indicate what size school provides maximum opportunities for students and thus will help fill a gap in research. This research gap indicates a greater need to study the actual and perceived effects of school size and SES on access to educational opportunities for students.

Design of the Study

This study was conducted through an intensive examination of public high schools in the state of Pennsylvania. It utilized four data sets derived from public PDE sources for the 2012-2013 school year. That year was the most recent year available for all sources at the time of this study. The data included public data from district and state levels provided by PDE for analysis:

1. Public School Enrollment Report: This report includes all public high schools in Pennsylvania and their total enrollment. This information serves as the source of the official student population in each school. All publicly funded Local Education Agencies (LEA) must report those students who were enrolled and attending as of October 1 of each school year (PDE, 2015b).
2. Market Value/Personal Income Aid Ratio (MV/PI AR): The MV/PI AR is the calculation used by PDE to determine the level of education funding offered to school districts.
3. Athletic Offerings Survey File: This file was used to examine athletic participation in high schools across the Commonwealth. As part of Act 82 of 2012, all public schools in Pennsylvania are required to disclose interscholastic athletic opportunities for students in grades 7-12 (PDE, 2015a).

4. Course Enrollment File through the Pennsylvania Information Management System (PIMS) data collected by PDE: PIMS houses PDE's statewide longitudinal data, with a goal of improving the data capabilities of school districts and the state through technology (PDE, 2015d). According to the PDE (2015d), PIMS is based on open Internet standards that enable sharing among diverse, otherwise incompatible, systems and includes safeguards for data quality and security.

Descriptive statistics included summary statistics for interval/ratio variables and frequency tables for nominal/categorical variables. Summary statistics included means, standard deviations, and 95% confidence intervals. In addition, bivariate correlations were computed for all interval/ratio independent and dependent variables.

Inferential statistics included regression analyses to determine the extent of the relationships between the independent (i.e., enrollment and SES status) and dependent (i.e., number of AP and honors courses, enrollment into AP and honors courses, interscholastic athletic offerings for males and females, and interscholastic athletic enrollment for males and females) variables. Multinomial regression analysis was conducted for AP/honors course offerings with enrollment and SES. Linear regression analysis was conducted for enrollment per student in AP/honors courses as well as for the athletic offerings and enrollment. All statistical analyses were tabulated and are presented in Chapter IV. A detailed discussion of each of the tables and the corresponding research questions is provided in Chapter V. Regression diagnostics was used to assess model fit and generalizability and to detect outliers and other influential cases (Field, 2009). A secondary analysis of the schools that were found to be anomalies was also conducted. Anomalies are schools that did not follow the pattern of course offerings of other schools of similar size or SES. The Software Package for Social Sciences (SPSS) was used to conduct all the measures of statistical analysis.

Delimitations

This study has several delimitations that the researcher would like to acknowledge. A foremost delimitation of this study is the choice not to examine student performance indicators due to the variability in current Pennsylvania state assessments. There is currently a change in testing from the PSSA to the Keystone Exams at the high-school level to meet the NCLB mandate. In addition, many districts are currently working on making the needed curriculum changes to become aligned to the PA Common Core.

A second delimitation of the study is the use of Market Value Aid/ Personal Income Ratio instead of Free and Reduced lunch indicators as an indicator of SES. Due to social pressures, students in high school may be less willing to register for free and reduced lunch if they qualify (Lindahl & Cain, 2012).

Third, this study adopted four classifications for identifying high-school size. Lindahl and Cain's (2012) work on high-school size resulted in categories of small, medium-small, medium-large, and large. Small schools range in size up to 400 students in grades 9-12. Medium-small schools range in size from 401 to 800 students. Medium-large schools range in size from 801 to 1,600 students. Finally, large schools have more than 1,600 students. Most research suggests that small schools enroll 600 to 900 students, and large schools enroll more than 900 students (Lay, 2007; PSBA, 2011). However, as Howley (2000) indicated, these classifications are not arbitrary, but taken in context from the prevailing research on what constitutes big or small as there is yet to be a consensus.

A fourth delimitation of this study is the choice of the researcher to exclude private, charter, cyber, and full-time vocational schools. Although many of these schools educate students in grades 9-12, the intent of the study is to examine how traditional high-school size and school SES affect opportunities for students. There is no clear way to establish SES within a private, charter, or cyber school. Students could be attending from various school districts, and so the MV/PI AR would not be an appropriate or accurate measure. Furthermore, career and technical high schools were removed from the data sets, as each technical school has its own set of operational procedures, structure, and enrollment. Some would be considered stand-alone schools offering students all graduation credits, while others are part-time options offering students only the technical courses the home school cannot deliver.

Finally, this study was conducted using data from Pennsylvania public high schools. The results of this study should be generalized with caution and only to those states which have characteristics similar to Pennsylvania, especially in reference to both the rural nature of the state with several urban centers. This may limit the generalizability of the results.

Limitations

Due to the nature of the study, a limitation is the inability to make generalizations on the effects of high-school size on opportunities in every situation. A limitation of this study relates to the accuracy of the data. Extant data were utilized as the basis for analysis. The data were derived from PDE through individual school districts. PDE has processes and procedures in place to verify the accuracy of the data it receives. However, there is always the potential for human error, and therefore the possibility of inaccurate school level data exists.

A second limitation is researcher data migration error. This study uses four unique data sets that were merged and migrated together for analysis, generating a potential for errors in the course of data migration. However, the researcher took steps to ensure the accuracy of the data through the migration and analysis. Several safeguards for data verification were employed including making contact with high-school principals for data verification. Also, line item analysis was conducted by the researcher for all schools prior to completing any data analysis to check for irregularities and inaccuracies.

Definition of Terms

Advanced Placement Course (AP) – Courses developed by a committee composed of higher education faculty and expert AP teachers who ensure that the course reflects college and university-level expectations. Courses are taught by highly qualitied high school teachers (College Board, 2015).

Co-curricular Activities - Activities to describe nonacademic, school based activities outside of the classroom explicitly designed to complement student learning (Darling, Caldwell, & Smith, 2005).

Economies of Scale - The relationship between average costs and output. Output is defined by student performance and a combination of inputs supplied by a school, such as teachers, and fixed inputs such as student characteristics (Duncombe & Yinger, 2001, p. 2).

Educational Opportunities - Courses and co-curricular activities a school offers to its students. This includes core classes, higher level academics, and participation in interscholastic athletic activities.

Free and Reduced Lunch - Children from families with incomes at or below 130% of the poverty level, children in families receiving Temporary Assistance for Needy Families (TANF), and children in families receiving food stamp benefits are eligible for free lunches. Children in families whose income is between 130% and 185% of the poverty level are eligible for reduced price lunches (PDE, 2015c).

Honors Course – An advanced academic course (PDE, 2015d). The Local Education Agency (LEA) designates courses to be deemed “honors.”

Large school - School with total enrollments of over 1,600 students in grades 9-12 (Lindahl & Cain, 2012)

Market Value (MV) - Sales value of taxable real estate as certified by the State Tax Equalization Board. The 2011 market value is used in the calculation of the market value aid ratio for payable year 2013-2014 (PDE, 2015c).

Market Value Aid Ratio (MV/AR) - The calculation PDE uses to determine the percentage of state aid provided to school districts based on Market Value of properties in the community.

(School District Market Value / SD WADM State Total Market Value / State Total WADM * 0.5)

Market Value/Personal Income Aid Ratio MV/PI AR) - The calculation PDE uses to determine the percentage of state aid provided to school districts based on the market value of properties and taxable income from the PA-40 from individuals in the community.

(.06 *MV AR) + (.04* PI AR)

Medium-large school - School with total enrollment of 801-1,600 students in grades 9-12 (Lindahl & Cain, 2012)

Optimal School Size - The school size at which per student expenditures would be minimized while student achievement would be maximized (Rooney & Augenblick, 2009, p. 1).

Per-Pupil Expenditures - Average amount a school district spends per student during a given school year.

Personal Income (PI) - Personal income, excluding out-of-state income, reported on the PA-40 income tax form. Data is certified by the Department of Revenue. The 2011 personal income is used in the calculation of the personal-income aid ratio for payable year 2013-2014 (PDE, 2015c).

Personal-Income Aid Ratio (PI AR) -

(School District Personal Income / SD WADM State Total Personal Income / State Total WADM * 0.5)

Pennsylvania Information Management System (PIMS) - Statewide data system designed to collect student information from all public-school districts. PIMS is based on open internet standards that enable sharing among diverse, otherwise incompatible, systems and includes safeguards for data quality and security (PDE, 2015d).

School Consolidation - The process of combining or merging multiple school districts to form a single school district (Rooney & Augenblick, 2009 p. 10).

Small school - School with total enrollment of fewer than 400 students in grades 9-12 (Lindahl & Cain, 2012)

Small-medium school - School with total enrollment of 401-800 students in grades 9-12 (Lindahl & Cain, 2012)

Socioeconomic Status (SES) – One's access to financial, social, cultural, and human capital resources (NCES, 2014). For this study, the overall level of affluence in a school district as measured by the Market Value/Personal Income Ratio will be utilized.

Student Achievement - Measurements of student academic success in schools. These measurements include but are not limited to GPA, standardized test scores such as ACT/SAT, state-mandated assessments, and class rank (Jackson & Lunenburg, 2010; Ding, 2008)

Weighted Average Daily Membership (WADM) - The 2011-2012 WADM is used in the calculation of the aid ratios for payable year 2013-2014 (PDE, 2015c). It is calculated by weighting half-time kindergarten ADM at 0.5, full-time kindergarten and elementary ADM at 1.0, and secondary ADM at 1.36.

Summary

This chapter described how school size and socioeconomic status, which have been studied through the decades, require further study. This study offers a missing piece to the academic literature to help policy makers when evaluating academic programs. The researcher utilized four research questions to determine the relationship between school size, SES, and opportunities (academic and athletic). This research is an important piece to help understand how students' access to certain educational opportunities can be affected by school size and SES. This chapter detailed the purpose of the study as well as the research questions. Data from public high schools in Pennsylvania were utilized for analysis. School enrollment, course enrollments, MV/PI AR, and the athletic data file were examined. Both descriptive and inferential statistics were conducted on the variables for size, SES, advanced level courses, and interscholastic athletics. Chapter II provides critical background knowledge and research into the complexity and history of the school size debate as well as analysis of the benefits of large, small, and medium-sized high schools. In addition, Chapter II presents the literature surrounding the benefits associated with students who access higher level courses, participate in athletics, perform arts activities, and become involved in other clubs and activities.

CHAPTER II

REVIEW OF THE LITERATURE

Students attending public schools of varying size and socioeconomic elements continue to have distinct experiences and outcomes. Research over the years has pointed to the complexities regarding the issue of equal and appropriate education for all students (Howley, 2008). School size and structure have been at the forefront of educational decisions since the 1800s. Socioeconomic standing has also been a large factor in the success of students since the early 1900s (NCES, 2014). The current body of research leans toward medium and small size schools as being the most effective for student achievement outcomes and participation rates in activities. In addition, the literature supports the view that students from economically disadvantaged backgrounds underperform on state and national assessments (Lee & Smith, 1997; Leithwood & Jantzi, 2009; Lindahl & Cain, 2012). To gain a greater understanding of how school size and SES impact students, the curricular and co-curricular offerings available to students require a more complete examination.

Chapter II discusses past and current research examining school size, SES, and school district consolidation. To help provide perspective on the two independent variables used in this dissertation, the researcher examined SES and school size through a historical context. Public education in the United States from the 1600s to the present day is the focus of the first section of this chapter. Research outlined in this chapter also provides a context for a current trend of states looking at school reform efforts through school or district consolidation. Current national reform efforts, a comprehensive review of recent school consolidation efforts in Pennsylvania, as well as an examination of current financial calculations and statistics used by the PDE to determine wealth within a district are reviewed. Also, current high-school enrollment information in Pennsylvania is presented. The literature surrounding high-school size and related to the benefits of educational opportunities offered to students is reviewed. The final section of this chapter discusses the gaps in the literature that this researcher has identified. The literature review indicates the complexity of the issue of how school size and economics affect students and their access to curricular and co-curricular offerings.

The Purpose of Schools in the United States

The education of students has been highly debated for centuries. To fully understand the depth, complexity, and passion surrounding the issues of school size and SES and their place in the current educational debate, a historical perspective on the on-going argument must be outlined. This research frames the idea of the transition from the one-room schoolhouses of the 1700s to the mega-schools of today that enroll 2,000 to 3,000 students. For perspective, in 1919 there were almost 200,000 one-teacher schools compared to just over 300 in 2005 (Rooney & Augenblick, 2009). The concept of "why" schools exist and "what" type of school provides the best outcomes for students can be traced back to the early colonies. Although today it may be viewed differently, the Constitution gave de facto delegation of the educational purview solely to individual states in 1789.

European influences on American education are evident going back to the first established school, the Boston Latin School, in 1635. The Boston Latin School was a primary school in Massachusetts established for wealthy families (Conant, 1959). Its primary purpose, and that of others like it, was to educate a particular class in preparation for influential positions in the government and the Church (Conant, 1959). Many similar schools were established in the colonies from the 1600s through the late 1700s. Although some public schools existed during this time, education was not free, as tuition was paid by families (Cubberley, 1922). The cost of education during these times was assumed by individual wealthy families (Rooney & Augenblick, 2009). During the early years of the nation, schooling was seen as primarily for the wealthy. It was not a widely held view that all children should be educated. Schools were viewed as preparatory institutions for colleges, which in turn were reserved for the wealthy (Conant, 1959).

The debate regarding mandating educational services for all children began in the late 1600s (Rooney & Augenblick, 2009). The views of the English philosopher John Locke helped frame the debate regarding American education. In 1690, Locke published *An Essay Concerning Human Understanding*, which argued that education "maketh the man" (Sobe, 2011). Locke felt that the mind was an empty cabinet that becomes filled over time through education. Although during Locke's time education was reserved for the rich, Locke himself thought schools should be created to help teach children from poor families how to work in skilled labor positions (Sobe, 2011). Locke did not regard the differences in students as aspects they could not overcome. He felt that education could be for all people. This belief was a foundation for many future education scholars and reformers such as Thomas Jefferson, Jean-Jacques Rousseau, Horace Mann, and John Dewey (Sobe, 2011).

Jean-Jacques Rousseau, another influential educational scholar of the time, published *Emile, or on education* in 1762, building on the ideas of Locke and others. Rousseau's beliefs can be seen as the origin of modern education within the United States. He believed children develop through many stages and education should be appropriate for each stage. This basic principle is fundamental to educational practice today, but was a novel idea in the 1700s (Sobe, 2011). He was also the first person to express that education needs to be individualized for each student based on his or her current "developmental stage" (Sobe, 2011). He also was one of the first scholars to distinguish the importance of public education and individual education. Another contribution from Rousseau was his belief that the structure or environment of education are critical to success of the individual. As a result of his influence, educational systems began to stress the importance of the educational environment. However, during Locke's and Rousseau's time, education was primarily privately funded by individual families or towns that could afford it. Not until the end of the 19th century did states provide free education to all children (Cubberley, 1922).

The transformation of the small, one-teacher schoolhouse began in the early 1800s with the urbanization of the United States (Conant, 1959). The Industrial Revolution ushered in a dramatic shift in every aspect of life in the United States, and education was no exception (Conant, 1959). Small towns and villages began to give way to larger cities, and the educational landscape in the United States changed due to the needs of the society. The need for skilled workers became critical. The purpose of school began to transform from theory to practice, and the era of specialization in education began (Cubberley, 1922).

A lesser-known educational scholar during the early 1800s was Joseph Lancaster. Lancaster is of particular interest for this dissertation because of his ideas about the business aspect of education. Lancaster developed the Monitorial System of Education, commonly known as the Lancasterian model. In England, Lancaster created a system of educating students through peer education. The Lancasterian model was brought to the Philadelphia area during the early 1800s. Students who had a certain level of expertise would help teach their less-educated schoolmates. One of the greatest contributions this model made to modern education was the grouping of students into similar age groups for lecture-style instructional. In order to help keep costs down, new methods of instruction which included larger class sizes that used peers facilitating the learning of others were introduced. The main goal of the school was to have students learn to read, write, and work out math in simplistic ways (Mesquita, 2012). This process was seen to help facilitate the instruction of many students without the cost of hiring many expert teachers. This idea help forged a new way to look at the efficiency of education and schools (Mesquita, 2012).

The Lancasterian model was the first to look at the costs associated with education and examine ways to keep those costs down. In referring to the contribution of reformers such as Lancaster, Mesquita (2012) states, "the movement to fuse capitalistic business enterprise and compulsory schooling…lay at the very foundation of the English and American public schools" (p. 661). During Lancaster's time, education was beginning to be viewed by some as a business enterprise to make money. The Lancasterian model was driven by the ability to educate students at a low cost per pupil. Lancaster created a system to finance his schools through subscriptions paid by students or sponsors. Lancaster would charge a per-student fee for instruction. Students who could not afford it were able to attend for free by having wealthy businessmen pay for their education (Mesquita, 2012).

Another contribution of Lancaster was the concept of reporting results and being accountable for them. Lancasterian schools used writing as the primary source of instruction and results. Performance results were analyzed by the amount of writing done by students. Although he was reporting to the businessmen helping to finance his venture, Lancaster ensured that all results were recorded based on the total number of students making progress. Lancaster measured the development of students by their output of writing and the number of calculations they completed during a given school year (Mesquita, 2012).

Until the mid-1800s, the manner in which schools were structured remained a local decision. States did not require all children to go to school. Most states and the Federal government remained out of the educational framework. As is the case today, the role of states and the Federal government in respect to education was highly debated (Conant, 1959). In general, during the 1800s, education was seen as a local municipal concern, with little state or federal involvement. However, beginning in the mid-1800s, government began to take an active role in education. According to Beadie (2000), as cited by Rooney and Augenblick (2009), a number of states began to levy taxes to help fund local school districts. In addition, many northern states created local and state school boards, moved away from individual student payments to attend public schools, and instituted a form of compulsory attendance (Rooney & Augenblick, 2009).

Compulsory education in the colonies began in the mid-1600s in Massachusetts with the Law of 1647 or the "Old Deluder Satan Act" (Cubberley, 1922). This law required any town with 50 or more families to hire a housemaster to teach its children to read and write. Clearly, this view of the importance of education for everyone was taking hold well before the nation was even established. Massachusetts was also the first state to pass a mandatory attendance law was in 1852 with the Massachusetts School Attendance Law of 1852. It stated:

> Every person who shall have any child under his control between the ages of eight and fourteen years, shall send such child to some public school within the town or city in which he resides, during at least twelve weeks, if the public schools within such town or city shall be so long kept, in each and every year during which such child shall be under his control, six weeks of which shall be consecutive. (Commonwealth of Massachusetts, 2014)

By 1885, 12 states had compulsory attendance laws, and by 1918 all of them did.

The first public high school was established in Boston, Massachusetts. In 1821, Boston English High School was created. Its goal was to provide free educational options for students who did not attend Latin grammar schools. A few years later, in 1827, as a move towards education for all students, Massachusetts passed a law that any town with more than 500 families needed to establish a public high school (Cubberley, 1922).

Widely known as the father of American public education, Horace Mann's ideas about began to take shape in the late 1830s (Groen, 2008). Moving away from the Jeffersonian aristocratic view of education, Horace Mann viewed education as a vehicle for all children to develop and grow. He believed in the power of equal education for all children, and his belief formed the basis for the common school (Brick 2005). Mann saw the common school for all children as a way to grow any child regardless of his or her family situation or upbringing, as long as the educational institution was set up in such a way as to foster this growth. Mann viewed schools as the only way to fully develop and education all children. He viewed the deterioration of the family as a main reason schools needed to be more than just educational buildings. They were to offer opportunities families could not themselves supply and teach ethical and moral behavior as well as individual responsibility (Brick 2005).

Mann was a high ranking member of the Whig party and his educational views reflected a political shift in the United States. The Whigs overwhelmingly advocated a state-run public-education system. Mann was appointed secretary of the newly formed Massachusetts State Board of Education by the Whig governor (Groen, 2008, p. 253). In contrast to Jefferson, Mann supported public education for all, not just the select few (Groen, 2008). He felt that common schools were the only way to practice self-government (Brick 2005). They also were an opportunity for state governments to become active in education. Ultimately, Mann's ideas helped build a strong foundation for the national, federal view of education as a vehicle to give everyone equal access to education.

The Federal government's role in public education increased in the aftermath of industrialization. Nationalization of all aspects of school life began in the late 1800s.

John Dewey built his educational philosophy on the ideas and practice of Horace Mann, believing that public education institutions can grow and develop the individual (Dewey, 1944). In 1916, Dewey published his first work on education, *Democracy and Education*. He put greater emphasis on the schools themselves as he thought that schools should "be more decisive in determining one's growth and development than innate gifts or tendencies" (Brick, 2005, p. 168). He believed a person is a product of his or her environment, not of something innate so, schools should be the sources of opportunity (Dewey, 1944). Dewey helped foster the belief that the school is the only institution that can provide an adequate education for children (Dewey, 1944). His work has proved the basis for many of the educational policies since the 1950s and still resonates today.

One of Dewey's most dramatic influences on education in the United States was on curriculum and teaching strategies. His philosophy moved away from the classical views of both Jefferson and Mann. Schools were viewed as institutions to create opportunities for individual growth and development (Dewey, 1944).

By the early 1900s, schools began to offer comprehensive services including co-curricular activities (Conant, 1959). Although some high schools offered these activities earlier, most started offering organized sports, music, and art programs after the turn of the 20th century. These co-curricular activities would not be examined for their perceived benefits until later. In addition, with instruction, curriculum, and assessment the primary aspects of school, the size of the school and its effects on these aspects began to be examined.

Advances in technology, methodology, and enrollment increases all arrived in the years following the World War II. In addition, the role of the Federal government expanded in the educational field. In 1965, the Elementary and Secondary Education Act (ESEA) was passed by President Johnson as part of the War on Poverty. This ushered in an era of accountability for student achievement. The ESEA was created to help traditional low-achieving and poor school districts with Federal funding for K-12 education. Since the passage of ESEA, the Federal government has continued to play an expanded role in the structure and purpose of schools in the United States. In 2001, the ESEA was reauthorized under No Child Left Behind (NCLB). More recently, the Federal government has provided funding for states through the Race to the Top (RTT).

As in the era of Mann in the 1800s, the political landscape influences the educational system in the United States. The period from the early 1990s through today has seen some influential reform and policy efforts. As part of the response to accountability expectations, legislatures nationwide have looked for ways to create more effective, higher-achieving schools. One of these reform efforts involves examining the size of schools and school districts as an on-going measure to improve quality and efficiency.

National School Consolidation

The issue of school consolidation in the United States dates back to the 1800s. Increased accountability measures and the costs associated with such measures, coupled with state budget problems, impacted states' decisions to look at consolidation. In the mid-1900s, consolidation was seen nationally as an answer to the increasing costs of education, especially for poor, rural schools. The consolidation trend was connected to other general reform efforts in government and the continued urbanization across the states (Rooney & Augenblick, 2009).

Economies of scale in education is a general reference to the notion that the overall operating costs can be decreased by servicing more students. Tholkes and Sederberg (1990), state economies of scale as a "curvilinear relationship between average cost and the number of units produced" (p. 10). Duncombe and Yinger (2005) define economies of scale in business output terms: "economies of scale are said to arise when the cost per unit declines as the number of units goes up" (p. 3). In educational terms, economies of scale is used to compare per-pupil expenditures, enrollment, and cost associated with the output, student performance (Duncombe & Yinger, 2005).

Tholkes (1991) helped frame how school districts can achieve or quantify economies of scale. According to Tholkes (1991), when assessing economies of scale, input and output factors are examined. Capital and operating costs are the input factors considered with economies of scale in business as well as in education. Specifically, which input factors are necessary for schools to generate educational services? They include "personnel, purchased services, supplies, facilities, and equipment" (Tholkes, 1991, p. 10). Output factors are those specific results or features which result from the input factors of each school. Output can be measured by the cost factors associated with the number of students serviced through courses offered, co-curricular activities, and support services for students (Tholkes, 1991). Tholkes's research concludes that school districts see the realization of economies of scale for services through consolidation as long as the addition of one more student results in a lower average cost per instructional contact hour or their unit of service.

Rooney and Augenblick (2009) conducted a study for the Colorado School Finance Project to help provide background information about school consolidation. Their study was conducted through an extensive review of school-district data from each state across the country. This included a review of historical documents, a literature review, and individual interviews with consolidation experts. The data were broken down from a historical perspective for the number of districts nationwide and the number of districts by size in each state to compare Colorado to the national picture. Furthermore, they examined the perceived motivations for districts to consolidate. Finally, their work culminated in a few key recommendations for states and districts considering consolidation. They found from 1939-1940 through 1959-1960 the number of school districts declined by 65% although the overall student population increased by 40%. In 1939, there were about 25.7 million students in the United States. By 2005, that number had almost doubled to 48.0 million students. They also found the number of school districts went from 117,108 to 14,166 over the same time frame. Furthermore, over 100,000 school districts had consolidated over the previous 70 years, creating much larger school districts nationwide. They found that over the same time period, the average size of school districts went from 190 to 3,290 students. But despite enrolling over 34% of all students nationwide, large school districts (over 25,000 students) make up only 1.9% of all school districts. Furthermore, although 86% of the nation's school districts have fewer than 4,999 students enrolled, they service just 31.5% of the total student population. Although the consolidation movement has created larger school districts overall, there are still thousands of districts servicing fewer than 1,000 total students (Rooney & Augenblick, 2009).

In addition, Howley, Johnson, and Petrie (2011) completed a study for the National Education Policy Center reviewing the national research on consolidation from a historical perspective, as well as analysis of the current research. This study summarized the outcomes of consolidation efforts, providing more detail to their definition of consolidation by adding school closure and the transferring of students to other existing schools or the creation of new, larger schools (p. 1). Most of the current research looking at school consolidation is an examination of the effects of school size on multiple outcomes such as costs factors, student achievement, and educational opportunities. According to Howley, Johnson, and Petrie, (2011) 500 of the largest school districts enroll 43% of the entire student population. The differences among states in terms of the number of school districts and the operation of their educational systems play a role in their view of consolidation. For example, Hawaii has one school district for the entire state, while New Jersey has over 600 (Howley, Johnson, & Petrie, 2011).

The research conducted by Rooney and Augenblick (2009) and Howley, Johnson, and Petrie (2011) revealed more overall negative results as a result of school consolidation since the 1970s. These two summative research studies found the following:

- Prior to 1970, consolidation was found to have positive results such as grade specific school structures, specialized teachers, and increased opportunities for rural students.
- The degree of improved achievement and lower costs has been contradictory.
- Cost benefits have generally been limited to small districts.
- Larger schools can provide more educational opportunities, but there is no increase in the number of students taking advantage of these opportunities.
- Participation rates in co-curricular activities by economically disadvantaged students decreases in larger schools.

As states and districts consider consolidation, it is important to outline the reasons for it. Educators have adopted business models that are thought to provide increased economic results in terms of school efficiency, productivity, and results (Howley, Johnson, & Petrie, 2011). Several factors are indicated as motivations for schools to consider consolidation including, but not limited to, economies of scale, academic quality, community impacts, geography, and governance (Howley, Johnson, & Petrie, 2011; Rooney & Augenblick, 2009). Several states have sought to incentivize consolidation for local school boards. For example, West Virginia, Kentucky, Ohio, New York, and Alabama have provided funding and policy interventions for districts that consolidate (Howley, Johnson, & Petrie, 2011). These states did in fact see a greater number of merger efforts than states that did not incentivize consolidation. Pushing local school boards even further towards consolidation, Arkansas eliminated school districts with fewer than 350 students (Howley, Johnson, & Petrie, 2011).

To indicate the overall impact consolidation has on education, Berry (2004) found that over a period from 1930 to 1970, nine out of 10 school boards nationwide disappeared. In addition to consolidation, reforms in the 20th century included increases in instructional year, smaller class size, and salary increases (Berry, 2004, p. 60). These major reforms helped produce the American schools of today (Berry, 2004). As part of this study, Berry (2004) examined a particular segment of the population (white males) graduating from 1920 to 1949 across the country. Berry chose this time period as it consisted of an era when the greatest consolidation took place nationwide, forever changing the educational landscape from coast to coast. This consolidation effort and subsequent closure of schools resulted in larger individual schools and districts. Berry examined the school system characteristics that affected the value of student's education as seen in the labor market. More specifically, Berry wanted to examine the overall wages earned in relation to the districts' educational services.

Berry (2004) took a two-step approach. First, he reviewed the increased wages for one year of additional schooling across the lower 48 states during the 1920s, 1930s, and 1940s. This resulted in 144 individual estimates. Second, the wages resulting from additional schooling were compared to the state's average school size. District characteristics included the size, student/teacher ratio, length of school year, teacher wages, and funding from the state (Berry, 2004). Berry (2004) found that small schools had a significant positive effect on graduates' wages. An increase in school size by 100 students showed a 1/3 standard deviation decline or a 3.7% decrease in earnings over a lifetime (p. 61). On the other hand, Berry also found that larger districts showed positive results in the earnings of students. Therefore, during the consolidation period of 1920 to 1949, there were distinct implications for the earnings of white male students. Berry (2004) found an inverse relationship with earnings and individual school size as there was a decrease in educational quality as school size increased (p. 62).

The research by Berry (2004), Howley, Johnson, & Petrie (2011), and Rooney & Augenblick (2009) indicates that there is a positive relationship between smaller schools and student outcomes; however, the results are less than conclusive. Several states looked closely at school consolidation and even moved with legislative action. In 2007, Maine passed a consolidation law looking to

> Provide "equitable and rigorous" educational quality, greater tax rate equity, more effective and efficient resource use, and preservation of school choice. (Rooney & Augenblick, 2009, p. 11)

In the late 1990s, the state of Georgia's research into consolidation led to some unifying of school districts (Rooney & Augenblick, 2009). This section of Chapter II examines the recent consolidation efforts in three states: New York, West Virginia, and Alabama. The New York case studied a global approach to economies of scale, while the West Virginia study examined costs and outcomes for students in high school. The Alabama research studied the relationship between size, school quality, financial indicators, and student performance on standardized exams.

Examination of New York State Consolidation

Duncombe and Yinger (2005, 2001) have conducted multiple studies examining rural consolidation in New York State. The latest research study conducted in 2005 examined pre- and post-consolidation data from 1985 to 1997 for rural school districts in the state. New York is a good state to measure the impact of consolidation as it is one a few that until 2005 provided incentives for school district consolidation or reorganization. New York State contributed up to 40% in operating aid for districts over five years. After nine years, this incentive phased out. Furthermore, the state provided reimbursement for up to 30% of the capital costs incurred by the district. These incentives have proven to show districts' willingness to consolidate as New York provided almost $40 million towards consolidation in 1999 alone (Duncombe & Yinger, 2005).

Duncombe and Yinger (2005) examined 12 school districts to gather the pre/post consolidation data. Another 190 districts serve as a comparison group. Multiple sources of data were utilized for the research. The first measure examined student achievement data or the performance variable. These data consisted of the percentage of students unable to reach minimum competency on elementary-school math and reading tests, dropout rate, and the percentage of Regents diplomas given. The second data measure consisted of the cost model variable for demographics and socioeconomic inputs including district income, property value, and school-lunch subsidy percentages. These measures are represented in the New York State Aid Ratio, which is the income per pupil, tax base per pupil, and state aid per pupil divided by total income (Duncombe & Yinger, 2005). The next variable used is the "price variable" for average teacher salaries of teachers in their first five years of service. Finally, "environmental variables," including the child poverty rate, incidences of single-parent families, limited-English-Language students, students with special needs, and subsidized lunch percentages were included in the data set.

The descriptive statistics indicated that the results of consolidation were mixed. In 1997, districts that consolidated spent more in instructional and non-instructional expenses than non-consolidated rural districts. This was in contrast to the same expenses in 1985, when these districts spent less. Academically, school districts that consolidated showed a small increase in math and reading scores in the primary grades. In addition, the student drop-out rate in consolidated school districts decreased slightly during this period. But the research also showed a drop in the percentage of students receiving Regents diplomas in consolidated schools. Also, larger districts did not necessarily provide a greater number of higher level course offerings for students (Duncombe & Yinger, 2005).

To further examine the descriptive results, Duncombe and Yinger (2005) performed a regression analysis of the data collected, finding that small districts were more likely to show economies of scale through consolidation. More specifically, the research displayed a strong predictor for several cost factors districts face.

Transportation, administrative, instructional, per-pupil, and capital-spending costs were found to have a significant association with consolidation. Districts that consolidated decreased their per-pupil costs for transportation by over a quarter per student compared with districts that did not consolidate over the same time period. Administrative costs decreased over time as size increased. Districts that doubled in size through consolidation had an average decrease in administrative costs of two-fifths. Savings on instructional costs varied by the size of the districts being consolidated. Those with 300 students or fewer that combined saw a 28 percent reduction in instructional cost. The decrease in costs for larger districts was not as significant. Districts with at least 1,500 students that consolidated saw in a decrease of instructional costs of seven percent. Finally, capital spending saw significant decreases over time through consolidation. Districts that consolidated producing a school district that doubled in size had a reduction in capital spending of an average of 25 percent (Duncombe & Yinger, 2005, pps. 21-22).

Duncombe and Yinger's (2005) analysis of consolidation in New York State concluded that rural districts with initial enrollment numbers of 300 students or fewer had significant decreases in costs and achieved economies of scale as a result of merging. Although there is a short term increase in overall costs, the costs decrease over time (Duncombe and Yinger, 2005). However, consolidated school districts had mixed results in increased student achievement and other academic indicators.

Economic Analysis of West Virginia High Schools

Hicks and Rusalkina (2004) conducted a comprehensive study of school consolidation in West Virginia, in particular of the relationship between associated costs and educational performance. They examined the measure of inputs and outputs of public high schools in West Virginia using a production-function approach. In this study, Hicks and Rusalkina collected and analyzed public data for of all West Virginia's high schools from 1997 to 2001. This included test scores, attendance and enrollment data, and AP enrollment information. In addition, data regarding teacher education, years of service, and salaries was also examined. Descriptive and regression analysis on these variables was conducted.

Hicks and Rusalkina (2004) found that overall district wealth and parental income have the most significant correlation with educational outcomes. Teacher education also has a positive impact on student achievement. School size plays a small, positive role in higher test scores among high school students at large schools (p. 21). Of interest, Hicks and Rusalkina found that the relationship between school size and student outcomes is significant. Furthermore, class size has a positive relationship with achievement. However, they did not find a significant association between poverty and achievement.

Hicks and Rusalkina (2004) also analyzed the data using an Adjusted Performance Measure (APM). APM is an overall look at the results of a school when controlling for things a principal and teachers have little or no control over. As Hicks and Rusalkina state, "the APM explains the unexplained variables into a single metric which then can be compared across schools" (p. 25). If a school receives a negative APM, then it is considered as performing below what was predicted. When adjusting for APM, they found no correlation with high school size. In conclusion, they found that the relationship between size and performance has no relevance to overall test scores across the size range.

School Size in Alabama Public High Schools

Lindahl and Cain (2012) conducted an examination of high-school size in the state of Alabama. Their review of current research indicated high school size across the country increased as the overall population increased. However, they found an inverse relationship when comparing the number of schools with the number of students. As the overall student population increases, the number of schools servicing the students is actually decreasing (Lindahl & Cain, 2012). This is consistent with other research on high school size.

Lindahl and Cain's research (2012) is of particular interest to this study because of its examination of the relationship high schools and selected variables. The purpose of their study was "to examine the relationship between the size of Alabama's public high schools, selected school quality and financial indicators, and their students' performance on standardized exams (Lindahl & Cain, 2012, p. 2)." Lindahl and Cain used free and reduced lunch numbers as a surrogate variable as they found that not all high-school students would indicate whether they qualified for such a service due to social pressures. Furthermore, they recommended caution in using standardized tests to measure school success as standardized tests are limited in scope.

This study used 11th grade as the indicator for school size rather than overall building size. Eleventh grade in Alabama is the point at which students need to perform proficiently on Math/Reading assessments. Eighty-five public schools in Alabama were utilized in this study. Information was collected from school years 2003-2004 and 2006-2007. The study categorized schools as small, medium-small, medium-large, and large. There were 29 small schools ranging in size from 40 to 120 students in 11th grade, 24 small to medium schools ranging in size from 104 to 240 student, 21 medium to large schools ranging from 250 to 370 students, and 11 large schools ranging from 372 to 618.

The study examined a number of factors. Lindahl and Cain first collected and examined demographic information related to the schools. These characteristics included grade level size, school configuration, Title I percentage, free and reduced price lunch percentage, and percentage of white students. In addition, the study looked at "school quality" indicators including attendance rates, mean number of pupils per computer in classrooms, mean number of students per computer with Internet access, level of education of the teachers, and mean percentage of highly qualified teachers. Furthermore, they examined two financial indicators: mean per-pupil expenditures and mean local district millage rate. Finally, the math and reading mean passing percentage scores on the Alabama High School Graduation Exam (AHSGE) were examined as student performance indicators.

In reviewing demographic indicators, Lindahl and Cain (2012) found a lower percentage of students eligible for free and reduced price lunches as the size of the school increased. In addition, there was no pattern or relationship between the number of white and minority students. Another finding was that the size of the school had little or no relationship to the daily attendance rate. Schools categorized as "small" had average daily attendance rates of 95%, "medium-small" had a daily attendance rates of 94%, both "medium-large" and "large" schools had rates of 95% (Lindahl and Cain, 2012).

Lindahl and Cain's (2012) final finding came in examining student performance. Students scored higher in reading than in math across all schools, regardless of size. Furthermore, students identified as special education scored consistently lower across the board, but overall general education student scores rose as the size of the school increased.

Pennsylvania School Consolidation

Pennsylvania's educational history is marked by school consolidation efforts dating back to the 1960s. In 1950, Pennsylvania had 2,530 school districts (PSBA, 2009, p. 6). As the school reform effort swept across the country in the late 1950s and early 1960s, the Pennsylvania legislature acted to reduce the number of school districts in the Commonwealth. In 1961, Act 561 drastically reduced the number of district (PSBA, 2009). Act 299 of 1963 added incentives and special payments to unions and districts if they consolidated. Finally, Act 150 of 1968 created additional consolidation incentives for districts (PSBA, 2009). Since 2009, there have been 500 school districts in Pennsylvania. In 2007, Standard and Poor's School Evaluation

Services conducted a study of the cost-effectiveness of consolidating Pennsylvania School Districts. In addition, several school districts in Pennsylvania have recently examined the likely overall impact of consolidation for their students and constituents. Two of these feasibility studies will be reviewed in this section. Furthermore, a 2009 Pennsylvania School Boards Association (PSBA) Education Research and Policy Center study on consolidation will be reviewed. Finally, demographic statistics for high-school size across Pennsylvania will be examined.

In 2009, then-Governor Ed Rendell proposed a commission to study the issue and create a plan to reduce the number of school districts from 500 to 100. Rendell's plan never gained any traction in the state legislature or in the Department of Education; therefore, it was not put into action as it was seen as a further assault on local control and small communities. PSBA (2009) states: "large schools in rural communities provided school spirit of community and a place people could identify with" (p. 7). Since 2009, the only school districts to merge are the Monaca School District and Center School District to create Center Valley School District outside Pittsburgh in western Pennsylvania.

Study on the Cost-Effectiveness of Consolidating Pennsylvania School Districts

Standard and Poor's study completed in 2007 was commissioned by the State's Legislative Budget and Finance Committee in Resolution S208 (Standard & Poor's, 2007). This study examined a prevailing thought that small schools and school districts cost more money to operate than larger schools and districts. The study is of particular interest for this dissertation due to the nature of the assumption implied and the use of current data from Pennsylvania school districts. The study had five objectives. The first two objectives will be the focus of this section of the literature review as they are directly related to this dissertation. The first asked whether consolidation helps smaller districts with purchasing power for supplies and services. The second asked whether consolidated school districts provide more services and programs.

The study utilized a variety of quantitative and qualitative data. Quantitative data included an analysis of spending, enrollment, and achievement data for all of Pennsylvania's school districts. The achievement data used came from the 2005-2006 school year for math and reading scores on the PSSA. The demographic, financial, and enrollment data came from the 2003-2004 school year. Financial information was reviewed from a district-level not individual-school perspective. The study examined costs known as "operating expenditures, which include spending for instruction, instructional staff support, pupil support, general administration, school administration, operations, maintenance, student transportation, and food services; debt service is not included in operating expenditures" (Standard & Poor's, 2007, p. 14). Examining per-pupil expenditures does not consider the differences in district spending on particular subsets of students. Standard and Poor's (2007) utilized a process of "normalizing" to account for differences in spending based on English Language Learners (ELL), special education, and economically disadvantaged. This research yielded some interesting results: districts spend 35% more for economically disadvantaged students, 108% more for students with disabilities, and 20% more for students with limited English proficiency (p. 15). Therefore, the study weighted the spending to compare across districts. This weighting is useful for the purposes of the Standard and Poor's study, but this dissertation will look at other factors to examine only those districts in the same socioeconomic range to eliminate the need for this normalizing process.

Small school districts that were seen as potentially benefiting from consolidation were asked to participate using an 18-question written survey. The survey consisted of questions related to the legislature's five objectives. Standard and Poor's (2007) identified 88 potential districts to participate. Forty-nine completed the survey and participated in the study, a 56% response rate. Finally, survey results from intermediate unit (IU) executive directors were also utilized as data measures for the quantitative portion. Sixteen IU executive directors participated in a six-question written survey. These IUs were identified as potentially providing services for the previously identified 88 districts.

In addition, qualitative data included interviews with superintendents, school-board members, representatives from the Pennsylvania Association of School Administrators, Pennsylvania Association of School Business officials, Pennsylvania State Education Association, PDE, and the Department of General Services (Standard & Poor's, 2007). In total, 50 individuals were interviewed as part of the study in a combination of face-to-face and phone interviews (p. 15).

When examining the first objective, Standard and Poor's (2007) found a significant relationship between a district's overall size and the cost associated on a per-pupil basis. The data revealed that in general as enrollment increased, per-pupil costs decreased until a certain student threshold. This threshold was found to be around 2,500-2,999 students. Districts ranging in size from 250 students to 3,000 students showed this relationship. The average per-pupil expenditure in 2003-2004 for districts with fewer than 500 students was $9,674. The average per-pupil expenditure in 2003-2004 for districts with 2500 to 2999 students was $8,057. Once district enrollment hit 3,000 students, the trend reversed, and the per-pupil costs began to trend upward. This trend represents a u-shape regression line (Standard & Poor's, 2007, pgs. 17, 20). This finding is consistent with Duncombe and Yinger's (2005) work that found that an optimal school-district size for per-pupil expenditures was between 2,000 and 3,000 students.

Standard and Poor's (2007) found economies of scale could be realized in Pennsylvania when consolidated districts resulted in student enrollments of 2,500 to 3,000 students.

Although the findings of this study indicated a cost savings based on per-pupil expenditures for a particular range of students per district, the researchers also indicated the results show theoretical implications of consolidation. It is not feasible to create the ideal size in all districts. For example, some of the districts that could consider consolidating may not border another district with the same enrollment numbers and thus benefit from consolidating. However, when accounting for these pairing difficulties, Standard and Poor's (2007) found 34 likely pairings. If these districts achieved the per-pupil expenditures of those districts in the 2,500-3,000 student range, about $81 million dollars could be saved (p. 23).

The findings related to the second objective, which examines the educational impact associated to school and district size, are of particular interest for this dissertation. Consistent with other research (Duncombe & Yinger, 2005), many superintendents interviewed saw potential benefits to consolidation related to academic programs. Standard and Poor's (2007) found 92% of districts with more than 3,000 students or more report AP test results, compared to only 51% of districts with fewer than 3,000 students (p. 31). One of the superintendents interviewed indicated an inability to offer advanced placement courses due to the size of the district, while another could not offer a variety of languages or higher level math courses. Furthermore, 63% of the responding superintendents thought consolidation could provide greater educational opportunities (Standard & Poor's, 2007).

In addition to the overall belief by superintendents that increased educational opportunities can result from consolidation, there is a similar belief about extra-curricular opportunities. Fifty-one percent of the respondents thought they could offer more extracurricular opportunities for students. However, 49% disagreed and felt consolidation would actually discourage students from participating and enrollment in these activities would decrease. This concern came from the belief that there will be fewer openings in extra-curricular activities and less personalization of the opportunities (Standard & Poor's, 2007).

District Feasibility Studies

Although consolidating schools continues to be a topic in the school reform movement in Pennsylvania, actual consolidation is rare. Three feasibility studies from the Commonwealth of Pennsylvania are examined in this section of the literature review. The goals for each pair of districts vary slightly from study to study. All three feasibility studies sought to examine the anticipated effects of merging two or more districts. These effects include financial, political, and educational. These studies sought to determine the impact on taxpayers in their communities. However, the specific rationale and goals for each study are also identified. The feasibility studies examined two districts in Berks County (Exeter Township and Antietam) in 2013, two districts in Columbia County (Bloomsburg and Central Columbia) in 2012, and six districts in Fayette County (Connellsville, Frazier, Albert Gallatin Area, Brownsville Area, Laurel Highlands, and Uniontown Area) in 2011.

A feasibility study for a combined school district was submitted in 2013 to the Antietam School District and Exeter Township School District boards of directors. The report was an effort to examine the effect of district consolidation on the community and instructional programs. Although cost is normally at the forefront of consolidation efforts, this report began with a review of the educational programs. For the purposes of this study only the relevant demographic, educational, and financial research will be reviewed in this section.

Exeter Township School District included 4,322 total students in three elementary schools, one intermediate school, one junior high school, and one high school (Civic Research Alliance, 2013, p. 2). Antietam School District included 1,046 students in one primary center, one elementary center, and one middle/senior high school (Civic Research Alliance, 2013, p. 2). The overall combined projected enrollment of t consolidated district for the 2012-2013 school year was 5,220 students. This was a 3.4% increase from a combined enrollment for the 2002-2003 school year, but it had declined over the previous four years (Civic Research Alliance, 2013, p. 11). The total students enrolled in grades 9 through 12 in a combined district would have been 1,691 in 2012-2013. The projected enrollment for the 2017-2018 school year for a combined district was 5,034 students, with 1,632 in grades 9-12 (Civic Research Alliance, 2013, p. 13). The total number of students in the combined district is not consistent with Duncombe and Yinger's (2005) estimate of the ideal size of a school district to fully achieve economies of size.

The feasibility study for Antietam and Exeter Townships reviewed academic course offerings for a consolidated school district. It also reviewed current academic programs offered by the two districts. There were five main areas of academic/co-curricular focus areas for the feasibility study. These areas included:

- preserving or expanding student choice and course options
- structured and highly prescriptive core programs
- student flexibility
- support for vocational programs
- impact of cyber programs (Civic Research Alliance, 2013, p. 35)

For the purpose of this dissertation, high-school academic program information, sports, and clubs will be reviewed. The feasibility study found that both schools offered a wide range of academic programs to students.

While there is evidence to support more overall offerings at Exeter School District, Antietam School District offers a comparable number of Advanced Placement and honors courses in the core areas. Table 1 highlights the four core content-area offerings of both schools. Exeter Township offered 13 Advanced Placement (including Computer Science) courses compared to eight for Antietam (Civic Research Alliance, 2013, p. 51). A combined school district would have resulted in nine additional Advanced Placement opportunities for students from Antietam and two for students from Exeter. In addition, both schools offered a diverse selection of elective courses. However, a combined school district would offer an additional 39 academic courses.

Table 1

Course Comparisons Between Districts

Content Area	Exeter Township SD	Antietam SD
English	Total-26 AP-2 H-4	Total-33 AP-1 H-3
Math	Total-29 AP-2 H-6	Total-20 AP-2 H-3
Science	Total-30 AP-3 H-6	Total-23 AP-2 H-6
Social Studies	Total-17 AP-4 H-6	Total-15 AP-4 H-6

(Civic Research Alliance, 2013, pp.36-50)

The feasibility study also examined other "academic" impacts and considerations such as the schedule(s) of each school, the graduation requirements, the GPA calculations, grade scales, and promotion rates. All the above factors are important for consideration, but not relevant to the focus of this dissertation.

In examining the co-curricular activities, the feasibility study found that Exeter Township clearly offered more clubs and activities, while the athletic numbers are similar. Exeter offered 26 total sports compared to 23 for Antietam. The number of clubs and activities offered at Exeter was 37 and 21 for Antietam. The feasibility study concluded that new ideas and diversity would positively impact Exeter Township students and more opportunities for Antietam students would be the overall academic and co-curricular results of a combined district (Civic Research Alliance, 2013, p. 65). A limitation of this feasibility study is the lack of information regarding enrollment numbers for courses, sports, and clubs. This makes it difficult to fully gauge the number of students currently accessing the opportunities available to them.

The main goal of the feasibility study of a proposed merger of Fayette County school districts was to examine the financial impact of consolidating them. While the overall findings of the study are similar to those of Exeter Township/Antietam, this study was unique as the resulting merger would not combine any high schools, keeping the current six high schools intact. The feasibility study examined finances, enrollment, facilities, curriculum, special education, transportation, and food services. For the purpose of this dissertation, only the enrollment figures (for an analysis and perspective of size) and curriculum will be reviewed.

The Fayette County feasibility study only examined total current enrollment for the school districts and broke down the enrollment data by grade level for the combined analysis. The projected total enrollment for a combined school district (grades 9-12) was 5,500 students for the 2010-2011 school year and 4,960 students for the 2019-2020. This represents about a 9.5% decrease in student enrollment over 10 years. The study concluded that this would result in financial savings from a decrease in staff and fewer facilities to maintain (Education Management Group, 2011, p. 45).

As mentioned above, the proposed merger in Fayette County would not result in combining high schools. The educational opportunity impact for the high schools in Fayette County was much less than other proposed mergers which combine high schools. To highlight this result, the study states that it “does not deal with planned courses currently offered and only discusses graduation requirements” as a main educational impact of a merger (Education Management Group, 2011, p. 88).

While both feasibility studies examining the proposed mergers of Fayette County and Antietam and Exeter Township school districts had at least a partial focus on curriculum impacts, the Bloomsburg/Central Columbia study sought to review the financial impact upon the districts considering merging, particularly at the middle- and high-school levels. The main focus of the study was to devise options for each school district with respect to renovation projects that were on the horizon and the impact they would have financially on the taxpayers in each district. Bloomsburg School Board President David Klingerman (2014) indicated that in 2010 and 2011 major flooding caused substantial damage to the facilities such as the football field, locker rooms, the basement of the high school, and major parts of the middle school. This was the third time in in the previous five years the school district saw major flooding. Therefore, Bloomsburg was in the market to seek options for renovations, building new facilities, or face higher insurance payments. At the same time, Central Columbia was about to undertake a $30 million renovation on the high school. The two school board presidents got together to revisit the issues and discuss them with the superintendents. According to Klingerman (2014), these factors pushed the school boards of each district to study the impact of a possible merger. He said, “Neither district was in any financial trouble, yet at the time Bloomsburg had a unique situation and would not have entered into this study except for the recent flooding” (D. Klingerman, personal communication, June 12, 2014).

The feasibility study was undertaken as a way to examine whether a merger of the school districts would save money. As mentioned throughout this chapter, the cost-benefit analysis is broad and well documented. However, the feasibility study for the Bloomsburg/Central Columbia merger did not look at curriculum and educational opportunities. Klingerman stated, “they felt Bloomsburg needed to prove that financial make any sense before you looked at any curriculum issues” (D. Klingerman, personal communication, June 12, 2014).

A planned second phase of the study was voted down by both school boards after the initial study showed that the financial numbers did not favor merging the districts. The Bloomsburg School Board voted 7-2, and the Central Columbia School Board voted 8-1 not to continue the study to phase two (Klingerman, 2014). The decision was made strictly from a financial perspective. Both school districts could not show that taxpayers would save in the short or long term. As Klingerman said:

> Bloomsburg just spent about ten million on major renovations that would be wasted. In addition, the merged high school would be at Central and the building is in need of major repairs that would result in millions worth repair. But the biggest issue was the teacher contracts. (D. Klingerman, personal communication, June 12, 2014)

According to Pennsylvania law, merging districts must take the best part of the contracts on both parties in relation to salaries and benefits. Klingerman specified that Bloomsburg had really good health benefits, but the pay scales were not comparable. Central Columbia had an excellent pay scale but a less generous health benefits package. The merged districts’ teacher contract would include Central Columbia’s pay scale and Bloomsburg’s health benefits. Therefore, this feasibility study does not provide a basis for review of educational opportunities offered by school districts of different size. However, as the school board president, Klingerman said that “he felt in his opinion high schools are five miles apart and one community that is split and this would bring the entire community and resources together, provide one mission for the greater good of the entire community” (D. Klingerman, personal communication, June 12, 2014). He also felt students at a larger school would have more opportunities at the advanced placement and honors levels and that specialty elective courses as well as additional activities could be offered to students. The Bloomsburg/Central Columbia report never fully reviewed academic programs as the school boards decided against continuing the feasibility study after the initial financial review came up short of expectations.

Of the data reviewed in the Bloomsburg/Central Columbia study worth noting for this dissertation are the projected enrollment numbers for a combined school district and more specifically a combined high school. Based on the feasibility study, a full merger would have resulted in a district with approximately 3,500 students in the 2015-2016 school year (Civic Research Alliance, 2012). As mentioned above, this total student enrollment number is consistent with the findings of Duncombe and Yinger (2005) for the ideal size of a school district. A merged high school would have resulted in about 1,100 students in the 2014-2015 school year (Civic Research Alliance, 2012).

High School Size in Pennsylvania

Recently, the Pennsylvania School Boards Association (PSBA) Education Research and Policy Center (ERPC) stated:

> While there is ample advocacy based and research based grounded literature addressing the question of appropriate school size for elementary and secondary schools, it seems unfortunately there are no definitive studies indicating exactly how large or small a school building should be in order to most appropriately meet the needs of all students. (PSBA, 2011, p. 1)

This was part of an extensive effort in Pennsylvania to examine the relationship of high school size to numerous factors including finances, achievement, educational opportunities, and overall student impacts.

As with much of the research already discussed, PSBA (2011) outlined both positive and negative findings for both large and small schools. Some potential benefits to large schools include the “availability of diversified curriculum in large learning settings and the overall quality of programming” (PSBA, 2011 p. 1). However, large schools can contribute to depersonalization, negatives, alienation, and ultimately truancy and dropout rates. In addition, the PSBA found more disciplinary incidents, violence, and bullying in large schools. They cite Shapiro (2009) as finding only 12% of students in large high schools take advantage of the specialized courses associated with larger schools.

The preponderance of research generally states that smaller schools have better performance, attendance rates, test scores, extracurricular participation, and graduation rates (PSBA, 2011). In addition, smaller schools have better parent participation rate and have been seen to close the achievement gap for minority students in urban settings. Once again, PSBA (2011) cited several studies listing the negative aspects of small schools including Black (2006), who found schools can be too small to offer adequate curriculum and instruction. Also, PSBA (2011) cited Tajalli and Opheim (2005), who found size has no effect on performance.

According to the National Center for Educational Statistics (NCES) in 2010, the average size of high schools across the country was 875 students. In Pennsylvania, the average high school size was 816 (NCES, 2011). High-school size in Pennsylvania is comparable to the average size in the rest of the United States. A fundamental question is how to define a small or large school by enrollment. Most research suggests that small schools enroll roughly 600 and 900 students, and large schools more than 900 (Lay, 2007; Lindahl & Cain, 2012; PSBA, 2011). In 2009, PSBA conducted a review of the size of high schools in Pennsylvania and their Annual Yearly Progress (AYP) status. AYP reports the performance of schools and districts in status levels that depend on the school's or district's performance in recent years (PSBA, 2011 p. 12). AYP is measured through a school's proficiency on the PSSA for reading and math. AYP is no longer used for performance indicators in Pennsylvania as that accountability measure has been replaced with the School Performance Profile (SPP).

Of the 10 largest high schools in Pennsylvania, only one made AYP (PSBA, 2009). In fact, seven of the schools were in *Corrective Action II*, one was *Making Progress*, and two were on *Warning*. PSBA (2009) also found that of the 10 smallest high schools in Pennsylvania, all but two of them made AYP. The other two high schools were on warning. However, it is difficult to evaluate the current research due to the variance in definition of small, medium, and large.

High School Size Nationally

The concept of larger schools providing additional benefits is not a new in the 21st century. Cubberley (1922) indicated that large schools would require fewer administrators, offer specialized instruction by grades, and provide better facilities at a lower cost. School reform advocate James Conant was viewed in the mid-1900s as a proponent of larger high schools. Conant (1959) found that large schools offer more robust educational opportunities for students. However, Conant believed the ideal size of a grade in high school should be 100. Today, this is not seen as a large enrollment number, but Tenant's researched was based mostly on rural education in the early 1900s. Therefore, schools of 400 students were generally viewed as large during Conant's time.

Economies of scale are more likely to be achieved at larger schools. A larger facility should result in reduced costs per-pupil and construction costs as opposed to building and maintaining smaller facilities (PSBA, 2011). Research confirms the difficulty in accurately addressing the cost factors within schools (Azari-Rad, Hamid, Philips, & Prus, 2002; Howley, 2008; Duke, DeRoberto, & Trautvetter, 2009). Azari-Rad, Hamid, Philips, and Prus (2002) reviewed construction costs for new schools in the 1990s. Their study examined the cost of construction for new schools from 1992-1999 across the country using the F. W. Dodge data on acceptable bid pricing for public and private schools. They found that constructing multiple smaller buildings instead of building one larger structure would increase costs by 4.7%. In addition, Duke, DeRoberto, and Trautvetter (2009) examined cost related to size utilizing a different method. As opposed to the traditional look at per-pupil costs, they studied per-graduate costs, conducting a meta-analysis of current and past research looking at cost factors. Through this lens, they found although small schools have a slightly higher cost per pupil compared to large schools, small schools showed an overall cost effectiveness due to the greater percentage of on-time graduates. However, Howley (2008) also examined construction costs for schools similar to those in the study by Azari-Rad, Hamid, Philips, and Prus (2002), but with an additional data set. His study reviewed the costs by constructing and analyzing data from the Common Core Data (CCD) and a national data set of new school construction projects from 1989 through 2003. He found little difference in the overall cost of building and operating a large versus a small school. In fact, he found no difference in the costs for buildings with 138-600 students compared to buildings with 601-999 students.

The debate surrounding school size really began to take shape following Tenant’s work. Many scholars began looking into how school size affects many educational factors. Barker and Gump (1964) looked at larger schools and whether they indeed showed an increase in student participation and activities. They found that a 20-fold increase in size produced only a 5-fold increase in opportunities.

School size research can be categorized for evaluation and analysis. For the purposes of this study, Gregory's (2000) classification of school size research will be utilized. The research will be reviewed through four distinct categories. These categories are sociological studies, input studies, process studies, and output studies (Gregory, 2000). He describes sociological studies relating to those early school reform efforts discussed earlier in this dissertation. Earlier in Chapter II, the history of school reform, high school size, and consolidation were reviewed and would be categorized by Gregory (2000) as sociological studies. Input studies evaluate the costs associated with school size. Previously in Chapter II, input studies involving West Virginia and New York were reviewed. Process studies include all the factors that evaluate what is actually happening in a school, such as the curriculum, course offerings, school culture, and instructional practices, among other aspects. Output studies review the relationship of school size and student achievement. Using Gregory's (2000) classifications, this study is considered a process study.

Process study research states that several factors impact achievement and outcomes for students (Keng & Dodd, 2008; Lay, 2007; Leithwood & Jantzi, 2009; Monk & Haller, 1993). Leithwood and Jantzi (2009) conducted a meta-analysis of 18 studies reviewing the effects of high school size on numerous factors. Using the ERIC database, they initially reviewed 280 studies. Through a series of three filters--published refereed journals, original evidence, or explicit descriptions of research methodology—they analyzed 57 pieces of literature that were published after 1990, 38 of them from the United States. Of these 57 studies, 40 dealt with secondary schools. Their study examined several areas related to school size:

- Student Achievement
- Equitable Distribution of Learning

- Attendance, Truancy, and Retention
- Participation, Identification, and Connection with School
- Course-Taking Patterns
- Extracurricular Activities
- Student Attitudes and About Self and Others
- Physical Safety, Health, and Well Being
- Social Behaviors
- Costs and Cost Efficiency
- Teacher Turnover
- Teacher Attrition (Leithwood & Jantzi, 2009)

Leithwood and Jantzi (2009) found the following overall benefits to large (over 800 students) high schools:

- Variety of classes
- Specialization of teachers
- Greater likelihood of drawing a diverse population
- More stimulating classes
- Less stereotyping of students
- Greater opportunities for students to develop social relationships

They also concluded that small high schools offer the following overall benefits:

- Faculty and staff know students well
- Faculty take greater responsibilities for student learning
- Connections between students and the community increase

- Teaching strategies are better
- Monitoring and supervision are less necessary (Leithwood & Jantzi, 2009)

For the purposes of this dissertation, participation, course enrollments, and extracurricular activities will be the focus. In addition, as this is a meta-analysis, many of the studies will be examined in further detail later in this section.

To further examine the in-school factors or process differences in high school size, Leithwood and Jantzi (2009) examined the enrollments of students through a review of several studies. Leithwood and Jantzi (2009) cited the work of Monk and Haller (1993), Lee and Smith (1995), and Alexander (2002). Both Leithwood and Jantzi (2009) and Monk and Haller (1993) found that large schools offer a greater number of course credits for students. However, Leithwood and Jantzi (2009) cited Lee and Smith's 1995 study that indicated smaller schools with a more limited variety of courses with higher standards achieve better outcomes (p. 476). As with much of the research surrounding school size, the results are mixed in reference to course offerings. Leithwood and Jantzi concluded that large schools may in fact offer more courses; however, this is not always the case and even some small schools offer comparable curricula.

Although research examining school size and extracurricular activities exists, Leithwood and Jantzi (2009) reviewed only four such studies. They indicated that a lack of recent literature in this area is a limitation to the robustness of the data. They cited the work of Coladacci and Cobb (1996), McNeal (1999), and Feldman and Matjeasko (2007) as indicating a strong relationship between school size and extracurricular participation. Each of the studies examined shows that smaller schools have a higher rate of participation than larger schools.

Socioeconomic Status

NCES (2014) broadly defines SES as "one's access to financial, social, cultural, and human capital resources" (p. 4). Student outcomes are consistently linked to SES indicators (Tajalli and Opheim, 2004). The majority of the research conducted using SES has included as components parental educational attainment, parental occupational status, and household income. SES is utilized in educational research in large part because students from economically disadvantaged backgrounds tend to do poorly in school compared to those from higher socioeconomic backgrounds (Sirin, 2005). The National School Lunch Program (NSLP) measure for free or reduced price lunch is the most commonly used indicator for SES in educational research (NCES, 2014). However, there has been a recent call to expand the measure of SES for students to include neighborhood and school resources (NCES, 2014).

SES has played a prominent role in educational research and its effect on student achievement since the early 1900s (NCES, 2014). The National Assessment of Educational Progress (NAEP) uses five variables to report on SES. These variables are race, ethnicity, SES, gender, and disability and English Language Learners (ELL). However, there is no defined mandate on the measures researchers should utilize (NCES, 2014). The most readily available and attainable measure to access SES is through the NSLP. The NSLP indicators for free or reduced price lunch is the most widely used and accepted measure for educational researchers (NCES, 2014). Eligibility in the NSLP is widely accepted to be an indicator of low-income. However, researchers are continually looking for improved measures for identifying poverty (NCES, 2014).

For various reasons, SES has traditionally been used as a factor for correlation with achievement. The current literature on SES and student outcomes revolves around student achievement and the use of free or reduced price lunch (Tajalli & Opheim, 2004). Sirin (2005) conducted a meta-analysis of the literature examining SES and student achievement from 1990-2000. This analysis consisted of over 100,000 students in over 6,800 schools. Sirin utilized studies that met a list of criteria for examining SES. For a study to be included in the meta-analysis the research had to:

1. apply a measure to SES and student achievement;
2. report quantitative data and detail the correlation between SES and achievement;
3. include students from grades K-12;
4. have been published in a professional journal between 1990 and 2000; and
5. include students from the United States.

After the studies were identified, Sirin performed a coding procedure developed for meta-analysis by Stock et al. (1982). This procedure used six components including identification, school setting, student characteristics, methodology, SES and student achievement, and the effect size. In addition, the meta-analysis needed to account for the various SES measures used in the initial studies. SES was determined in several distinct ways, among them parental education, parental occupation, parental income, and eligibility for free or reduced lunch. Finally, the variable for student achievement needed to be categorized. Achievement was categorized into several components that included math, verbal, science, and general achievement measures.

A Pearson's correlation coefficient was utilized to determine effect size, and Sirin (2005) performed a "shifting unit of analysis to avoid any violations of statistical independence (p. 423)." One correlation was selected from each independent sample unless there were multiple correlations conducted in the study. At that point, the correlations were averaged so the sample contributed only one correlation to the overall analysis. In addition, Sirin utilized a variety of statistical tests on the data collected including a chi-square test for homogeneity, an ANOVA regression procedure, and a measure to account for publication bias.

Sirin (2005) indicated several key findings that are important to this dissertation. When assessing SES as a variable, parental education was the most commonly used SES measure with free or reduced price lunch eligibility the least common. Sirin's research found a medium level of association between SES and academic achievement (p. 438). Of all the factors examined, Sirin (2005) found that school SES is the strongest relationship with student success and family SES the second strongest. In other words, a "student's location in the socioeconomic structure has a strong impact on students' academic achievement (p. 438)." Family and school SES can help develop a student's ability to perform academically (Sirin, 2005). Sirin's work can be combined with recent research to indicate that the relationship between SES and achievement may exist due to cognitive environment, and exposure to a cognitively challenging home environment may prepare students better for the challenges of school (Tucker-Drob & Harden, 2012). The family or school SES determined by a child's neighborhood and school will affect his or her home life as well as help to foster social norms which are important factors for success in school (Sirin, 2005).

Another study examining socioeconomic status and student achievement was conducted by Tajalli and Opheim in 2004. They collected data on school finances, students, and school characteristics from over 7,600 public schools in Texas. Through their screening process, they ended with 532 cases for 4th grade, 198 for 8th grade, and 97 for 10th grade. They used the Texas Assessment of Academic Skills (TAAS) for 4th, 8th, and 10th grade students. These results were used as the dependent variables. Fourteen independent variables were used. The consisted of size, operating expenditure per pupil, teacher-student ratio, average teacher base salary, average teacher years of experience, percentages of students economically disadvantaged, white students, and expenditures on regular programs, bilingual programs, compensatory programs, gifted students, career and technology programs, instruction, and instructional leadership. Tajalli and Opheim conducted forward logistic regression on the dependent and independent variables. Their research indicated that school size effects depend on the SES of students (p. 45). They found that measures of SES were significantly affected by the proportion of economically disadvantaged students. Tajalli and Opheim (2004) also found that the relationship between achievement and SES was weaker in smaller schools than in larger schools. Students in impoverished areas were more likely to succeed in smaller schools. This aligns with other research in the field which found achievement increases for students in large, affluent schools (Lee & Smith, 1996).

There are number of concerns with using free or reduced price lunch indicators alone in research involving students. Educational researchers are examining ways of identifying a more comprehensive approach to measuring SES. There is an innate difficulty in identifying new measures of SES partly due to the popularity of using the NSLP measures. This measure is widely accepted, easy to collect, and there are years of comparable data sets of the years (NCES, 2014). First, the use of free or reduced lunch for high-school students has been shown to indicate a substantially lower percentage of economically disadvantaged students than is actually present in a school. Free or reduced price lunch percentages will be underreported in most high schools because it is self-identified, and students in high school are less likely to identify themselves than students in lower grades (Lindahl & Cain, 2012; NCES, 2014). Second, NSLP uses only one measure for SES: family income (NCES, 2014). Sirin (2005) also pointed out the difficult and complex issue surrounding SES research in education and recommends a more comprehensive look at SES.

In 2003, a panel of experts in the fields of economics, statistics, human development, and sociology proposed a way for the National Assessment Governing Board (NAGB) to improve the measure and use of SES. This panel examined SES methodologies and use of SES in educational research. It concluded that there needs to be an improved measure for SES that involves multiple factors (NCES, 2014). NCES indicated that these improved measures of SES should include school factors as well as individual factors such as measures of the NSLP. The use of school/community economic data would be inclusive of such a measure. Dincombe and Yinger's (2005) use of a state's aid ratio constitutes such a newly defined measure.

Academic Opportunities

The relationship school size has with curricular offerings continues to be an important topic in education. Monk and Haller (1993) discuss the importance of this topic as it relates to equity for students regardless of their SES, location, or school size. They frame this research topic by defining the supply side of course offerings as impacted by specific variables including differences in the availability of teachers, ability of teachers, and class size. In addition, according to Monk and Haller (1993), contextual effects such as SES, setting of the school (urban/suburban/rural), grade configuration, and the presence of a teachers' union need to be examined.

Monk and Haller (1993) conducted a study reviewing contextual variables in relation to school size. They utilized the course and school files from the *High School and Beyond Survey of 1990.* The course file contains information related to course-specific information. Of the more than 1,000 high schools included in the survey, only 682 were actually included after private schools and schools without a 12^{th} grade were removed.

In categorizing the data collected, Monk and Haller (1993) factored in the aspect of unique scheduling features at high schools. High schools vary greatly in the number of class periods per day and the length of time each class meets. Courses can be offered by year, semester, trimester, or quarter. Monk and Haller added weighting based on the length of the course. In addition, no special education courses were used. For further classification and analysis, Monk and Haller examined the data by courses offered as academic versus vocational, size and number of offerings, and advanced versus remedial. The data included contextual variables such as SES, location setting (urban, suburban, rural), grade configuration, and unionization in the school.

From this study, Monk and Haller (1993) found some clear links between high school size and course offerings. They created four groups: course offerings, academic and vocational offerings, subject-specific analysis, and advanced/remedial offerings. When examining overall course offerings and high school size, they found some significant relationships in the contextual variables. A "clear positive relationship between size and the number of course credits" (p. 10) was established. When examining size, they created a cut-off point for size based on one standard deviation (SD) over the mean of all graduation classes reviewed. Based on this cut-off point, they found course offerings increased by 3.37 courses for every 10 students up to a 338 student threshold. After reaching 338 students, the increase in course offerings dropped to 2.13 new courses for every 10 students (p. 12). In addition, they found an even greater relationship between SES of the school and the number of courses offered. A one standard deviation increase on the SES scale resulted in 14.19 new courses (p. 12). Furthermore, when analyzing school location (urban, suburban, rural), they found some relationship with course offerings. In schools with over 338 graduating students, an increase in 10 students would result in 2.13 additional courses for suburban schools, 1.05 for urban, and no change for rural (p. 12). Finally, for overall course offerings, schools that had a union presence showed a negative effect on the relationship between size and offerings. For example, schools with over 338 graduating students with a union presence increased options by 1.5 courses for every 10 students. However, non-unionized schools increased course offerings by 2.13 for the same increase in students.

The second area of focus for Monk and Haller (1993) related to the academic versus vocational course offerings. They continued to use 338 students as the threshold number for evaluating size effects. They found that school size has a greater effect on vocational offerings than academic offerings. They found a tendency for vocational offerings to grow more quickly as school size increases compared to academic offerings. In addition, they found that SES has little or no effect on vocational course offerings, but there is a relationship between SES and academic offerings.

A third area of focus for Monk and Haller (1993) was academic subject-specific information. Using enrollment numbers to represent three different high-school size configurations of 25, 338, and 600, they examined the differences in core academic subject areas across the differing sizes. There were a couple of important findings from this analysis. There was a strong positive relationship between school size and unique course offerings in the areas of English and science. In the English and science subject areas, the numbers of unique course offerings grew as the size of the school increased. However, in math and social studies, the number of unique course offerings remained relatively constant as the size of the schools increased. The areas that saw the most significant differences in total numbers were world-language and performing-arts courses. Large schools offered more unique courses in these areas compared to small and medium size schools. As a result, there is a stronger positive relationship between school size when looking at world language and performing arts compared to math and social studies (Monk & Haller, 1993).

The final area of analysis undertaken by Monk and Haller (1993) examined the differences in academic versus remedial courses in relation to high school size. For their study, they classified advanced courses as AP, honors, and College Prep (CP). Remedial courses included basic, simplified, practical, and reduced-pace courses. The analysis indicated a positive relationship with school size in some academic departments. Regardless of the size of the school, social studies had the fewest advanced courses, while math/science represented the highest number of advanced courses as the size of the school increased. In addition, the analysis indicated that not only does school size impact advanced courses, SES, urbanization, and unionization do so in a similar manner.

Overall, Monk and Haller's (1993) work provides important information related to the relationship of high-school size and course offerings. They found that a clear link exists between school size and educational opportunities. Students in smaller schools receive fewer opportunities. However, this is not the case in all curriculum areas and can vary greatly depending upon other factors such as SES, location, and union presence. The uncertain conclusions reiterate the need for further, more current examination.

Advanced Placement Programs

One of the main purposes of this dissertation is to examine the benefits and drawbacks to a student's high-school education based on the size of the school. This section of the chapter describes several research studies highlighting a number of benefits to students who attend a school that offers a strong AP program or participate in it. High schools can offer a variety of higher or upper-level rigorous courses or programs. Through the AP program, students can be exposed to college-level curriculum while still in high school. The College Board Advanced Placement Program (AP) offers over 37 different courses for students. A student may also choose to take an end-of-course exam to earn college credit while still in high school. Students are scored on a 1-5 scale. Generally, students who receive a three on an AP exam will place out of an introductory or exploratory course in that subject. For the purposes of this dissertation and to examine the most widely offered level of advanced placement, the AP program will be examined. In 2005, the AP program had 1.2 million students enrolled taking, over two million exams (Keng & Dodd, 2008).

Dougherty, Mellor, and Jian (2005) conducted a study to examine the perceived benefit of AP programs. They examined the relationship between AP courses and college graduation, using data from over 54,000 eighth-grade students in Texas. They examined information from 1994 when the students were in 8^{th} grade, then again in 1998 when they graduated from high school, and again five years later in 2003, giving each student five years to graduate from college. Only students who graduated from a public college or university in the state of Texas were included. These data were analyzed through descriptive measures using mean and standard deviations. In addition, Dougherty, Mellor, and Jian conducted sum of squares regression analysis.

Dougherty, Mellor, and Jian’s (2005) data examined the AP exam scores in English, math, science, and social studies for those students enrolled in AP courses. These data were categorized into four areas: 1) students who took the course and passed the AP exam (scored 3 or higher), 2) students who took the course but did not pass the AP exam, 3) students who took the course but did not take the AP exam, and 4) students who did not take any AP course or exam. They found “that the percent of a school’s students who take and pass AP exams is the best AP-related indicator of whether the school is preparing increased percentages of its students to graduate from college. ” (Dougherty, Mellor, & Jian, 2005).

Building on the work of Dougherty, Mellor, and Jian (2005), Keng and Dodd (2008) examined the perceived benefits to students who enroll in AP programs. They conducted a study at the University of Texas at Austin that examined students with an AP background in high school and those with no AP background over the period of 1998-2001. The study reviewed the 10 most popular AP exams taken by incoming freshman classes. This consisted of over 5,000 students each year. The classes examined included Biology, Calculus AB, Calculus BC, Chemistry, Macroeconomics, English Language and Composition, English Literature and Composition, United States History, United States Government and Politics, and Spanish Language. The study also examined overall GPA, credit hours earned in that subject area, GPA in the subject area, and credit hours earned overall by the students. Finally, subsequent course grades for students were also examined.

Keng and Dodd (2008) incorporated a variety of data analysis procedures. For each of the AP courses, a MANOVA was used to detect overall differences in the means of the dependent variable across the comparison groups. If the MANOVA showed significant results, an ANOVA was run on each dependent variable to identify differences in the dependent variables. All 40 of the MANOVA runs yielded statistically significant differences in the means of the comparison groups ($p < 0.05$). The corresponding ANOVA runs produced several significant findings.

Consistent with the work of others (Casserly, 1988; Dodd, Fitzpatrick, Triscari, Mahoney, & Cope, 1988; Morgan & Crone, 1993; Morgan & Ramist, 1998), Keng and Dodd (2008) found that students who were exempt from a course based on their AP exam scores performed as well if not better in a subsequent course than students who took the pre-requisite college course. Furthermore, the results build upon the work of Morgan and Maneckshana (2000) who found that students earning high scores on the AP exams (4-5), had higher college GPA's than those who earned lower grades.

Keng and Dodd (2008) found that students who earned college credit through the AP exam consistently outperformed other students in college. These results are similar to the work of Doughty, Mellor, and Jian (2005). This is even more significant when examining grades related to the course where AP credit was given. This trend did level out for the lower achieving non-AP students who had lower high school ranks and lower SAT/ACT scores.

Dougherty, Mellor, & Jian's study produced several important findings. First, students who passed an AP exam had a 64% college graduation rate compared to a 42% college graduation rate for students who took the course but did not pass the AP exam and a 17% college graduation rate for students who did not take any AP course. In addition, Dougherty, Mellor, and Jian (2005) found that this increased percentage of college graduation remained constant among ethnicity subgroups. Furthermore, they found a 32% increase in the college graduation rate of low-income AP students over low-income non-AP students (Dougherty, Mellor, & Jian, 2005).

Dougherty, Mellor, and Jian (2005) concluded that the best indicator of success for schools preparing students for college is to increase the number of students taking AP courses and the AP exam. In addition, they recommend that school-district policymakers examine their

AP programs for quality instruction, but also students' preparedness for the program (Dougherty, Mellor, & Jian, 2005).

Although more highly motivated and better prepared students are more likely to choose AP courses (Doughty, Mellor, & Jian, 2005), the research is clear about the potential of the AP program. This is highlighted by Challenge Success (2013) assertion "that for certain students who would not otherwise have access to these kinds of college level courses, the AP program may be particularly beneficial." (p. 9)

Co-Curricular Activities in High Schools

In addition to advanced level course offerings, this dissertation used interscholastic athletics as the second independent variable. Like advanced level coursework, participation in athletics has also proven to be beneficial to students. Lay (2007) examined school size in relationship to adolescent participation in school and volunteering. The results indicated overall limited support for small schools. Lay also pointed to several benefits of large schools such as the ability to specialize, more extracurricular activities, and bulk purchases and decreased costs (Lay, 2007, p. 792). As previously stated, there is no consensus on ideal high-school size. Lay (2007) defined the ideal high school size as 300 to 400 total students compared to Lee and Smith's (1997) ideal size of 600 to 900.

For his study, Lay (2007) sought to answer four research questions:

- Do students in smaller schools participate in school activities and community service more than their counterparts in larger schools?
- What is the ideal size of a high school?
- What is the best range of student population for enhancing participation?
- Is size/participation contingent on parental income, race, and educational aspirations?

For the study, Lay (2007) used data from the National Household Education Survey (NHES), a 1999 telephone survey of parents and students on civic involvement. A parent and a student in grades 6-12 in each household were surveyed. However, only responses from students in grades 9-12 were used. A total of 3,010 responses were analyzed. Of those surveyed, 63% of the respondents were white, 16% were Black, and 17% were Latino. Lay utilized a bivariate analysis with a continuous variable divided into categories with increments of 300 students. Several key findings resulted from the research (Lay, 2007):

- Larger schools offer more opportunities to participate, but students in smaller schools are proportionally more likely to participate in activities.
- Smaller schools encourage more students to participate in activities.
- Poorer students in larger schools are slightly less likely to participate in activities, but there are no differences among white, black or Hispanic students in this same variable.
- While larger schools may provide more opportunities for participation, a greater proportion of students take advantage of the activities that are available to them in smaller schools.
- 75% of students in schools with fewer than 300 participate in some type of school-sponsored activity, 9% more than larger schools.
- Even when controlling for demographic factors that may contribute to one's participation, the likelihood of participate declines as school size grows.
- Large schools do not suppress participation, but students in schools with 1,501-1,800 students are significantly less likely to participate in school activities.
- Large schools do not suppress participation of racial minorities in school activities (Lay, 2007, p. 299).

Lay's (2007) findings are an important part of the literature surrounding school size and its effect on students. Overall, he found the size of the school clearly will influence the number of options for students and participation in those options.

Fredericks and Eccles (2006) conducted a study using longitudinal data from the Maryland Adolescent Development in Context Study. This study consisted of a diverse mix of demographic information from low- and high-income urban, suburban, and rural communities. It examined student data from 7th grade through one year after high school using both surveys and interviews. Fredericks and Eccles included an ANOVA in their analysis. They found that athletic participation leads to better and more efficient use of time and higher motivation to perform well in school as well as higher grades and educational attainment. Furthermore, they found a positive correlation between co-curricular activities and student achievement in adolescents. They suggested that students in high school who are active and participate in co-curricular activities are less likely to drop out and have lower rates of delinquency.

Their findings are consistent with the work of Taliaferro, Rienzo, and Donovan (2010) which examined a national data set from 1999, 2001, 2003, 2005, and 2007 from the National Youth Risk Behavior Survey. The survey monitored students in grades 9-12 and their health risk behaviors such as tobacco, alcohol, and other drug use, sexual behaviors, and acts of violence. More than 13,000 students completed the survey in each of the years examined. Students who participated in sports were significantly less likely to engage in risky behaviors.

In addition, other benefits have been found through participation in co-curricular activities. A study conducted by Darling, Caldwell, and Smith (2005) looked at longitudinal data collected from six high schools in California from 1987 to 1990. More than 2,000 students participated in the study. The students answered a questionnaire related to their behaviors. The researchers used a diverse demographic mix for participation and grouped the activities into four categories: sports, performing groups, leadership groups, and interest clubs. The used both descriptive and inferential analysis on the data collected. Their findings suggested a steady yet significant positive difference in marijuana use, grades, attitude towards school, and academic aspirations for those students who were actively engaged in co-curricular activities (Darling, Caldwell, & Smith, 2005). Their findings are consistent in indicating positive outcomes found by Frederick and Eccles (2006) and Taliaferro, Rienzo, and Donovan (2010).

The long-term benefits of participation in sports may be immeasurable. Carlson, Scott, Planty, and Thompson (2005) conducted a study that examined high school athletes and their outcomes over eight years after graduating high school. The authors used the National Educational Longitudinal Study of 1988. The study utilized both bivariate and multivariate regression analysis on the data collected. The findings suggest that high school athletes are more likely to earn a bachelor's degree and a higher income than high school non-athletes.

O'Bryan, Braddock, and Dawkins (2008) used the 2002 Educational Longitudinal Study data for their research. They examined the long-term effects of school based athletic participation and parental involvement. The survey utilized a two-step process. The initial survey in 2002 was completed by 15,362 high school 10th grade students. A follow-up in 2004 was completed for those students still attending the same high school. Multiple regression analysis of the data provided significant findings. A student's participation in sports, clubs, and the arts is often accompanied by increased parental involvement. In addition, this was especially the case for African-American males and their parents. This research helps build the case for the findings of Darling, Caldwell, and Smith (2005) which suggests that parental involvement is a key component in fostering academic success. Darling, Caldwell, and Smith (2005) indicate that it results in better decision making, better peer-group orientation, less drug use, and fewer acts of violence.

There is also evidence to support a link between extra-curricular activities in middle-school students and success in high school. Denault, Poulin, & Perdersen (2009) examined high school students who participated in athletics, the fine arts, and school-sponsored clubs. They studied 272 students and their parents starting in middle school (grade 6) and each subsequent year through grade 10. Their research utilized both descriptive and inferential measures. They found that participation in athletics and the fine arts in grades 7 and 8 is a predictor of student achievement in 9th and 10th grade.

Gaps in the Literature

This dissertation helps to fill the gap in specific research related to the relationship among high school size, socioeconomic status, and educational opportunities in Pennsylvania. There are numerous national and state studies examining the historical perspective on appropriate high school size. However, most of the research was conducted through surveys using large national databases. In addition, there are countless attempts to quantify the relationship between high-school size and student outcomes or achievement at both the national and state levels. Furthermore, there are numerous examinations of the costs associated with maintaining and operating schools based on size. Overall, these studies have produced mixed results when examining those relationships. Process studies examining the relationship of high school size and school effects are more limited. This dissertation's research on the educational opportunities for students based on high school size and SES and the actual information related to the number of students accessing those opportunities, on course offerings and participation rates based on school size and socioeconomic status, and on school size and extra-curricular activities will add to the body of research related to high-school size effects.

Summary

Throughout the history of the United States, the purpose and structure of schools have been debated. To provide context to this study, this chapter reviewed the purpose of schools along with the issue school consolidation from a national and state perspective. In addition, the independent (high school size, socioeconomic status) and dependent (AP courses, athletics) variables used in this study were reviewed in detail from both a national and state perspective. While the research does not definitively indicate the ideal size for a high school (Howley, 2008; Lay, 2007; Lindahl & Cain, 2012), the research of Leithwood and Jantzi (2009), Fredericks and Eccles (2006), and others indicates the benefits to students of participating in advanced coursework as well as co-curricular activities. Furthermore, the indicators for SES have been shown to be incomplete or misleading when examining SES for secondary students (NCES, 2004). Therefore, the need for a more comprehensive measure is needed. Chapter III presents the methodology used in this dissertation, including data sources, data-set preparation, data verification, and data analysis.

CHAPTER III

METHODOLOGY

Schools of varying size and socioeconomic status have proven to be beneficial for students, as have specific programs, curricula, and activities. The overall body of academic research is inconclusive regarding the relative benefits of large, medium, or small schools when looking at all aspects of student outcomes. The size and SES of a school on its students play vital roles. The purpose of this study was to determine whether there is a relationship between high-school size, SES, and educational opportunities (academics and athletics) for students. This chapter outlines the context of the study, the data sources, data preparation and verification procedures, and the analytic procedures utilized.

Context of the Study

This study included extant data of public high schools in Pennsylvania. There were 500 school districts in Pennsylvania and 601 traditional public high schools (students enrolled in grades 9-12) in the 2012-2013 school year (PDE, 2015b). All were eligible for this study. However, after removing those for which the data used in the study were incorrect or incomplete but which could not subsequently be verified, the final n = 473.

The purpose of this study was to examine, through an analysis of quantitative data, the relationship between the size of a high school and its socioeconomic conditions and the educational opportunities it offers. Data from private, charter, cyber, and full-time vocational schools were not used for this study. All data were considered public, and no individual student information was accessed. Data came from four sources. Three were open access or public through the Pennsylvania Department of Education (PDE): Total School Enrollment, Market Value/Personal Income Aid Ratio, and the Athletic Offerings. The PIMS course enrollment data file also contains public information, but it must be requested through PDE for use in research. The data were collected from each public school. However, they were filtered to exclude student information included in the initial data collection.

As mentioned by scholars studying school size, researchers must account for wealth and socioeconomic status in a district. In Pennsylvania, the Department of Education uses a number of calculations to determine the amount of financial aid or subsidies school districts will receive from the state government. The Market Value/Personal Income Aid Ratio (MV/PI AR) represents the relative wealth (market value and income), in relation to the state average, for each pupil in a school district. For example, Gettysburg Area School District and Littlestown Area School District are both located in Adams County. Gettysburg has a MV/PI AR of .3245, while Littlestown's is .5184. According to PDE, the lower the ratio, the wealthier the school district. MV/PI AR is calculated in accordance with Section 2501(14) and (14.1) of the school code (PDE, 2015c).

According to the PDE (2014), Market Value (MV) is the sales value of taxable real estate as certified by the State Tax Equalization Board. The 2011 market value was used in the calculation of the market value aid ratio for payable year 2013-2014. Personal Income (PI) is determined as taxable state income reported on the PA-40 income tax form from 2011, as certified from the Department of Revenue (PDE, 2015c).

This approach is consistent with the work of Duncombe and Yinger (2005) in factoring for SES. Free and reduced price lunch percentage was not used as an indicator in this dissertation. Following other research in this field, free and reduced price lunch numbers are reliant on each student's self-selection. Students in secondary schools may be less likely to participate. Lindahl and Cain (2012) found that, owing to social pressures, not all high school students indicate whether they qualify for such a service. Consistent with Duncombe and Yinger (2005), the use of MV/PI AR provides a clearer picture of the economic status of a school district.

Course offerings consist of various levels of courses that can be offered by a school. For the purposes of this study, data were collected on the honors and AP-level courses offered. The overall student enrollment numbers in these offerings were also collected. Using these data is consistent with the research linking positive outcomes to advanced level coursework by students. This information was collected through PIMS course data. The state of Pennsylvania collects enrollments in every course offered in all high schools each school year. A request for access to the information was made to PDE and granted.

Finally, information on interscholastic athletic offerings and participation by gender at every high school was collected and analyzed. These data can be found on the public website of PDE. According to Pennsylvania School Code (24 P.S. § 16-1601-C), all public schools must submit information for each school regarding interscholastic athletic opportunities offered and the enrollments in each sport. This does not include clubs or intramural activities. Although information regarding facilities, equipment, team enrollments, travel, and uniforms is also collected by PDE, this study only examined the offerings and enrollment figures.

Data Set Preparation

To facilitate statistical analysis, the four sources of data described above went through a sequence of data-set preparation procedures (Creswell, 2003). The state uses unique identifiers to identify school districts and individual schools. These include LEA Name, a nine-digit LEA number, school name, and four-digit school number in each of the data sets. In 2012-2013, there were 601 public high schools in Pennsylvania enrolling students in grades 9-12. Of the 601 high schools, 473 met the criteria for eligibility in this study. The data were merged using the unique identifiers. To ensure that the data collection was accurate and reliable, the LEA number and school number were used to sort the data and create a unique 13-digit code. In addition to the data-merge procedures, a series of steps to filter some of the data from the data set was required.

The Pennsylvania Department of Education (PDE also provided financial information from each school district, AP Course offerings and enrollment figures, Honors Course offerings and enrollment figures, and athletic (as defined by the PIAA) offerings and enrollment figures. The researcher used data available from the 2012-2013 school year as this was the most current year for all data sources.

The school-enrollment file contains enrollment data for all schools in Pennsylvania, including elementary, intermediate, and middle schools. Therefore, schools not enrolling students in grades 9-12 were removed. Second, all charter and cyber schools were removed. In addition, full-time career and technical high schools were removed from the data sets as each has its own set of operational procedures, structure, and enrollment. Some of these schools would be considered stand-alone schools, offering students all graduation credits, while others are part-time options, offering students only the technical courses the home school cannot deliver. Next, a list of all AP courses recognized by PDE was configured from the state's *2012/2013 PIMS Manual* (V1.0.1 V2 Release 5/21/2013). This manual consists of courses recognized by PDE. Honors-level courses were not verified in the same manner. PDE does not designate which courses will be considered honors. The decision to mark a course as honors is left to the Local Education Agency (LEA).

After the primary data were initially merged into an Access database (Figure 1), the researcher reviewed the data for errors, omissions, or irregularities. Finally, all the data were moved into an Excel spreadsheet with individual column headings. This was done through a line-item analysis of every school entry. This process yielded several areas in each data set that needed to be corrected or explored further. Every school identified through this line-item analysis was contacted via telephone or through email in an attempt to correct the data.

Data Verification Process

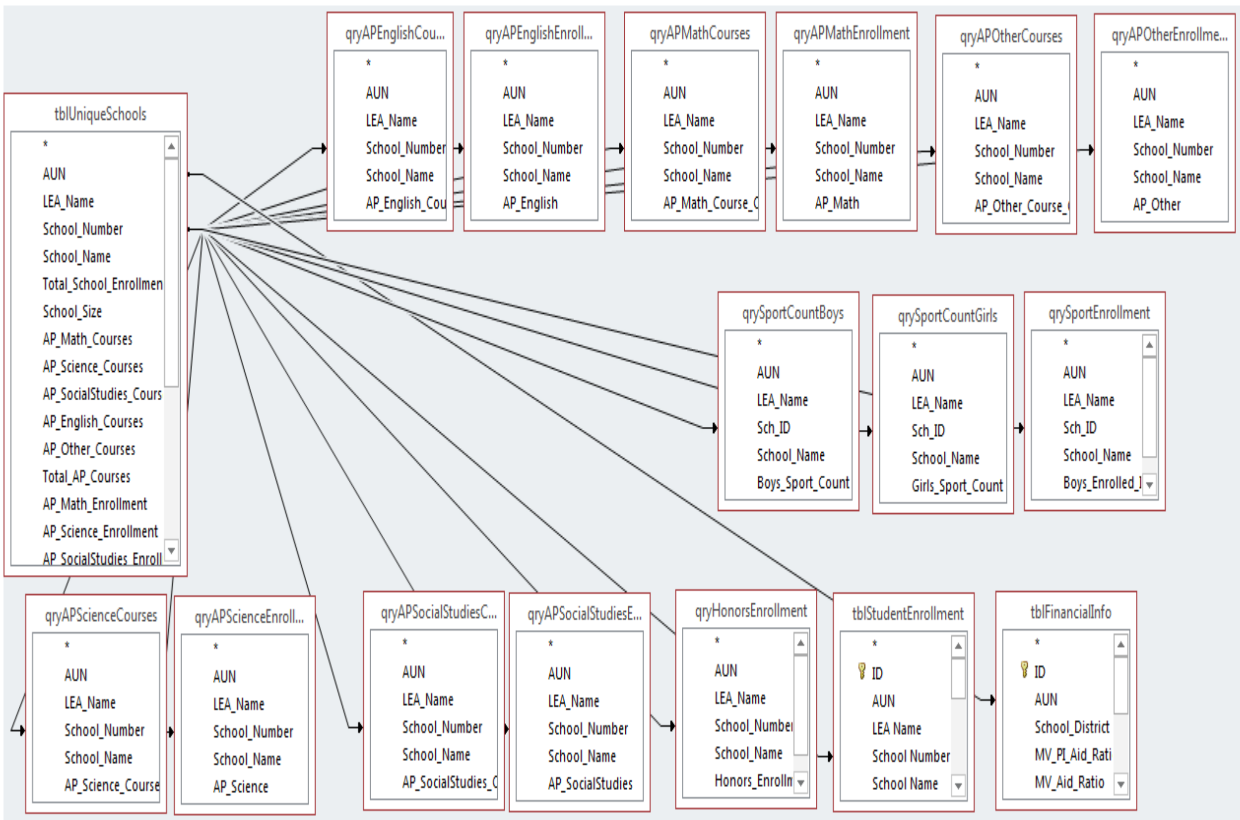

Figure 1. This figure displays the merging of initial data sources through a Microsoft Access Database.

During the data-set preparation procedures, the researcher identified missing or clearly inaccurate course data from schools. Upon receiving permission from the Indiana University of

Pennsylvania IRB, the researcher completed the procedures as outlined below. High-school principals were contacted to verify the accuracy of data using the following procedures:

1. The principal was contacted via email or telephone with a description of the nature of the research and the information requested.
    a. After seven days, if the principal did not respond, a second contact attempt was made. If after another seven days the principal did not respond, a third attempt at verification was made by the researcher. After three attempts, schools that could not be contacted were removed from the data set.
2. After the initial approval of the principal, the researcher sent a chart via email outlining the data in question.
3. The principal received instructions on how to fill out the form, a deadline for return, and a follow-up email address.
4. The principal then conducted a review of the data for two facets:
    a. Accuracy
    b. Absence or incompleteness.
5. Once the data were verified, completed, or deleted, the principal sent the revised chart back to the researcher.
6. The researcher made a follow-up email and phone call to the principal upon receipt of the data.

Although no personally identifiable information was collected during this study, there was always a potential for a breach of confidentiality. To guarantee confidentiality, all data verification information supplied by the principals was stored on a password-protected computer.

These data will be deleted after three years. Only the lead researcher had access to the information. Principals could decide to end their role in the data verification process at any time.

Seventy-one high school principals were contacted for this portion of the data verification. Of the 71 high-school principals initially contacted for verification of course enrollment discrepancies, eight verified or corrected the data for their schools during the first phase. A second contact of principals who had not responded was attempted on week after the initial attempt. The second contact yielded an additional six responses. A final attempt was made one week after the second. An additional three principals responded to the third contact. A total of 17 principals returned phone calls or emails in reference to the data verification, a 25% response rate. Once the data verification process was completed, those schools whose data sets could not be verified or completed were removed from the final count, resulting in an *N* of 473.

The data were merged again using an Access database, and the researcher did a secondary line-item analysis of all schools. Each school's information was merged into one row on an Excel spreadsheet. Each school's data were examined by row/column for irregularities. No further concerns with the data set were found during the secondary line-item analysis. The data were then exported to Software Package for Social Sciences (SPSS) V22 for final data analysis.

Data Analysis Procedures

Variables

This study was designed to examine several factors. The primary independent variables were the school enrollment or high-school size figures for students in grades 9-12, and the SES (Market Value/Personal Income Aid Ratio) indicator. Table 2 outlines the variables and research questions for the study. Twenty-four dependent variables were examined. The dependent variables consisted of all 34 possible AP courses offered in math, science, social studies, English, and other academic courses. In addition, a dependent variable for total honors courses offered by a school was included. Furthermore, the enrollment figures for those AP and honors courses were also considered dependent variables. Finally, the 19 sports for males and 18 for females recognized by the Pennsylvania Interscholastic Athletic Association (PIAA) were also included as dependent variables.

Table 2

Research Questions, Variables, and Extant Data Sources

Research Question(s)	Independent Variable(s)	Dependent Variable(s)	Data Source
1. What is the relationship between the size of a high school, the socioeconomic status, and the number of advanced educational opportunities offered to students?	School Enrollment Market Value/Personal Income Aid Ratio	AP Math Courses AP Science Courses AP English Courses AP Social Studies Courses AP Other Courses Total Honors Courses	MV/PI AR School Enrollment PIMS File
2. What is the relationship between the size of a high school, the socioeconomic status, and students enrolling in advanced educational opportunities in their school?	School Enrollment Market Value/Personal Income Aid Ratio	AP Math Enrollment AP Science Enrollment AP SS Enrollment AP English Enrollment AP Other Enrollment Honors Enrollment	MV/PI AR School Enrollment PIMS File
3. What is the relationship between the size of a high school, the socioeconomic status, and the number of athletic opportunities (official school sports) available to students?	School Enrollment Market Value/Personal Income Aid Ratio	Female 9th Athletics Female JV Athletics Female V Athletics Male 9th Athletics Male JV Athletics Male V Athletics	MV/PI AR School Enrollment Athletic PDE School Enrollment

Table 2 Continued

4. What is the relationship between the size of a high school, the socioeconomic status, and the number of students participating in athletic opportunities available in their school?	School Enrollment Market Value/Personal Income Aid Ratio	Female 9th Athletic Enrollment Female JV Athletic Enrollment Female V Athletic Enrollment Male 9th Athletic Enrollment Male JV Athletic Enrollment Male V Athletic Enrollment	MV/PI AR School Enrollment Athletic PDE School Enrollment

The Software Package for Social Sciences (SPSS) V22 was used to conduct all the measures of statistical analysis. Descriptive statistics including summary statistics for interval/ratio variables and frequency tables for nominal/categorical variables were conducted. Summary statistics included means, standard deviations, and 95% confidence intervals. In addition, bivariate correlations were computed for all interval/ratio independent and dependent variables.

Inferential statistics included regression analyses to determine the extent of the relationships between the independent (e.g., enrollment and SES status) and dependent (e.g., number of AP and honors courses) variables. Multinomial regression analysis was conducted for AP and honors course offerings with enrollment and SES. Linear regression analysis was conducted for enrollment per student in AP/honors courses as well as for the athletic offerings and enrollment. Prior to the regression analyses, Spearman's correlations (for interval/ratio variables) were applied. For significant overall regression analyses, the t-test results for the model predictors were examined to determine significant predictors for each of the regression models.

All statistical analyses were tabulated and are presented in Chapter IV. A detailed discussion of each of the tables and the corresponding research questions is provided in Chapter V. Each of the research questions was addressed with multiple regression analysis. A significant regression model describes the relationship between a research question's dependent and independent variables, with beta coefficients indicating the strength and direction for the significant predictors in the model equation. The equation helps to identify the relationship between the variables. Overall model fit, generalizability, and to detect outliers and other influential cases was done through the regression diagnostics (Field, 2009).

Summary

The purpose of this study was to determine whether there is a relationship between high-school size, SES, and educational opportunities (academics and athletics) for students. This chapter outlined the methodology used to examine the relationship between high-school size and educational opportunities for students. The size and SES of the school have a major impact on its students. Extant data of 473 public high schools in Pennsylvania retrieved from PDE were utilized for analysis. This chapter outlined the context of the study, the data-set preparation, the data verification process, and the variables utilized. The dependent variables were academic and athletic offerings and student participation in those offerings. The independent variables were total school enrollment and the MV PI/AR. In addition, the data-analysis procedures employed were presented. Descriptive, summary, and inferential statistics were conducted. Data were collected from a variety of sources, verified, and imported into SPSS for the descriptive and inferential analysis. The results of the data analysis are presented by research question in Chapter IV.

CHAPTER IV

RESULTS OF THE DATA ANALYSIS

As educational leaders and policy makers debate reform measures designed to provide equal educational opportunities and outcomes for all, the current status of these opportunities needs to be addressed. This study was designed to study the relationship between high-school size, socioeconomic status (SES), and educational opportunities (both academic and athletic) for students. Schools of varying size have proven to provide students with varying benefits. In addition, SES is a factor in educational opportunities and outcomes (NCES, 2014). The size of the school and its economic circumstances play a vital role on the experiences students receive. Chapter I outlined the context of the study while identifying the complexities surrounding both high-school size and SES. Chapter II detailed the theoretical framework associated with the purpose of schools, the structure of school buildings, and size from both a historical perspective and a detailed analysis of current research. Chapter III presented a description of the design of the study, data collection, and data-analysis procedures. This chapter compares the financial characteristics of the 473 high schools examined in this study and analyzes the results, tabulated and summarized to address the research questions.

Comparisons of Pennsylvania Public High Schools

School Building Configuration

The descriptive statistics of the high schools in this study provide a profile of the schools. Table 3 illustrates the classifications used in the data analysis. School buildings in Pennsylvania are configured in different ways depending on the grade levels of the students they service. The building configurations of the high schools were divided into seven classifications. The configuration accounts for the actual grade levels housed in one building or one campus, as illustrated in Table 3. Of the seven distinct classifications, high schools with students in grades 9-12 (*n*=364, 77%) was the most common. Combined junior/senior high schools with students in grades 7-12 was the second most common configuration (*n*=82, 17%). Interestingly, one school still operates as a K-12 building.

Table 3

School Building Grade Classifications

Classification	Frequency	Relative Percent
HS Grades 8th -12th Grade	2	0.4
HS Grades 9th -12th Grade	364	77.0
HS Grades 10th -12th Grade	9	1.9
HS Grades 11th -12th Grade	2	0.4
Junior/Senior HS 7th -12th Grade	82	17.3
Junior/Senior HS 6th -12th Grade	13	2.7
Kindergarten -12th Grade	1	0.2
Total	473	100

In addition to schools in Pennsylvania being classified by grade level, they are also grouped by enrollment category. Table 4 presents the categories of schools in Pennsylvania. This study used the Lindahl and Cain's (2012) four categories to categorize high schools based on enrollment of students in grades 9-12. Their categories included small, medium-small, medium-large, and large. The largest number of schools was in the small-medium range (*n*=154, 33%), which enroll 401-799 students. Of interest, over half of the schools enrolled fewer than 800 students.

Table 4

Student Enrollment Categories

Enrollment	Category	Frequency	Relative Percent
Over 1,600 Students	Large	57	12
800-1,599 Students	Medium-Large	145	31
401-799 Students	Small-Medium	154	33
400 or Fewer Students	Small	117	25

N=473.

Grade Level Enrollments

There is a large size disparity among high schools in Pennsylvania. The number of students attending various schools across the Commonwealth differs considerably. Table 5 presents the summary results of the student-enrollment information for the high schools in this study. Grade-level enrollment by gender is presented in Table 5. The average high school enrolled 847 students in grades 9-12 in the 2012-2013 school year. The smallest school in Pennsylvania consisted of 91 students, while the largest had 3,244 students.

Table 5

Grade Level Enrollment by Gender

Gender and Grade Level	Mean	SD	Minimum	Maximum
Female Enrollment Grade 9	101	76.26	0*	424
Male Enrollment Grade 9	109	81.10	0*	500
Female Enrollment Grade 10	107	80.47	0*	624
Male Enrollment Grade 10	113	86.56	0*	810
Female Enrollment Grade 11	106	78.14	11	483
Male Enrollment Grade 11	112	81.14	14	501
Female Enrollment Grade 12	106	78.63	13	521
Male Enrollment Grade 12	111	82.26	13	532
Total Enrollment Grades 9-12	847	593.83	91	3244

N=473; * Many high schools do not have 9^{th}- or 10^{th}-grade students.

School District Financial Characteristics

The financial data collected for the purposes of examining SES for each school is presented in Table 6. Similar to size disparity, Pennsylvania has a wide range of school districts as determined by wealth indicators. MV/PI Aid Ratio represents the percentage of aid a given school district receives from the state. A value near one indicates the greatest amount of aid for a district, while a value near zero indicates the least. The average MV/PI AR was .56. The highest ratio for a district was .886, and the lowest was .150.

Market Value (MV) indicates the sales value of all taxable income in a district. The average MV was $1,512,091,668, with the highest district value $46,460,204,455 and the lowest

$91,101,487. Personal Income (PI) represents the taxable income found on the PA-40 income tax form. The average PI for school districts was $590,111,662, with the highest $2,103,916,130 and the lowest $46,760,502. Weighted Average Daily Membership (WADM) is used in combination with the MV/PI AR to determine the enrollment and aid. The average WADM for school districts was 23,932, with the highest value 238,207 and the lowest 434.

Table 6

School District Socioeconomic Status Descriptive Results

Description of Variable	Mean	SD	Minimum	Maximum
MV/PI Aid Ratio	.56	.172	.150	.886
Market Value	$1,512,091,668	2622410074	$91,101,487	$46,460,204,455
Personal Income	$590,111,662	117617780	$46,760,502	$2,103,916,130
WADM	23,932	10805	434	238,207

N=473. MV/PI Aid Ratio is the calculation PDE uses to determine the percentage of state aid provided to school districts based on market value of properties and taxable income from the PA-40 income tax return of individuals in the community; WADM = Calculated by weighting half-time kindergarten Average Daily Membership (ADM) at 0.5, full-time kindergarten and elementary ADM at 1.0, and secondary ADM at 1.36. The 2011-2012 WADM is used in the calculation of the aid ratios for payable year 2013-2014 (PDE, 2015c).

When examining SES and the four size classifications through descriptive analysis, a distinct pattern developed. Table 7 presents the information for size and SES comparison. As the size of the school decreases, the MV/PI AR increases. Generally speaking, small schools in Pennsylvania have a lower SES than larger schools. Schools in the small-school classification had an average MV/PI AR of .667 compared to .450 for larger schools.

Table 7

Socioeconomic Status With Size Classification Comparison

	Large (*n*=57)		Medium-Large (*n*=145)		Medium-Small (*n*=154)		Small (*n*=117)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
MV/PI AR	.450	.19	.488	.18	.596	.141	.667	.11

Data Analysis by Research Question

Each research question was examined through multiple measures. Descriptive and summary analyses were first conducted, followed by inferential analysis for each research question. The data analysis involved performing correlations between the dependent (i.e., AP courses, honors courses, and athletic offerings) and independent (i.e., total enrollment, MV/PI AR) variables used in this study. Spearman correlations were utilized for this dissertation as the data were found to not follow a normally distributive pattern. After the correlations for the dependent and independent variables were completed, regression analysis was conducted to determine the extent of the relationships between them. A multinomial logistic regression was conducted for AP Course variables because the dependent variable, AP Course counts, had more than three levels. The parameter estimates for the logistic regression results are split into multiple parts because the parameters compare pairs of outcome categories. Linear regression analysis was conducted for the athletic offerings and enrollment analysis. The analysis is presented by research question.

Research Question #1: What is the relationship between the size of a high school, the SES of the school, and the number of advanced educational opportunities offered to students?

Overview of AP Course Offerings. The AP courses offered by high schools are presented in Table 8. AP English courses (n=360, 75.8%) were the most common AP courses offered by high schools. This was followed by AP Science and AP Social Studies, which were offered by the same number of schools (n=322, 68%). A large number of high schools did not offer any AP Math (n=159, 34%).

Table 8

Summary Results of AP Course Offerings by High Schools in Pennsylvania

AP Subject(s)	0	1	2	3	4+	Schools Offering at Least 1 AP Course
Math[1]	159(34%)	147(31%)	91(19%)	76(16%)	NA	314(66%)
Science[2]	152(32%)	92(20%)	91(19%)	88(19%)	50(11%)	322(68%)
Social Studies[3]	152(32%)	138(29%)	88(19%)	53(11%)	42(9%)	322(68%)
English[4]	114(24%)	237(50%)	122(26%)	NA	NA	359(76%)
Other[5]	298(63%)	73(15%)	30(6%)	21(4%)	51(11%)	175(37%)

The columns in the table represent the number of schools and the percentage of the total. Valid count refers to the number of courses offered by each high school. ( ) indicates relative percent. N=473.

[1] Schools can offer three AP Math courses.
[2] Schools can offer five AP Science courses.
[3] Schools can offer seven AP Social Studies courses.
[4] Schools can offer two AP English courses.
[5] Schools can offer eight AP Other courses.

When examining the AP Course offerings and the four size classifications, the researcher found another distinct pattern. For each of the five AP Course categories, the number of offerings increased as the size of the school increased (Table 9). In other words, larger schools were offering more AP courses in each of the five areas examined in this study. There is an incremental increase through the size classifications.

Table 9

AP Course Offerings and Size Classification Comparison

	Large (*n*=57)		Medium-Large (*n*=145)		Medium-Small (*n*=154)		Small (*n*=117)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
AP Math	2.19	1.03	1.69	1.02	.88	.855	.44	.621
AP Science	3.00	1.58	2.14	1.29	1.29	1.19	.61	.900
AP Social Studies	2.70	1.51	1.94	1.44	1.08	1.08	.50	.703
AP English	1.39	.750	1.21	.735	.97	.631	.67	.572
AP Other	2.65	2.27	1.60	1.91	.36	.854	.13	.580

AP math offerings with student enrollment and MV/PI aid ratio. The correlations between AP Math course offerings, MV/PI AR, and student enrollment in grades 9-12 are given in Table 10. The number of AP Math courses offered and MV/PI AR were moderately correlated: r (471) = -.52, $p < .001$. The negative correlation indicates an inverse relationship with the MV/PI AR: as the amount of aid to a school increases, its AP Math course offerings decrease. The number of AP Math courses offered and student enrollment 9-12 had a stronger association, r (471) = .60, $p < .001$. This indicates that as enrollment increases, the number of

AP Math course offerings also increases. Both school size and SES display a meaningful association with AP Math offerings and result in significant relationships amongst the variables.

Table 10

Correlations Between AP Math Course Offerings and Independent Variables

	AP Math Course	MV/PI Aid Ratio	Student Enrollment 9-12
AP Math Offerings	1.00	-.52***	.60***
MV/PI AR		1.00	-.47***
Student Enrollment			1.00

N=473. Spearman's Correlation Coefficients were calculated for all correlations. MV/PI AR = the calculation PDE uses to determine the percentage of state aid provided to school districts based on market value of properties and taxable income from the PA-40 income tax return of individuals in the community. Student Enrollment = the total student enrollment in a school in grades 9-12.
***p < .001.

The overall model summary for AP Math is found in Table 11. Through multinomial logistic regression analysis, the researcher found strong model significance: R^2 = .46 (Nagelkerke), Model $\chi^2_{(6)}$ = 261.80, p < .001. Using this model, 46% of the variance in the AP Math course offerings can be accounted for through school size and SES. In other words, almost half of the differences in AP Math course offerings can be predicted by school size and SES.

Table 11 also displays the results based on number of AP Math courses offered. The coefficient (B) for student enrollment in grades 9-12 is 0.001, and the odds ratio for this coefficient is 1.001. This suggests that when student enrollment in grades 9-12 increases by one, the likelihood of having one AP Math course compared to none increases by .001, or .1% (1.001 – 1).

The second part of Table 11 presents the coefficient (B) for student enrollment 9-12 (0.002) and the odds ratio for this coefficient (1.002). This suggests that as student enrollment in grades 9-12 increases by one, the likelihood of having two AP Math courses compared to none increases by .002, or .2%. The coefficient (B) for MV/PI AR is -5.195, and the odds ratio for this coefficient is 0.006. In this case, increasing the MV/PI AR decreases the likelihood of having AP Math courses. More specifically, as the MV/PI AR increases from zero to one, the change in odds of having two AP Math courses compared to none decreases by .994, or 99.4%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having two AP Math courses compared to none by 1/.006, or 166.7; a .1 decrease in MV/PI AR means a school is 166.7 times more likely to have two AP Math courses as compared to none.

The third part of Table 10 presents the coefficient (B) for student enrollment in grades 9-12 (0.003) and the odds ratio for this coefficient (1.003), which suggests that as student enrollment increases by one, the change in likelihood of having three AP Math courses compared to none increases by .003, or .3%. The coefficient (B) for MV/PI AR is -10.485, and the odds ratio for this coefficient is 0.00003, so that increasing the MV/PI AR decreases the likelihood of having AP Math courses. More specifically, as the MV/PI AR increases from zero to one, the change in likelihood of having three AP Math courses compared to none decreases by .99997, or 99.997%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 reduction in it. Such a decrease would increase the likelihood of having three AP Math courses compared to none by 1/.00003, or

33,333; a .1 decrease in MV/PI AR means a school is 33,333 times more likely to have three AP Math courses compared to none.

Table 11

Multinomial Logistic Regression for AP Math Course Offerings

Variable	*B*	*SE*	*Exp*(*B*)	95% CI for *Exp*(*B*)	*p* – Value
1 vs. 0					
Constant	0.373	0.710			.599
Enrollment 9-12	0.001	0.111	1.001	(1.001, 1.002)	$.000^{***}$
MV/PI AR	-1.951	0.994	0.142	(0.020, 0.996)	.050
2 vs. 0					
Constant	0.847	0.756			.263
Enrollment 9-12	0.002	0.000	1.002	(1.002, 1.003)	$.000^{***}$
MV/PI AR	-5.195	1.113	0.006	(0.001, 0.049)	$.000^{***}$
3 vs. 0					
Constant	1.694	0.804			.035
Enrollment 9-12	0.003	.0000	1.003	(1.002, 1.004)	$.000^{***}$
MV/PI AR	-10.485	1.337	.00003	(0.000002, 0.000)	$.000^{***}$

SE = Standard error; AP Math Course Offerings = number of AP Math courses a school offers; Student Enrollment 9-12 = total student enrollment in grades 9-12; MV/PI AR =The calculation PDE uses to determine the percentage of state aid provided to school districts based on market value of properties and taxable income from the PA-40 from individuals in the community. R^2 = .46 (Nagelkerke). Model $\chi^2_{(6)} = 261.80$, $p < .001$. $n = 473$.
$^{***}p < .001$.

AP science offerings with student enrollment and MV/PI aid ratio. Table 12 presents the results of the correlation analysis for AP Science course offerings with MV/PI AR and student enrollment in grades 9-12. The number of AP Science courses offered and MV/PI AR were found to have moderate correlation: r (471) = -.45, $p < .001$. The negative correlation indicates an inverse relationship with the MV/PI AR; as the amount of aid to a school increases, its AP Science course offerings decrease. The number of AP Science courses offered and student enrollment in grades 9-12 were also moderately correlated: r (471) = .55, $p < .001$. This indicates that as enrollment increases, the number of AP Science courses also increases. Both school size and SES indicate a meaningful association with AP Science offerings and result in significant relationships amongst the variables.

Table 12

Correlations Between AP Science Course Offerings and Independent Variables

	AP Science Course	MV PI Aid Ratio	Student Enrollment 9-12
AP Science Course	1.00	$-.45^{***}$	$.55^{***}$
MV/PI AR		1.00	$-.47^{***}$
Student Enrollment			1.00

$^{***}p < .001$.

The overall model summary for AP Science can be found in Table 13. The researcher found strong model significance, $R^2 = .38$ (Nagelkerke), Model $\chi^2_{(8)} = 211.73$, $p < .001$. Using this model, 38% of the variance in the AP Science course offerings can be accounted for through school size and SES. In other words, we can conclude that over 1/3 of the differences in AP Science course offerings is the result of size and SES. This result is not as significant as the results for AP Math, but it still indicates overall strong predictability.

The first part of Table 13 shows the coefficient (B) for student enrollment in grades 9-12 (0.001), and the odds ratio for this coefficient (1.001), which tells us that when student enrollment in grades 9-12 increases by one, the likelihood of having one AP Science course compared to none increases by .001, or .1% (1.000 – 2). On average then, an increase of 100 in student enrollment in grades 9-12 increases the likelihood of having one AP Science course as opposed to having none by 10%.

The coefficient (B) for student enrollment in grades 9-12 (0.001) and the odds ratio for this coefficient (1.001) are both found in the second part of Table 13. This suggests that as student enrollment in grades 9-12 increases by one, the change in likelihood of having two AP Science courses compared to none increases by .001, or .1%. The coefficient (B) for MV/PI AR is -3.397, and the odds ratio for this coefficient is 0.033. In this case, increasing the MV/PI AR decreases the likelihood of having AP Science courses. More specifically, as the MV/PI AR increases from zero to one, the likelihood of having two AP Science courses compared to none decreases by .967, or .96.7%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the odds of having two AP Science courses compared to none by 1/.033, or 30.3; a .1 decrease in MV/PI AR means that a school would be 30.3 times more likely to have two AP Science courses than none.

The third part of Table 13 presents the coefficient (B) for student enrollment in grades 9-12 (0.002), and the odds ratio for this coefficient (1.002). This tells us that as student enrollment in grades 9-12 increases by one, the likelihood of having three AP Science courses compared to none increases by .002, or .2%. The coefficient (B) for MV/PI AR is -5.191, and the odds ratio for this coefficient is 0.006, so that increasing the MV/PI AR decreases the likelihood of having

AP Science courses. More specifically, as the MV/PI AR increases from zero to one, the likelihood of having three AP Science courses compared to none decreases by .994, or 99.4%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having three AP Science courses compared to none by 1/.006, or 166.6; a .1 decrease in MV/PI AR means a school is 166.6 times more likely to have three AP Science courses as compared to none. The coefficient (B) for student enrollment in grades 9-12 is 0.003, and the odds ratio for this coefficient is 1.003, which tells us that as student enrollment increases by one, the likelihood of having four AP Science courses compared to none increases by .003, or .3%.

Table 13

Multinomial Logistic Regression for AP Science Course Offerings

Variable	*B*	*SE*	*Exp*(*B*)	95% CI for *Exp*(*B*)	*p* – Value
<u>1 vs. 0</u>					
Constant	-0.723	0.800			.366
Enrollment 9-12	0.001	0.000	1.001	(1.000, 1.002)	.027*
MV/PI AR	-.423	1.109	0.655	(0.074, 5.757)	.655
<u>2 vs. 0</u>					
Constant	0.561	0.732			.444
Enrollment 9-12	0.001	0.000	1.001	(1.001, 1.002)	.000***
MV/PI AR	-3.397	1.040	0.033	(0.004, 0.257)	.001**
<u>3 vs. 0</u>					
Constant	.970	0.725			.181
Enrollment 9-12	0.002	.0000	1.002	(1.001, 1.003)	.000***
MV/PI AR	-5.191	1.060	.006	(0.001, 0.044)	.000***
<u>4 vs. 0</u>					
Constant	.573	0.812			.480
Enrollment 9-12	0.003	.0000	1.003	(1.002, 1.004)	.000***
MV/PI AR	-9.009	1.327	.000	(.0000009, 0.002)	.000***

AP Science Course Offerings = number of AP Science courses a school offers. R^2 = .38 (Nagelkerke). Model $\chi^2_{(8)} = 211.73$, $p < .001$, $n = 473$.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

AP social studies offerings with student enrollment and MV/PI aid ratio. Table 14 presents the results of the correlation analysis for AP Social Studies course offerings with MV/PI AR and student enrollment in grades 9-12. The number of AP Social Studies courses offered and MV/PI AR were moderately correlated: *r* (471) = -.43, $p < .001$. The negative correlation indicates an inverse relationship with the MV/PI AR; as the amount of aid to a school increases its AP Social Studies course offerings decrease. The number of AP Social Studies courses offered and student enrollment also indicated a moderate relationship: *r* (471) = .56, $p < .001$. Both school size and SES demonstrate a meaningful association with AP Social Studies offerings and result in significant relationships among the variables.

Table 14

Correlations Between AP Social Studies Offerings and Independent Variables

	AP Social Studies Course	MV PI Aid Ratio	Student Enrollment 9-12
AP Social Studies Course	1.00	$-.43^{***}$	$.56^{***}$
MV/PI AR		1.00	$-.47^{***}$
Student Enrollment			1.00

$^{***}p < .001$.

The AP Social Studies model regression is presented in Table 15. The researcher found strong model significance, $R^2 = .37$ (Nagelkerke), Model $\chi^2_{(8)} = 206.08$, $p < .001$. Using this model, 37% of the variance in the AP Social Studies course offerings can be accounted for through school size and SES. In other words, we can predict over 1/3 of the differences to AP Social Studies course offerings result from size and SES. This result is not as significant as the results for AP Math, but it still indicates overall strong predictability.

The coefficient (B) for student enrollment in grades 9-12 (0.001) and the odds ratio for this coefficient (1.001) are presented in the first part of Table 15. This suggests that when enrollment increases by one, the change in odds of having one AP Social Studies course compared to none increases by .001, or .1% (1.000 – 2). On average then, an increase of 100 in total student enrollment increased the likelihood of having one AP Social Studies course as opposed to none by 10%.

The second part of Table 15 presents the coefficient (B) for student enrollment in grades 9-12 (0.002) and the odds ratio for this coefficient (1.002). This suggests that as student enrollment increases by one, the change in odds of having two AP Social Studies courses compared to none increases by .002, or .2%. On average, an increase of 100 in total enrollment increased the likelihood of having two AP Social Studies course rather than none by 20%.

The third part of Table 15 presents the coefficient (B) for MV/PI AR (-2.970) and the odds ratio for this coefficient (0.051). In this case, increasing the MV/PI AR decreases the likelihood of having AP Social Studies courses. Specifically, as the MV/PI AR increases from zero to one, the change in likelihood of having two AP Social Studies courses compared to none decreases by .949, or 94.9%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having two AP Social Studies courses compared to none by 1/.051, or 19.6. A .1 decrease in MV/PI AR means a school was 19.6 times more likely to have two AP Social Studies courses than none.

The fourth part of Table 15 presents the coefficient (B) for student enrollment in grades 9-12 (0.003) and the odds ratio for this coefficient (1.003). This suggests that as student enrollment increased by one, the change in likelihood of having three AP Social Studies courses compared to none increased by .003, or .3%. On average, an increase of 100 in total enrollment increased the likelihood of having three AP Social Studies courses as opposed to having none by

30%. The coefficient (B) for MV/PI AR is -6.254, and the odds ratio for this coefficient is 0.002, so that increasing the MV/PI AR decreased the likelihood of having AP Social Studies courses. More specifically, as the MV/PI AR increased from zero to one, the change in likelihood of having three AP Social Studies courses compared to none decreased by .998, or 99.8%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having three AP Social Studies courses compared to none by 1/.002, or 500. A .1 decrease in MV/PI AR means a school is 500 times more likely to have three AP Social Studies than none.

Table 15

Multinomial Logistic Regression for AP Social Studies Course Offerings

Variable	*B*	*SE*	*Exp*(*B*)	95% CI for *Exp*(*B*)	*p* – Value
1 vs. 0					
Constant	0.568	0.693			.412
Enrollment 9-12	0.001	0.000	1.001	(1.000, 1.002)	.003**
MV/PI AR	-2.121	0.957	0.120	(0.018, .783)	.027*
2 vs. 0					
Constant	-0.041	0.745			.956
Enrollment 9-12	0.002	0.000	1.002	(1.001, 1.003)	.000***
MV/PI AR	-2.970	1.049	0.051	(0.007, 0.400)	.005**
3 vs. 0					
Constant	-0.040	0.801			.961
Enrollment 9-12	0.003	.0000	1.003	(1.002, 1.004)	.000***
MV/PI AR	-6.254	1.205	.002	(0.000, 0.020)	.000***
4 vs. 0					
Constant	.168	0.838			.841
Enrollment 9-12	0.003	.0000	1.003	(1.002, 1.004)	.000***
MV/PI AR	-8.008	1.319	.000	(.000003, 0.004)	.000***

AP Social Studies Course Offerings = number of AP Social Studies courses a school offers. R^2 = .37 (Nagelkerke). Model $\chi^2_{(8)} = 206.08$, $p < .001$, $n = 473$.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

AP English offerings with student enrollment and MV/PI aid ratio. Table 16 presents the results of the correlation analysis for AP English course offerings with MV/PI AR and student enrollment in grades 9-12. The number of AP English courses offered and MV/PI

AR indicated a weak association: r (471) = -.34, p < .001. The number of AP English courses offered and student enrollment also indicated a weak association: r (471) = .36, p < .001. This analysis indicates a moderate relationship between school size and SES with that of AP English offerings. Both size and SES were significantly related to AP English offerings.

Table 16

Correlations Between AP English Offerings and Independent Variables

	AP English Course	MV PI Aid Ratio	Student Enrollment 9-12
AP English Course	1.00	-.34***	.36***
MV/PI AR		1.00	-.47***
Student Enrollment			1.00

***p < .001.

The AP English model regression is presented in Table 17. The researcher found strong model significance, R^2 = .20 (Nagelkerke), Model $\chi^2_{(4)}$ = 92.204, p < .001. Using this model, 20% of the variance in the AP English course offerings can be accounted for through school size and SES. The overall model significance is the lowest of the AP courses, but it still indicates strong overall predictability.

The first part of Table 17 shows the coefficient (B) for MV/PI AR (2.022) and the odds ratio for this coefficient (0.132). In this case, increasing the MV/PI AR decreased the odds of having AP English courses. More specifically, as the MV/PI AR increased from zero to one, the change in likelihood of having two AP English courses compared to none decreased by .868, or 86.8%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having two AP English courses compared to none by 1/.132, or 7.57. A .1 decrease in MV/PI AR means a school was 7.57 times more likely to have one AP English courses than none.

The second part of Table 17 presents the coefficient (B) for student enrollment in grades 9-12 (0.001) and the odds ratio for this coefficient (1.001). This tells us that as student enrollment increased by one, the likelihood of having two AP English courses compared to none increased by .001, or .1%. On average, an increase of 100 in total enrollment increased the likelihood of having two AP English courses as opposed to having none by 10%. The coefficient (B) for MV/PI AR is -5.337, and the odds ratio for this coefficient is 0.005. In this case, increasing the MV/PI AR reduced the likelihood of a school having AP English courses. More specifically, as the MV/PI AR increased from zero to one, the likelihood of having two AP English courses compared to none decreased by .995, or 99.5%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having two AP English courses compared to none by 1/.005, or 200. A .1 decrease in MV/PI AR means a school is 200 times more likely to have two AP English courses than none.

Table 17

Multinomial Logistic Regression for AP English Course Offerings

Variable	*B*	*SE*	*Exp*(*B*)	95% CI for *Exp*(*B*)	*p* – Value
1 vs. 0					
Constant	1.838	0.639			.004
Student Enrollment 9-12	0.000	0.000	1.000	(1.000, 1.001)	.481
MV/PI AR	-2.022	0.889	0.132	(0.023, .756)	$.023^{*}$
2 vs. 0					
Constant	2.106	0.677			.002
Student Enrollment 9-12	0.001	0.000	1.001	(1.000, 1.002)	$.000^{***}$
MV/PI AR	-5.337	0.981	0.005	(0.001, 0.033)	$.000^{**}$

AP English Course Offerings = number of AP English courses a school offers. R^2 = .20 (Nagelkerke). Model $\chi^2_{(4)} = 92.204$, $p < .001$, $n = 473$.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

AP other offerings with student enrollment and MV/PI aid ratio. Table 18 presents the results of the correlation analysis for AP Other course offerings with MV/PI AR and student enrollment in grades 9-12. The number of AP Other courses offered and MV/PI AR were moderately correlated: r (471) = -.50, $p < .001$. The number of AP Other courses offered and student enrollment also showed a moderate relationship: r (471) = .56, $p < .001$. SES and school size were both significantly related to the number of AP Other courses offered.

Table 18

Correlations Between AP Other Course Offerings with Independent Variables

	AP Other Course	MV/PI Aid Ratio	Student Enrollment 9-12
AP Other Course	1.00	-.50***	.56***
MV/PI AR		1.00	-.47***
Student Enrollment			1.00

***$p < .001$.

The overall AP Other model regression summary is presented in Table 19. The researcher found strong model significance: $R^2 = .49$ (Nagelkerke), Model $\chi^2_{(8)} = 275.73$, $p < .001$. Using this model, 49% of the variance in the AP Other course offerings can be accounted for through school size and SES. This indicates that one can predict almost half of the differences in AP Other course offerings through size and SES.

The first part of Table 19 shows the coefficient (B) for student enrollment in grades 9-12 (0.001) and the odds ratio for this coefficient (1.001). This tells us that when enrollment increased by one, the change in likelihood of having one AP Other course compared to none increased by .001, or .1% (1.000 – 2). On average, an increase of 100 in enrollment increased the likelihood of having one AP Other course as opposed to having none by 10%.

The second part of Table 19 shows the coefficient (B) for student enrollment in grades 9-12 (0.001) and the odds ratio for this coefficient (1.001). This suggests that as enrollment increased by one, the likelihood of having two AP Other courses compared to none increased by .001, or .1%. The coefficient (B) for MV/PI AR is -3.397, and the odds ratio for this coefficient is 0.033. In this case, increasing the MV/PI AR reduced the likelihood of having AP Other courses. More specifically, as the MV/PI AR increased from zero to one, the likelihood of having two AP Other courses compared to none decreased by .967, or .96.7%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having two AP Other courses compared to none by 1/.033, or 30.3. A .1 decrease in MV/PI AR means a school is 30.3 times more likely to have two AP Other courses than none.

The third part of Table 19 shows the coefficient (B) for student enrollment in grades 9-12 (0.002) and the odds ratio for this coefficient (1.002), which tells us that as enrollment increased by one, the likelihood of having three AP Other courses compared to none increased by .002, or .2%. The coefficient (B) for MV/PI AR is -5.191, and the odds ratio for this coefficient is 0.006. Therefore, increasing the MV/PI AR reduced the likelihood of having AP Other courses. More specifically, as the MV/PI AR increased from zero to one, the change in likelihood of having three AP Other courses compared to none decreased by .994, or 99.4%. Since the MV/PI AR ranges from zero to one, a more effective way of looking at the impact of decreasing the MV/PI AR is to consider a .1 decrease in it. Such a decrease would increase the likelihood of having three AP Other courses compared to none by 1/.006, or 166.6. A .1 decrease in MV/PI AR means a school is 166.6 times more likely to have three AP Other courses than none.

The fourth part of Table 19 shows the coefficient (B) for student enrollment in grades 9-12 (0.003) and the odds ratio for this coefficient (1.003), which tells us that as enrollment increased by one, the change in likelihood of having four AP Other courses compared to none increased by .003, or .3%. The coefficient (B) for MV/PI AR is -9.009, and the odds ratio for this coefficient is 0.000. Therefore, increasing the MV/PI AR decreased the likelihood of having

AP Other courses. More specifically, as the MV/PI AR increased from zero to one, the change in likelihood of having four AP Other courses compared to none decreased by .000, or 00%.

Table 19

Multinomial Logistic Regression for AP Other Course Offerings

Variable	*B*	*SE*	*Exp*(*B*)	95% CI for *Exp*(*B*)	*p* – Value
1 vs. 0					
Constant	-.953	0.679			.160
Enrollment 9-12	0.001	0.000	1.001	(1.000, 1.002)	$.000^{***}$
MV/PI AR	-1.992	.997	0.136	(0.019, .963)	$.046^{*}$
2 vs. 0					
Constant	-1.751	0.846			.038
Enrollment 9-12	0.001	0.000	1.002	(1.001, 1.003)	$.000^{***}$
MV/PI AR	-4.345	1.380	0.013	(0.001, 0.194)	$.002^{**}$
3 vs. 0					
Constant	-.423	0.897			.637
Enrollment 9-12	0.002	.0000	1.002	(1.002, 1.003)	$.000^{***}$
MV/PI AR	-9.228	1.683	9.825E-5	(.0000006, 0.003)	$.000^{***}$
4 vs. 0					
Constant	1.445	0.773			.062
Enrollment 9-12	0.003	.0000	1.003	(1.002, 1.004)	$.000^{***}$
MV/PI AR	-13.520	1.645	1.344E-6	(.000000005, .000003)	$.000^{***}$

AP Other Course Offerings = number of AP- Other courses a school offers. R^2 = .49 (Nagelkerke). Model $\chi^2_{(8)} = 275.73$, $p < .001$, $n = 473$.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Honors offerings with student enrollment and MV/PI aid ratio. The honors course offerings by school size are presented in Table 20. Similar to AP course offerings, the size of the school was related to the number of honors offerings. In general, as the school got larger by student population, more honors course were offered. Large high schools in this study offered on average 24 honors courses, and small schools offered on average seven.

Table 20

Honors Course Offerings with Size Classification Comparison

	Large (*n*=57)		Medium-Large (*n*=145)		Medium-Small (*n*=154)		Small (*n*=117)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Honors Course(s)	23.70	15.79	18.92	16.51	11.92	10.18	7.42	6.59

Table 21 presents the results of the correlation run for Honors Course offerings with MV/PI AR and student enrollment in grades 9-12. The number of honors courses offered and MV/PI AR indicated a moderate association: r (471) = -.39, $p < .001$. In addition, the number of honors courses offered and enrollment were moderately correlated: r (471) = .47, $p < .001$.

Table 21

Correlations Between Honors Course Offerings and Independent Variables

	Honors Course Count	MV/PI Aid Ratio	Student Enrollment 9-12
Honors Course Count	1.00	-.39***	.47***
MV/PI AR		1.00	-.47***
Student Enrollment			1.00

***$p < .001$.

A linear regression was conducted to predict Honors Course offerings based on student enrollment in grades 9-12 and MV/PI AR. This regression is presented in Table 22. Enrollment 9-12 and MV/PI AR are both significant predictors of Honors Course offerings. A significant regression equation was found: ($F_{(2,470)}$ = 89.22, $p < .001$ with an $R^2 = .28$). Using this model of regression one can predict 28% of the variance in Honors Course offerings with a high degree of confidence (95% CI).

Table 22

Regression Analysis Between Honors Course Offerings and Independent Variables

Variable	*B*	*SE*	β	*t*-Score
Student Enrollment 9-12	0.007	0.001	.292	6.779^{***}
MV/PI AR	-26.335	3.424	-.332	-7.691^{***}

Honors = courses a school designates as "advanced" or above average. $F_{(2,470)} = 89.22$, $p < .001$, $R^2 = .28$.
$^{***}p < .001$.

Research Question #1 sought to identify the relationship between high-school size, SES, and advanced level course offerings. The analysis indicated that as a school increases in size, so does the number of both AP and honors course offerings available to students. SES also demonstrated a link to these offerings. As the school MV/PI AR decreases, the number of advanced level courses increases. This was demonstrated both descriptively through an analysis of the means and correlations as well as through the regression analysis. Regression analysis provided significant findings about the predictive value of advanced level course offerings based on school size and SES.

Additionally, the analysis revealed some important findings specific to each AP Course category and honors offerings. When analyzing AP Math offerings, the researcher made several findings of consequence. First, in general terms, the larger a school, the greater the number of AP Math courses. In addition, there was a similar association between SES and AP Math offerings. The higher a school's SES, the greater the number of AP Math courses. The strength of this connection was profound. On average, an increase of 100 in student enrollment in grades 9-12 increased the likelihood of having two AP Math course offerings as opposed to having none by 20%. Furthermore, an increase of 100 in enrollment increased the likelihood of having three AP Math courses compared to having none by 30%. The analysis of SES and AP Math offerings revealed that schools with a lower MV/PI AR of .1 were 167 times more likely to offer two AP Math courses than none.

The findings revealed a similar association for AP Science course offerings with size and SES. Again, in general terms, the larger a school, the greater the number of AP Science courses. There was a similar association between SES and AP Science offerings. An increase in SES resulted in an increase in the number of AP Science courses. This strength of this connection was significant. On average, an increase of 100 in student enrollment in grades 9-12 increased the likelihood of having two AP Science course as opposed to having none by 20%. Furthermore, an increase of 100 in enrollment made having three AP Science courses compared to having none 30% more likely. With regard to SES and AP Science offerings, for every .1 decline in MV/PI AR, schools were 30 times more likely to offer two AP Science courses rather than none.

The results for AP Social Studies and AP English were similar. Again, generally, a larger school offered more AP Social Studies and AP English courses. In addition, there was a similar association between SES and AP Social Studies and AP English offerings. The higher a school's SES, the greater the number of AP Social Studies and English courses. The strength of this connection was significant. On average, an increase of 100 in student enrollment in grades 9-12 increased the likelihood of having two AP Social Studies or AP English courses as opposed to having none by 20%. When examining SES and AP Social Studies or AP English offerings, for each reduction of .1 in MV/PI AR, schools were 500 times more likely to offer three AP Social Studies courses rather than none and 166 times more likely to offer three AP English courses rather than none.

Research Question #2: What is the relationship between the size of a high school, the SES of the school, and the per-student enrollment in advanced level course offerings?

Overview of AP Course Enrollment. The total student enrollment for each AP course is presented in Table 23. This total includes numbers from multiple sections as well as the possibility of students enrolling in more than one AP course per subject. The enrollment numbers for AP Social Studies were the highest of all the AP courses. The average enrollment for AP Social Studies courses was 62 students, with 649 students enrolled in AP Social Studies courses in one school. Of the four core areas analyzed in this study, AP Math had the lowest average enrollment, with 41 students in AP Math courses per school.

Table 23

AP Enrollment Comparison

Description of Variable	Mean	SD	Minimum	Maximum
AP Math Enrollment	41	61.84	0	383
AP Science Enrollment	45	68.74	0	628
AP Social Studies Enrollment	62	97.33	0	649
AP English Enrollment	42	58.08	0	381
AP Other Enrollment	13	30.10	0	252

N=473. Enrollment = the number of total students enrolled in a given course. This may include multiple sections of the same course as well as students enrolling in more than one AP Course per subject area.

Table 24 represents the number of students enrolled in a given AP course compared to the total student population in grades 9-12 (AP Enrollment/Total Enrollment). AP Social Studies courses had the highest average per student enrollment of the four core areas, at .057. AP Math courses had the lowest average per student enrollment, at .038.

Table 24

AP Enrollment per Student

Description of Variable	Mean	SD	Minimum	Maximum
AP Math Enrollment per Student	.038	.045	0	.247
AP Science Enrollment per Student	.045	.053	0	.331
AP Social Studies Enrollment per Student	.057	.069	0	.348
AP English Enrollment per Student	.045	.052	0	.567
AP Other Enrollment per Student	.010	.021	0	.108

Enrollment per Student = the value of the number of students enrolled in the course compared to the total student population in grades 9-12. For example, a school with 800 total students enrolled and 20 students enrolled in an AP Math course would have a .025 AP Math Enrollment per Student. Students may also have enrolled in more than one AP Course per subject.

The enrollment per student comparison with size classification indicated an interesting trend. AP Math, Science, and Social Studies all had higher per-student enrollments as the size of the school increased. Only AP English did not follow this trend. The enrollment per student in medium-large schools for AP English was .55 compared to .53 for large size schools (Table 25). This indicates that, in general, larger schools had a higher per-student enrollment in most AP courses than did smaller schools.

Table 25

AP Course Enrollment per Student and Size Classification Comparison

	Large (n=57)		Medium-Large (n=145)		Medium-Small (n=154)		Small (n=117)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
AP Math	.067	.055	.051	.048	.029	.034	.019	.036
AP Science	.065	.066	.056	.052	.041	.049	.026	.046
AP Social Studies	.098	.077	.075	.078	.048	.058	.027	.046
AP English	.054	.042	.055	.068	.039	.043	.038	.044
AP Other	.024	.028	.016	.023	.006	.016	.003	.014

AP math course enrollment with total student enrollment and MV/PI aid ratio. The AP Math enrollment per student and MV/PI AR and total enrollment are also moderately correlated: r (471) = -.50, $p < .001$ and r (471) = .44, $p < .001$ respectively. Table 26 presented the AP Math correlations with total enrollment and SES. This analysis indicates that as a school's total enrollment increased, per-student enrollment in AP Math courses increased as well. Conversely, there was an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per-student enrollment in AP Math courses decreased. This indicates that the association between size, SES, and AP Math enrollment per student is significant.

Table 26

Correlations Between AP Math Enrollment and Independent Variables

	AP Math Enrollment	AP Math Enrollment per Student	MV PI Aid Ratio	Student Enrollment 9-12
AP Math Enrollment	1.00	.94***	-.54***	.66***
AP Math Enrollment per Student		1.00	-.50***	.44***
MV/PI AR			1.00	-.47***
Student Enrollment				1.00

***$p < .001$.

Table 27 presents the results of the linear regression for AP Math enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a proportion of the total variation in AP Math enrollment per student was predicted by enrollment and MV/PI AR. Therefore, student enrollment and MV/PI AR were significant predictors of AP Math enrollment per student: $F_{(2,470)} = 95.54$, $p < .001$, $R^2 = .29$. In addition, the unstandardized slope (.0000009) and standardized slope (.121) for total enrollment 9-12 are statistically significantly different from 0: t (470) = 2.842, p <.05. In other words, an increase of 100 students resulted in a .0009 increase in AP Math enrollment per student. Furthermore, the unstandardized slope (-.125) and standardized slope (-.476) for MV/PI AR are statistically significantly different from 0: t (470) = -11.153, p <.001. In other words, an increase of .1 in MV/PI AR resulted in a .0125 decrease in AP Math enrollment per student. MV/PI AR was a more statistically significant predictor of AP Math enrollment per student than school size.

Multiple *R* squared indicates that approximately 29% of the variation in AP Math enrollment per student could be predicted by school size and SES.

Table 27

Regression Analysis Between AP Math Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.0000009	.000	.121	2.84^{**}
MV/PI AR	-0.125	.011	-.476	-11.15^{***}

AP Math Enrollment per Student = number of students enrolling in AP Math courses in a given school compared to its total student enrollment. $F_{(2,470)} = 95.54$, $p < .001$, $R^2 = .29$.
$^{**}p < .01$, $^{***}p < .001$.

AP science course enrollment with total student enrollment and MV/PI aid ratio.

The AP Science enrollment per student and MV/PI AR total enrollment were weakly associated: *r* (471) = -.39, *p* < .001 and *r* (471) = .35, *p* < .001 respectively, as found in Table 28. This analysis indicates that as a school's total enrollment increased, per-student enrollment in AP Science courses increased as well. Conversely, there was an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per-student enrollment in AP Science courses decreased.

Table 28

Correlations Between AP Science Enrollment and Independent Variables

	AP Science Enrollment	AP Science Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
AP Science Enrollment	1.00	.93***	-.48***	.61***
AP Science Enrollment per Student		1.00	-.39***	.35***
MV/PI AR			1.00	-.47***
Student Enrollment				1.00

$^{***}p < .001$.

Table 29 presents the results of the linear regression for AP Science enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a portion of the total variation in AP Science enrollment per student can be predicted by student enrollment and MV/PI AR: $F_{(2,470)} = 49.78$, $p < .001$, $R^2 = .18$. Total enrollment in grades 9-12 was not found to be a significant factor in AP Science enrollment per student (p=.203). However, the unstandardized slope (-.120) and standardized slope (-.390) for MV/PI AR are statistically significantly different from 0: t (470) = 8.490, p <.001. In other words, an increase of .1 in MV/PI AR produced a .012 decrease in AP Science enrollment per student. MV/PI AR was a more significant predictor of AP Science enrollment per student than school size. Multiple R squared indicates that approximately 18% of the variation in AP Science enrollment per student was predicted by school size and SES.

Table 29

Regression Analysis Between AP Science Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.0000005	.000	.059	1.275
MV/PI AR	-0.120	.014	-.390	-8.490^{***}

AP Science Enrollment per Student = number of students enrolling in AP Science courses in a given school compared to its total student enrollment. $F_{(2,470)} = 49.78$, $p < .001$, $R^2 = .18$.
$^{***}p < .001$

AP social studies course enrollment with total student enrollment and MV/PI aid ratio. The AP Social Studies enrollment per student and MV/PI AR and total enrollment are moderately associated: r (471) = -.42, $p < .001$ and r (471) = .41, $p < .001$ respectively, as presented in Table 30. This analysis indicates that as a school's total enrollment increased, per-student enrollment in AP Social Studies courses increased as well. Conversely, there was an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per-student enrollment in AP Social Studies courses decreased.

Table 30

Correlations Between AP Social Studies Enrollment and Independent Variables

	AP Social Studies Enrollment	AP Social Studies Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
AP Social Studies Enrollment	1.00	$.95^{***}$	$-.47^{***}$	$.62^{***}$
AP Social Studies Enrollment per Student		1.00	$-.42^{***}$	$.41^{***}$
MV/PI AR			1.00	$-.47^{***}$
Student Enrollment				1.00

$^{***}p < .001$.

Table 31 presents the results of the linear regression for AP Social Studies enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a proportion of the total variation in AP Social Studies enrollment per student was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of AP Social Studies enrollment per student: $F_{(2,470)} = 85.89$, $p < .001$, $R^2 = .27$. In addition, the unstandardized slope (.000002) and standardized slope (.145) for total enrollment 9-12 are statistically significantly different from 0: t (470) = 3.342, p <.01. In other words, an increase of 100 students produced a .0002 increase in AP Social Studies course enrollment per student. Additionally, the unstandardized slope (-.175) and standardized slope (-.441) for MV/PI AR were statistically significantly different from 0: t (470) = -10.167, p <.001. In other words, an increase of .1 in MV/PI AR produced a .0175 decrease in AP Social Studies enrollment per student. MV/PI AR was a more statistically significant predictor of AP Social Studies enrollment per student than school size. Multiple R squared indicates that approximately

27% of the variation in AP Social Studies enrollment per student was predicted by school size and SES.

Table 31

Regression Analysis Between AP Social Studies Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.000002	.000	.145	3.342**
MV/PI AR	-0.175	.017	-.441	-10.167***

AP Social Studies Enrollment per Student = number of students enrolling in AP Social Studies courses in a given school compared to its total student enrollment. $F_{(2,470)} = 85.89$, $p < .001$, $R^2 = .27$.
$^{**}p < .01$, $^{***}p < .001$

AP English course enrollment with total student enrollment and MV/PI aid ratio. The AP English enrollment per student and MV/PI AR and total enrollment were also weakly associated: r (471) = -.26, $p < .001$ and r (471) = .17, $p < .001$ respectively as presented in Table 32. This analysis indicates that as a school's total enrollment increased, per-student enrollment in AP English courses increased as well. Conversely, there was an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per student enrollment in AP English courses decreased.

Table 32

Correlations Between AP English Enrollment and Independent Variables

	AP English Enrollment	AP English Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
AP English Enrollment	1.00	$.89^{***}$	$-.40^{***}$	$.52^{***}$
AP English Enrollment per Student		1.00	$-.26^{***}$	$.17^{***}$
MV/PI AR			1.00	$-.47^{***}$
Student Enrollment				1.00

$^{***}p < .001$.

Table 33 presents the results of the linear regression for AP English Enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a portion of the total variation in AP English enrollment per student was predicted by enrollment and MV/PI AR. Therefore, both were significant predictors of AP English enrollment per student: $F_{(2,470)} = 27.48$, $p < .001$, $R^2 = .11$. Total enrollment in grades 9-12 was not found to be a significantly significant factor in AP English enrollment per student (p=.370). However, the unstandardized slope (-.103) and standardized slope (-.339) for MV/PI AR are statistically significantly different from 0: t (470) = -7.07, p <.001. In other words, an increase of .1 in MV/PI AR produced a .0103 decrease in AP English enrollment per student. MV/PI AR was a more statistically significant predictor of AP English enrollment per student than school size. Multiple R squared indicates that approximately 11% of the variation in AP English enrollment per student was predicted by school size and SES.

Table 33

Regression Analysis Between AP English Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.0000004	.000	-.043	-.897
MV/PI AR	-0.103	.015	-.339	-7.070***

AP English Enrollment per Student = number of students enrolling in AP English courses in a given school compared to its total student enrollment. $F_{(2,470)} = 27.48$, $p < .001$, $R^2 = .11$.
***$p < .001$.

AP other course enrollment with total student enrollment and MV/PI aid ratio. The AP Other enrollment per student and MV/PI AR and total enrollment are also moderately correlated: r (471) = -.48, $p < .001$ and r (471) = .52, $p < .001$ respectively, as presented in Table 34. This indicates that as a school's total enrollment increased, the per student enrollment in AP Other courses increased as well. Conversely, there was an inverse relationship with the MV/PI AR. As the MV/PI ARI increased, the per-student enrollment in AP Other courses decreased.

Table 34

Correlations Between AP Other Enrollment and Independent Variables

	AP Other Enrollment	AP Other Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
AP Other Enrollment	1.00	.99***	-.49***	.57***
AP Other Enrollment per Student		1.00	-.48***	.52***
MV/PI AR			1.00	-.47***
Student Enrollment				1.00

***$p < .001$.

Table 35 presents the results of the linear regression for AP Other enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a proportion of the total variation in AP Other enrollment per student was predicted by enrollment 9-12 and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of AP Other enrollment per student: $F_{(2,470)} = 124.92$, $p < .001$, $R^2 = .35$. The unstandardized slope (.0000005) and standardized slope (.140) for student enrollment are statistically significantly different from 0: t (470) = -3.426, p <.01. In other words, an increase of 100 in student enrollment produced a .00005 increase in AP Other enrollment per student. Additionally, the unstandardized slope (-.063) and standardized slope (-.517) for MV/PI AR are statistically significantly different from 0: t (470) = -12.645, p <.001. In other words, an increase of .1 in MV/PI AR produced a .0063 decrease in AP Other enrollment per student. MV/PI AR was a more statistically significant predictor of AP Other enrollment per student than school size.

Multiple *R* squared indicates that approximately 35% of the variation in AP Other enrollment per student resulted from school size and SES.

Table 35

Regression Analysis Between AP Other Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.0000005	.000	.140	3.426^{**}
MV/PI Aid Ratio	-.063	.005	-.517	-12.645^{***}

AP Other- Enrollment per Student = number of students enrolling in AP Other courses in a given school compared to its total student enrollment. $F_{(2,470)} = 124.92$, $p < .001$, $R^2 = .35$.
$^{**}p < .01$, $^{***}p < .001$.

Honors course enrollment with total student enrollment and MV/PI aid ratio. Table 36 presents the Honors Course enrollment in the four school size classifications. As was the case with AP enrollment, the larger the school, the more students enrolled in honors courses. This total includes numbers from multiple sections as well as the possibility of students enrolling in more than one honors course. The largest number of students enrolled in a single school's honors courses was 6,160. The number of students enrolled in honors courses in each size high school is compared to the total student population in grades 9-12 (Honors Enrollment/Total Enrollment). The average per-student enrollment was .741 in honors courses (Table 35).

Table 36

Honors Course Enrollment per Student with Size Classification Comparison

Variable	Large (n=57) M	SD	Medium-Large (n=145) M	SD	Medium-Small (n=154) M	SD	Small (n=117) M	SD
Honors Enrollment per Student	.95	.59	.91	.83	.68	.55	.51	.51

The honors enrollment per student and MV/PI AR and total enrollment are moderately correlated: r (471) = -.40, p < .001 and r (471) = .30, p < .001 respectively, as presented in Table 37. This analysis indicates that as a school's total enrollment increased, per student enrollment in honors courses increased as well. Conversely, there was an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per-student enrollment in honors courses decreased.

Table 37

Correlations Between Honors Course Enrollment and Independent Variables

	Honors Enrollment	Honors Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
Honors Enrollment	1.00	$.88^{***}$	$-.50^{***}$	$.67^{***}$
Honors Enrollment per Student		1.00	$-.40^{***}$	$.30^{***}$
MV/PI AR			1.00	$-.47^{***}$
Student Enrollment				1.00

$^{***}p < .001$.

Table 38 presents the results of the linear regression for honors enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a proportion of the total variation in Honors Course enrollment per student was predicted by student enrollment in grades 9-12 and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of honors enrollment per student: $F_{(2,470)} = 60.583$, $p < .001$, $R^2 = .21$. Total student enrollment was not a statistically significant factor for honors course enrollment per student (p=.124). However, the unstandardized slope (-1.614) and standardized slope (-.420) for MV/PI AR are statistically significantly different from 0: t (470) = -9.295, p <.001. In other words, an increase of .1 in MV/PI AR produced a .16 decrease in Honors Course enrollment per student. MV/PI AR was a more statistically significant predictor of Honors Course enrollment per student than school size. Multiple R squared indicates that approximately 21% of the variation in Honors Course enrollment per student was predicted by school size and SES.

Table 38

Regression Analysis Between Honors Course Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.000008	.000	.069	1.539
MV/PI Aid Ratio	-1.614	.174	-.420	-9.295^{***}

Honors Enrollment per Student = number of students enrolling in honors courses in a given school compared to its total student enrollment. $F_{(2,470)} = 60.583$, $p < .001$, $R^2 = .21$.
$^{***}p < .001$

The findings for Research Question #2 indicate similar AP and Honors Course offerings, when combining the effects of total student enrollment and SES, we find strong model significance for enrollment per student in advanced level courses such as AP and honors. Through the descriptive analysis, enrollment per student increased as school size increased. Also, as the MV/PI AR increased, the per-student enrollments decreased. Through the regression analysis, the researcher found that SES played a large role in the enrollment of students in AP and honors courses. SES was a more significant predictor of all AP Course enrollments and Honors Course enrollments than school size. However, combining these two factors provides a clear picture of their overall significance on student enrollment.

Research Question #3: What is the relationship between the size of a high school, the SES of the school, and the number of interscholastic athletics offered to students?

Overview of interscholastic athletic offerings. Both descriptive and inferential statistics were calculated for interscholastic athletic offerings. Descriptive statistics included mean, SD, minimum, and maximum. In addition, Spearman correlations were calculated for all pairs of variables because the data did not follow a normally distributed pattern. Linear regression analysis was performed on all of the athletic offerings.

The descriptive statistics for interscholastic athletic offerings are presented Table 38. Table 39 displays the athletic offerings categories by Female/Male and by 9th grade, Junior varsity, and Varsity offerings. Male varsity athletics had the highest average number of offerings (9). Female 9th Grade athletics had the lowest average number of offerings (2). Interestingly, only female junior varsity offerings equaled those for males. Male athletic offerings had a higher average and maximum than for females for two of three categories (9th Grade, Varsity). In addition, junior varsity female offerings (15) had a higher maximum than males' (14).

Table 39

Descriptive Statistics for Interscholastic Athletic Offerings

Description of Variable	Mean	SD	Minimum	Maximum
Female 9th Grade Athletics	2	1.7	0	6
Female Junior varsity Athletics	5	2.7	0	13
Female Varsity Athletics	8	3.1	0	15
Male 9th Grade Athletics	3	1.6	0	8
Male Junior varsity Athletics	5	2.8	0	14
Male Varsity Athletics	9	2.9	0	15

N=473. Athletic options as defined by the PIAA. There are 19 possible athletic options for males and 18 for females.

Table 40 presents the comparison of the four size classifications with their interscholastic athletic offerings by gender. Following the same trend as academic opportunities, the number of athletic offerings increased as the schools' size increased. This was consistent across gender categories and between 9th Grade, Junior varsity, and Varsity.

Table 40

Interscholastic Athletic Offerings with Size Classification Comparison

	Large (*n*=57)		Medium-Large (*n*=145)		Medium-Small (*n*=154)		Small (*n*=117)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Female 9^{th}	2.42	1.73	2.21	1.78	2.32	1.52	2.71	1.69
Female JV	7.04	2.76	5.96	2.77	3.50	1.42	2.62	1.21
Female V	11.31	2.51	9.75	2.59	7.14	2.13	5.16	1.73
Male 9^{th}	3.21	1.54	3.00	1.58	2.17	1.50	2.22	1.93
Male JV	7.59	2.48	6.30	2.85	3.98	1.60	2.86	1.42
Male V	12.44	1.53	10.88	2.06	8.47	2.06	6.11	1.804

Female 9th grade athletic offerings with MV/PI aid ratio and student enrollment. The correlations between female 9th Grade athletic offerings, MV/PI AR, and student enrollment in grades 9-12 are given in Table 41. No significant correlations were found.

Table 41

Correlations Between 9th Grade Female Interscholastic Athletic Offerings and Independent Variables

	Female 9th Grade Athletics	MV/PI Aid Ratio	Student Enrollment 9-12
Female 9th Grade Athletics	1.00	.00 (134)	.47 (134)
MV/PI AR		1.00	-.47*** (473)
Student Enrollment			1.00

$^{***}p < .001$.

Table 42 presents the results of the linear regression for female 9th Grade athletic opportunities with student enrollment in grades 9-12 and MV/PI AR. According to this model, neither enrollment nor MV/PI AR are significant predictors of female 9th Grade athletic opportunities.

Table 42

Regression Analysis Between Female 9th Grade Interscholastic Athletic Offerings and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	-.000005	.000	-.032	-.346
MV/PI Aid Ratio	-.083	.867	-.009	-.096

$F_{(2,131)} = .060$, $p > .05$, $R^2 = .00$.

Table 43 presents the results of the correlation between junior varsity female athletics with MV/PI AR and student enrollment in grades 9-12. The number of junior varsity female athletics offered and MV/PI AR were strongly correlated: r (361) = -.61, p < .001. This represents an inverse relationship between MV/PI AR and junior varsity female athletics. As the amount of aid to a school increased, its female junior varsity athletic offerings decreased. The number of female junior varsity athletics offered and student enrollment in grades 9-12 were also strongly correlated: r (361) = .65, p < .001. As enrollment increased, the number of female junior varsity athletic offerings also increased.

Table 43

Correlations Between Female Junior varsity Interscholastic Athletic Offerings and Independent Variables

	Female JV Athletics	MV/PI Aid Ratio	Student Enrollment 9-12
Female JV Athletics	1.00	$-.61^{***}$ (363)	$.65^{***}$ (363)
MV/PI AR		1.00	$-.47^{***}$ (473)
Student Enrollment			1.00

$^{***}p < .001$.

Table 44 presents the results of the linear regression for female junior varsity athletic offerings with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a significant proportion of the total variation in female junior varsity offerings was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR are significant predictors of female junior varsity offerings: $F_{(2,360)} = 196.54$, $p < .001$, $R^2 = .52$. In addition, the unstandardized slope (.002) and standardized slope (.360) for total enrollment are statistically significantly different from 0: t (360) = 9.05, p <.001. In other words, an increase of

100 students will produce a .2 increase in female junior varsity offerings. Additionally, the unstandardized slope (-7.705) and standardized slope (-.498) for MV/PI AR are statistically significantly different from 0: t (360) = -12.51, p <.001. In other words, an increase of .1 in MV/PI/AR produced a .77 decrease in female junior varsity offerings. MV/PI AR is a more statistically significant predictor of female junior varsity offerings than school size. Multiple R squared indicates that approximately 52% of the variation in female junior varsity offerings was predicted by school size and SES.

Table 44

Regression Analysis Between Female Junior varsity Interscholastic Athletic Offerings and Independent Variables

Variable	B	SE	β	t-Score
Student Enrollment 9-12	.002	.000	.360	9.05^{***}
MV/PI AR	-7.705	.616	-.498	-12.51^{***}

$F_{(2,360)} = 196.54$, $p < .001$, $R^2 = .52$.
$^{***}p < .001$.

Table 45 presents the results of the correlation between female varsity athletics with MV/PI AR and student enrollment in grades 9-12. The number of female varsity athletic opportunities offered and MV/PI AR were moderately correlated: r (338) = -.65, p < .001. This represents an inverse relationship between MV/PI AR and female varsity athletics. As the amount of aid to a school increased, its female varsity athletic offerings decreased. The number of female varsity athletic opportunities offered and enrollment showed a strong correlation: r (338) = .72, p < .001. As enrollment increased, the number of female varsity-athletic opportunities offered also increased.

Table 45

Correlations Between Female Varsity Interscholastic Athletic Offerings and Independent Variable

	Female V Athletics	MV/PI Aid Ratio	Student Enrollment 9-12
Female V Athletics	1.00	$-.65^{***}$ (440)	$.72^{***}$ (440)
MV/PI AR		1.00	$-.47^{***}$ (473)
Student Enrollment			1.00

$^{***}p < .001$.

Table 46 presents the results of the linear regression for female varsity offerings with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a significant proportion of the total number of female varsity offerings was predicted by enrollment and MV/PI AR. Therefore, enrollment and the MV/PI AR were significant predictors of female varsity athletic offerings: $F_{(2,437)} = 309.60$, $p < .001$, $R^2 = .59$. In addition, the unstandardized slope (.002) and standardized slope (.463) for total enrollment are statistically significantly different from 0: t (437) = 13.73, p <.001. In other words, an increase of 100 students produced a .2 increase in female varsity athletic offerings. Additionally, the unstandardized slope (-7.988) and standardized slope (-.450) for MV/PI AR are statistically significantly different from 0: t (437) = -12.51, p <.001. In other words, an increase of .1 in MV/PI AR resulted in a .80 decrease in female varsity athletic offerings. Using this model, enrollment and SES accounted for an almost equal amount of the variance (t =13.73, t =-13.35).

Multiple *R* squared indicates that approximately 59% of the variation in female varsity-athletic offerings can be predicted by school size and SES.

Table 46

Regression Analysis Between Female Varsity Interscholastic Athletic Offerings and Independent Variables

Variable	*B*	*SE*	β	*t*-Score
Student Enrollment 9-12	.002	.000	.463	13.73^{***}
MV/PI Aid Ratio	-7.988	.598	-.450	-13.35^{***}

$F_{(2,437)} = 309.60$, $p < .001$, $R^2 = .59$.
$^{***}p < .001$.

Male athletic offerings with MV/PI aid ratio and student enrollment. Analysis of male interscholastic athletic offerings is presented and tabulated in the following section through descriptive, summary, and regression analyses. Table 47 presents the results of the correlation of male 9th Grade athletic offerings with MV/PI AR and student enrollment in grades 9-12. The number of male 9th Grade athletic opportunities offered and MV/PI AR indicated a weak association: r (283) = -.23, $p < .001$. This represents an inverse relationship between MV/PI AR and male 9th Grade athletic offerings. As the amount of aid to a school increased, its male 9th Grade athletic offerings decreased. Male 9th Grade athletic opportunities offered and enrollment indicated a weak association as well: r (283) = .33, $p < .001$.

Table 47

Correlations Between 9th Grade Male Interscholastic Athletic Offerings and Independent Variables

	Male 9th Grade Athletics	MV/PI Aid Ratio	Student Enrollment 9-12
Male 9th Grade Athletics	1.00	-.23*** (285)	.33*** (285)
MV/PI AR		1.00	-.47*** (473)
Student Enrollment			1.00

$^{***}p < .001$.

Table 48 presents the results of the linear regression for male 9th Grade athletic offerings with enrollment and MV/PI AR. The results of the regression analysis suggest that a small proportion of the total variation in male 9th Grade athletic offerings was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR are not significant predictors of 9th Grade athletic offerings: $F_{(2,282)} = 9.95$, $p < .001$, $R^2 = .07$. Multiple R squared indicates that only approximately 7% of the variation in male 9th Grade athletic offerings can be predicted by school size and SES.

Table 48

Regression Analysis Between Male 9th Grade Interscholastic Athletic Offerings and Independent Variables

Variable	*B*	*SE*	β	*t*-Score
Student Enrollment 9-12	.001	.000	.201	3.13**
MV/PI Aid Ratio	-.879	.608	-.093	-1.45

$F_{(2,282)} = 9.95$, $p < .001$, $R^2 = .07$.
$^{**}p < .01$.

The results of the correlation between male junior varsity athletic opportunities with 9th Grade athletic offerings and student enrollment in grades 9-12 are presented in Table 49. The number of male junior varsity athletic opportunities offered and MV/PI AR were strongly correlated: r (383) = -.61, p < .001. This represents an inverse relationship with the MV/PI AR and male junior varsity athletics. As the amount of aid to a school increased, its male junior varsity athletic offerings decreased. The number of male junior varsity athletic opportunities offered and enrollment were also strongly correlated: r (383) = .66, p < .001. As enrollment increased, the number of male junior varsity athletic opportunities offered also increased.

Table 49

Correlations Between Male Junior varsity Interscholastic Athletic Offerings and Independent Variables

	Male JV Athletics	MV/PI Aid Ratio	Student Enrollment 9-12
Male JV Athletics	1.00	-.61*** (385)	.66*** (385)
MV/PI AR		1.00	-.47*** (473)
Student Enrollment			1.00

***$p < .001$.

Table 50 presents the results of the linear regression for male junior varsity athletic offerings with student enrollment in grades 9-12 and MV/PI AR. The results suggest that a significant portion of the total variation in male junior varsity athletic offerings was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of male junior varsity athletic offerings: $F_{(2,382)}$ =210.69, $p < .001$, $R^2 = .53$. In addition, the unstandardized slope (.002) and standardized slope (.376) for total enrollment are statistically significantly different from 0: t (282) = 3.13, p <.001. In other words, an increase of 100 students was likely to produce a .2 increase in male junior varsity athletic offerings. Additionally, the unstandardized slope (-7.645) and standardized slope (-.487) of MV/PI AR are statistically significantly different from 0: t (282) = -12.66, p <.001. In other words, an increase of .1 in MV/PI AR was likely to result in a .76 decrease in male junior varsity athletic offerings. Using this model, SES accounts for a larger portion of the variation in male junior varsity athletic offerings than school size. Multiple *R* squared indicates that approximately 59% of the variation in male junior varsity athletic offerings is predicted by school size and SES.

Table 50

Regression Analysis Between Male Junior varsity Interscholastic Athletic Offerings and Independent Variables

Variable	*B*	*SE*	β	*t*-Score
Student Enrollment 9-12	.002	.000	.376	3.13^{***}
MV/PI AR	-7.645	.604	-.487	-12.66^{***}

$F_{(2,382)} = 210.69$, $p < .001$, $R^2 = .53$.
$^{***}p < .001$.

The results of the correlation between male varsity athletics with MV/PI AR and student enrollment in grades 9-12 are presented in Table 51. The number of male varsity athletic opportunities and MV/PI AR were strongly correlated: $r\ (441) = -.61$, $p < .001$. This represents an inverse relationship with MV/PI AR and male varsity athletics. As the amount of aid to a school increased, its male varsity athletics offerings decreased. The number of male varsity athletic opportunities offered and student enrollment in grades 9-12 were very strongly correlated: $r\ (441) = .80$, $p < .001$. As enrollment increased, the number of male varsity athletic opportunities offered also increased.

Table 51

Correlations Between Male Varsity Interscholastic Athletic Offerings and Independent Variables

	Male V Athletics	MV PI Aid Ratio	Student Enrollment 9-12
Male V Athletics	1.00	-.61*** (443)	.80*** (443)
MV/PI AR		1.00	-.47*** (473)
Student Enrollment			1.00

***$p < .001$.

Table 52 presents the results of the linear regression for male varsity athletic offerings with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a significant proportion of the total variation in male varsity athletic offerings was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of male varsity athletic offerings: $F_{(2,440)}$ =321.28, $p < .001$, $R^2 = .59$. In addition, the unstandardized slope (.003) and standardized slope (.554) for total enrollment are statistically significantly different from 0: t (440) = 16.64, p <.001. In other words, an increase of 100 students was likely to produce a .3 increase in male varsity athletic offerings. Additionally, the unstandardized slope (-5.919) and standardized slope (-.355) for MV/PI AR are statistically significantly different from 0: t (440) = -10.69, p <.001. In other words, an increase of .1 in MV PI/AR should produce a .59 decrease in male varsity athletic offerings. Using this model, school size accounts for a slightly larger portion of the variation in male varsity athletic offerings compared to SES. Multiple R squared indicates that approximately 59% of the variation in male varsity athletic offerings is likely to be predicted by school size and SES.

Table 52

Regression Analysis Between Male Varsity Interscholastic Athletic Offerings and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.003	.000	.554	16.64***
MV PI Aid Ratio	-5.919	.55	-.355	-10.69***

$F_{(2,440)}$ =321.28, $p < .001$, $R^2 = .59$.
***$p < .001$.

This descriptive and inferential analyses for Research Question #3 indicate that interscholastic athletic offerings will increase as the size of the school increases. The athletic offerings will also increase as the school's SES increases. The significance increases when comparing varsity athletics for both males and females. Female and male 9th Grade athletics do not indicate as strong a relationship. SES is a more significant factor than school size for all of the athletic indicators, with the exception of male varsity athletics. This is consistent with the advanced academic offerings relationship findings for size and SES.

Research Question #4: What is the relationship between the size of a high school, the SES of the school, and the per-student enrollments in interscholastic athletic opportunities?

Overview of interscholastic athletic enrollment. Both descriptive and inferential statistics were calculated for interscholastic athletic enrollments per student. Descriptive statistics included mean, SD, minimum, and maximum. In addition, Spearman correlations were calculated for all pairs of variables because the data did not follow a normally distributed pattern. Linear regression analysis was performed on all of the athletic enrollments per student.

Descriptive analysis to compare the enrollments in the interscholastic athletic offerings with the four school size classifications is presented in Table 53. Contrary to advanced-course offerings, advanced-course enrollments, and athletic offerings, the enrollment per student decreased as the size of the school increased. In essence, the larger the school, the fewer students participating in relation to the total number of students in the school. Male students in small schools had a per-student enrollment in varsity athletics at a rate of .68, compared to .31 for male students in large schools. The gap was wide for females as well. Female students in small schools had a per-student enrollment in varsity athletics at a rate of .51 compared to .26 for female students in large schools.

Table 53

Interscholastic Athletic Enrollment per Student with Size Classification Comparison

	Large (n=57)		Medium-Large (n=145)		Medium-Small (n=154)		Small (n=117)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Female 9th	.18	.20	.24	.27	.50	.51	.67	.47
Female JV	.15	.10	.19	.10	.19	.08	.23	.12
Female V	.26	.13	.33	.17	.44	.15	.51	.21
Male 9th	.32	.19	.38	.23	.42	.37	.71	.67
Male JV	.19	.13	.23	.10	.24	.10	.32	.17
Male V	.31	.13	.40	.11	.56	.16	.68	.23

Female athletic enrollments per student with MV/PI aid ratio and student enrollment. Female 9th Grade athletics enrollment per student and MV/PI AR were not correlated. These results are found in Table 54. However, the female 9th Grade athletics enrollment per student and student enrollment in grades 9-12 were moderately correlated: *r* (121)

= -.44, $p < .001$. This analysis indicates an inverse relationship between the size of the school and per-student enrollment. As a school's total enrollment increased, the per-student enrollment in female 9th Grade athletics decreased.

Table 54

Correlations Between 9th Grade Female Interscholastic Athletic Enrollment and Independent Variables

	Female 9^{th}-Grade Athletic Enrollment	Female 9th Grade Athletic Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
Female 9th Grade Athletic Enrollment	1.00	$.82^{***}$ (123)	-.08 (134)	.07 (134)
Female 9th Grade Athletic Enrollment per Student		1.00	.16 (123)	$-.44^{***}$ (123)
MV/PI AR			1.00	$-.47^{***}$ (473)
Student Enrollment				1.00

-
$^{***}p < .001$.

Table 55 presents the results of the linear regression for female 9th Grade enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a proportion of the total variation in female 9th Grade enrollment per student was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of female 9th Grade enrollment per student: $F_{(2,120)}$ =11.99, $p < .001$, R^2 = .17. Multiple R squared indicates that approximately 17% of the variation in female 9th Grade enrollment per student was predicted by school size and SES.

Table 55

Regression Analysis Between Female 9th Grade Interscholastic Athletic Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	0.000	0.000	-0.371	-4.21^{***}
MV/PI AR	0.180	0.181	0.088	0.99

$F_{(2,120)} = 11.99$, $p < .001$, $R^2 = .17$.
$^{***}p < .001$.

The female junior varsity athletics enrollment per student and MV/PI AR and total enrollment indicated a weak association: r (353) = -.27, $p < .001$ and r (363) = -.21, $p < .001$ respectively (Table 56). This analysis indicates an inverse relationship between the size of the school and enrollment in female junior varsity athletics. As a school's total enrollment increased, the per-student enrollment in female junior varsity athletics decreased. In addition, there was an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per-student enrollment in female junior varsity athletics decreased.

Table 56

Correlations Between Female Junior varsity Interscholastic Athletic Enrollment and Independent Variables

	Female JV Athletic Enrollment	Female JV Athletic Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
Female JV Athletic Enrollment	1.00	$.46^{***}$ (353)	$-.62^{***}$ (363)	$.69^{***}$ (363)
Female JV Athletic Enrollment per Student		1.00	$-.27^{***}$ (353)	$-.21^{***}$ (363)
MV/PI AR			1.00	$-.47^{***}$ (473)
Student Enrollment				1.00

$^{***}p < .001$.

Table 57 presents the results of the linear regression for female junior varsity athletic participation per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a portion of the variation in female junior varsity athletic participation per student was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of female junior varsity athletic participation per student: $F_{(2,350)}$ =52.51, $p < .001$, $R^2 = .23$. In addition, the unstandardized slope (-0.000007) and standardized slope (-.415) for total enrollment are statistically significantly different from 0: t (350) = -8.096, p <.001. In other words, an increase of 100 students would likely result in a .007 decrease in female junior varsity athletic participation per student. Additionally, the unstandardized slope (-.268) and standardized slope (-.462) for MV/PI AR are statistically significantly different from 0: t (350) = -9.011, p <.001. In other words, an increase of .1 in MV/PI AR was likely to produce a .27 decrease in female junior varsity participation per student. Using this model, school size accounted for a slightly larger portion of the variation in female junior varsity athletic participation per student compared to SES. Multiple R squared indicates that approximately 23% of the variation in female junior varsity participation per student was the result of school size and SES.

Table 57

Regression Analysis Between Female Junior varsity Athletic Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	-0.000007	0.000	-0.415	-8.096^{***}
MV/PI AR	-0.268	0.030	-0.462	-9.011^{***}

$F_{(2,350)}$ =52.51, p < .001, R^2 = .23.
$^{***}p$ < .001.

The female varsity athletics enrollment per student and MV/PI AR indicated a moderate association: r (417) = -.53, p < .001 (Table 58). This indicated an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per-student enrollment in female junior varsity athletics decreased. Table 57 also presents female varsity athletics enrollment per student and student enrollment 9-12 are not significantly associated: r (417) = -.04.

Table 58

Correlations Between Female Varsity Interscholastic Athletic Enrollment and Independent Variables

	Female V Athletic Enrollment	Female V Athletic Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
Female V Athletic Enrollment	1.00	.08 (417)	$-.60^{***}$ (440)	$.73^{***}$ (473)
Female V Athletic Enrollment per Student		1.00	-.04 (417)	$-.53^{***}$ (417)
MV/PI AR			1.00	$-.47^{***}$ (473)
Student Enrollment				1.00

$^{***}p < .001$.

Table 59 presents the results of the linear regression for female varsity athletic enrollment per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a proportion of the total variation in female varsity athletic enrollment per student was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of female varsity athletic participation per student: $F_{(2,415)}$ =97.101, $p <$ .001, R^2 = .32. In addition, the unstandardized slope (000) and standardized slope (-.616) for total enrollment are not statistically significantly different from 0: t (415) = -13.906, p <.001. Therefore, one cannot make any predictions based on this model. Additionally, the unstandardized slope (-.285) and standardized slope (-.285) for MV/PI AR are statistically significantly different from 0: t (415) = -6.440, p <.001. In other words, an increase of .1 in

MV/PI AR resulted in a .0285 decrease in female varsity athletic participation per student. Using this model, SES accounted for a larger portion of the variation in female varsity athletic enrollment per student than school size. Multiple *R* squared indicates that approximately 32% of the variation in female varsity athletic enrollment per student was predicted by school size and SES.

Table 59

Regression Analysis Between Female Varsity Interscholastic Athletic Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	0.000	0.000	-0.616	-13.906^{***}
MV/PI AR	-0.285	0.044	-0.285	-6.440^{***}

$F_{(2,415)} = 97.101$, $p < .001$, $R^2 = .32$.
$^{***}p < .001$.

Male athletic enrollment per student with MV/PI aid ratio and student enrollment. The analysis of male participation in interscholastic athletics is presented in the following section, including descriptive, summary, and regression analyses. Table 60 presents the results of the correlation for male 9th grade athletic offerings with MV/PI AR and student enrollment in grades 9-12. The number of male 9th grade athletic offerings and MV/PI AR were weakly associated: r (283) = -.23, $p < .001$. This represents an inverse relationship between MV/PI AR and male 9th grade athletic offerings. As the amount of aid to a school increased, it's male 9th grade athletic offerings decreased. Male 9th grade athletic offerings and student enrollment in grades 9-12 were also weakly associated: r (283) = .33, $p < .001$.

Table 60

Correlations Between Male 9th Grade Interscholastic Athletic Enrollment and Independent Variables

	Male 9th Grade Athletic Enrollment	Male 9th Grade Athletic Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
Male 9th Grade Athletic Enrollment	1.00	$.70^{***}$ (269)	$-.35^{***}$ (278)	$.54^{***}$ (278)
Male 9th Grade Athletic Enrollment per Student		1.00	.03 (269)	-.12 (269)
MV/PI AR			1.00	$-.47^{***}$ (473)
Student Enrollment				1.00

$^{***}p < .001$.

Table 61 presents the results of the linear regression for male 9th grade athletic participation per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a small proportion of the total variation in male 9th grade athletic participation per student was predicted by enrollment and 9th grade athletic participation. Therefore, enrollment and MV/PI AR were not significant predictors of male 9th grade athletic participation per student: $F_{(2,266)} = 7.68$, $p < .01$, $R^2 = .055$. Multiple R squared indicates that approximately 5.5% of the variation in male 9th grade athletic participation per student is predicted by school size and SES.

Table 61

Regression Analysis for Male 9th Grade Interscholastic Athletic Enrollment per Student

Variable	*B*	*SE*	β	*t*-Score
Student Enrollment 9-12	0.000	0.000	-0.243	-3.68^{***}
MV/PI AR	-0.050	0.142	-0.023	0.36

$F_{(2,266)} = 7.68$, $p < .01$, $R^2 = .055$.
$^{***}p < .001$.

Additionally, the male junior varsity athletic enrollment per student and MV/PI AR and total enrollment are weakly associated: r (373) = -.18, $p < .001$ and r (373) = -.31, $p < .001$ respectively (Table 62). This analysis indicates an inverse relationship between the size of the school and enrollment in male junior varsity athletics. As a school's total enrollment increased, the per student enrollment in male junior varsity athletics decreased. In addition, there was an inverse relationship with the MV/PI AR. As the MV/PI AR increased, the per-student enrollment in male junior varsity athletics decreased.

Table 62

Correlations Between Male Junior varsity Interscholastic Athletic Enrollment and Independent Variables

	Male JV Athletic Enrollment	Male JV Athletic Enrollment per Student	MV PI Aid Ratio	Student Enrollment 9-12
Male JV Athletic Enrollment	1.00	.30*** (375)	-.58*** (278)	.75*** (278)
Male JV Athletic Enrollment per Student		1.00	-.18*** (375)	-.31*** (269)
MV/PI AR			1.00	-.47*** (473)
Student Enrollment				1.00

***$p < .001$.

Table 63 presents the results of the linear regression for male junior varsity athletic participation per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a proportion of the total variation in male junior varsity athletic participation per student was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of male junior varsity athletic participation per student: $F_{(2,372)}$ =38.33 $p < .001$, $R^2 = .17$. In addition, the unstandardized slope (-.000008) and standardized slope (-.419) for total enrollment are statistically significantly different from 0: t (372) = -8.13, p <.001. In other words, an increase of 100 in enrollment resulted in a .008 decrease in male junior varsity athletic participation per student. Additionally, the unstandardized slope (-.227) and standardized slope (-.323) for MV PI/AR are statistically significantly different from 0: t (372) = -6.26, p <.001. In other words, an increase of .1 in MV/PI AR resulted in a .023 decrease in male junior varsity participation per student. Using this model, SES accounted for a larger portion of the variation in male junior varsity participation per student than school size. Multiple R squared indicates that approximately 17% of the variation in male junior varsity athletic participation per student could be predicted by school size and SES.

Table 63

Regression Analysis Between Male Junior varsity Interscholastic Athletic Enrollment per Student and Independent Variables

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	-0.000008	0.000	-0.419	-8.13^{***}
MV/PI AR	-0.227	0.036	-0.323	-6.26^{***}

$F_{(2,372)}$ =38.33 p < .001, R^2 = .17.
$^{***}p$ < .001.

Male varsity athletic participation per student and MV/PI AR were not correlated. On the other hand, male varsity athletic participation per student and student enrollment in grades 9-12 were strongly correlated: r (420) = -.69, p < .001 (Table 64). This analysis indicates an inverse relationship between the size of the school and participation in male varsity athletics. As a school's total enrollment increased, the per-student participation in male varsity athletics decreased.

Table 64

Correlations Between Male Varsity Interscholastic Athletic Enrollment and Independent Variables

	Male V Athletic Enrollment	Male V Athletic Enrollment per Student	MV/PI Aid Ratio	Student Enrollment 9-12
Male V Athletic Enrollment	1.00	$.19^{***}$ (422)	$-.67^{***}$ (443)	$.78^{***}$ (443)
Male V Athletic Enrollment per Student		1.00	.14 (422)	$-.69^{***}$ (422)
MV/PI AR			1.00	$-.47^{***}$ (473)
Student Enrollment				1.00

$^{***}p < .001$.

Table 65 presents the results of the linear regression for male varsity athletic participation per student with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a portion of the total variation in male varsity athletic participation per student was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of male varsity athletic participation per student: $F_{(2,420)} = 138.42$ $p < .001$, $R^2 = .40$. Additionally, the unstandardized slope (-.215) and standardized slope (-.180) for MV PI/AR are statistically significantly different from 0: t (420) = -4.33 $p < .001$. In other words, an increase of .1 in MV/PI AR should produce a .022 decrease in male varsity athletic participation per student. Using this model, SES accounted for a larger portion of the variation in male varsity athletic involvement per student than school size. Multiple R squared indicates that approximately 40% of the variation in male varsity athletic participation per student was predicted by school size and SES.

Table 65

Regression Analysis for Male Varsity Athletic Enrollment per Student

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	-0.000	0.000	-0.681	-16.44^{***}
MV/PI AR	-0.215	0.050	-0.180	-4.33^{***}

$F_{(2,420)} = 138.42$ $p < .001$, $R^2 = .40$.
$^{***}p < .001$.

Participation per student in interscholastic athletics is connected to school size. Unlike the number of athletic offerings, where the larger the school the more offerings for students, the enrollment per student ratio actually decreased as the schools increased in size. The researcher found the overall model significant in respect to offerings and enrollment with size and SES. One can make strong predictions about student involvement in athletics based on total student population and SES. For female athletics, those two variables combined accounted for 23% of the variance in junior varsity and 32% for varsity athletic participation per student. This finding also held true for male participation per student. Combining both student enrollment and SES accounts for 17% of the variance in junior varsity and 40% in varsity athletics. In other words, student enrollment and SES together accounted for half of the factors determining the participation in athletics per student. We then can predict with 95% confidence the number of athletic offerings using student enrollment and MV/PI AR.

Secondary Analysis of Outliers

Once the data analysis examining the level of relationship between size, SES, and educational opportunities was completed, a secondary analysis was conducted. The secondary analysis examined the extent of how well the regression model fit the observed data by further investigating the anomalies found. A new variable was constructed to calculate the total number of AP Course offerings per high school.

Through the initial data collection and analysis process, the researcher noticed several schools that did not follow the trend in offerings for AP courses. Of small schools (under 400 students), seven offered seven or more AP courses. By contrast, 151 schools with over 400 students offered fewer than seven AP courses. So size alone does not explain the number of AP courses offered by a school. When taking into account the MV/PI AR, one may assume that the small schools with a relatively high number of AP courses had a relatively high SES status. This was true for three of the seven, which had an MV/PI AR lower than .40. The mean SD for all school was found to be .56, as indicated in Table 6 (p. 92). The mean MV/PI AR for the seven small schools was .56, with a SD of .172. However, four of the small schools had an MV/PI AR of over .67.

Next, small-medium-sized schools (401-799 students) were examined. Of the 154 small-medium schools, 10 offered 10 or more AP courses. When looking at MV/PI AR, only three of them had an MV/PI AR under .40. Furthermore, three had an MV/PI AR over .72. In fact, one of these schools is in the 6^{th}-poorest school district in the state according to MV/PI AR.

The data revealed that medium-large schools (800-1,599 students) did not follow the same pattern as small schools. Twenty of the 145 medium-large schools offered more than 15 AP courses. However, none of these schools had a high MV/PI AR. The higher SES score would most likely help identify the reasons these schools offer more AP courses than schools of similar size. In fact, when looking at the 43 medium-large schools that offer fewer than five AP courses, 24 had an MV/PI AR over the mean of .56. However, four schools had an MV/PI AR under .40.

Finally, large schools (1,600 or more students) were examined. There are no real outliers in the large-school grouping. Only nine of the 57 large schools offered fewer than five AP courses. SES most likely was a factor, as six of the nine schools had an MV/PI AR over .56. Twenty-two large schools offered 15 or more AP courses, and 20 of them had an MV/PI AR under .40.

The second phase of the secondary analysis included regression analysis and outlier examination. Field (2010) states, "[A]n outlier is a case that differs substantially from the main trend of the data" (p. 215). Examining the outliers through diagnostics is a way for researchers to determine the strength of their regression and assessing the model. However, it should be noted that when outliers are found to be significantly different from the predicted values, one should look for ways to study these points to determine why they did not fit the model (Field, 2010).

Table 66 represents the residual statistics for the regression for total AP Course offerings with student enrollment in grades 9-12 and MV/PI AR as predictors. Diagnostic measures were performed to determine whether the outliers were having an effect on the regression. According to Field (2010), the residual terms should be correlated. This assumption is tested with the Durbin-Watson test. Test values can range between 0 and 4, with 2 indicating that the residuals are uncorrelated (Field 2010, p. 220). Several additional diagnostics were performed. The residuals and standardized residuals were compared for each school. The Cook's Distance statistic and the Mahalanobis distance were also calculated. The residuals are examined to determine what values may be significant outliers. Cook's Distance represents the overall influence of a case on the model (Field, 2010, p. 217), while the Mahalanobis Distance measures the distance of cases from the mean of the predictor variable (Field, 2010, p. 217).

Table 66

Residual Statistics for Total AP Course Offerings Regression Analysis

Residual	Mean	SD	Minimum	Maximum
Predicted Value	6.14	3.91	.02	20.10
Adjusted Predicted Value	6.14	3.91	-.02	20.07
Residual	0	3.38	-12.07	11.67
Standardized Residual	0	1.00	-3.57	3.46
Mahalanobis Distance	113	3.03	.003	33.19
Cook's Distance	.013	.01	0	.20

N=473.

This regression (*d* =1.96) indicated that the residuals are uncorrelated. All schools that had a standardized residual over 2.00 were marked for further examination. Of the 473 schools in the data set, 26 had a standardized residual over 2.00. Thirteen of them under-predicted, and 13 over-predicted. Furthermore, there were four schools with standardized residuals over 3.00. Two under-predicted, and two over-predicted. In examination of the Cook's Distance, any value over one would be a cause for concern (Field, 2010). There are no values of the data set with a Cook's Distance over one. Field (2010) indicates any The Mahalanobis Distance greater than 25 for a sample size of 500 should be examined. For an n = 473, then any cases over 23.65

(473/500 * 25) should be examined. There was one school (Case #346) with a Mahalanobis Distance (33.19) over 23.65. Therefore, the regression does not need to be repeated with the outliers removed.

All AP courses offered per school were summarized through SPSS for analysis. Table 67 presents the results of the linear regression for total AP Course offerings with student enrollment in grades 9-12 and MV/PI AR. The results of the regression analysis suggest that a portion of the total variation in total AP Course offerings was predicted by enrollment and MV/PI AR. Therefore, enrollment and MV/PI AR were significant predictors of total AP Course offerings ($F_{(2,471)}$ =314.54 $p < .001$, $R^2 = .57$). Additionally, the unstandardized slope (-13.847) and standardized slope (.991) for MV PI/AR are statistically significantly different from 0: t (471) = -.463 p <.001. In other words, an increase of .1 in MV/PI AR would produce a decrease of 1.385 in total AP Course offerings. Using this model, SES and school enrollment accounted for similar variation in total AP Course offerings. The multiple regression *R*- squared value indicates that approximately 57% of the variation was predicted by school size and SES.

Table 67

Regression Analysis for Total AP Course Offerings

Variable	*B*	*SE*	*β*	*t*-Score
Student Enrollment 9-12	.004	0.000	.437	-13.21***
MV/PI AR	-13.847	0.991	-.463	-13.98***

$F_{(2,471)}$ =314.54 p < .001, R^2 = .57.

***p < .001.

Table 68 presents the summary diagnostics of the 26 outliers as determined through the regression analysis for the total AP Course offerings with MV/PI AR and total enrollment 9-12. Of the nine large schools found in the set of outliers, seven of them had a total predicted value of AP courses higher than the actual number offered as predicted by the regression equation. For the medium-large schools, seven of the 12 offered more AP courses than predicted, while the four medium-small schools all offered more AP courses than predicted. In examining MV/PI AR, 14 schools fell into the lowest 25th percentile (.457 or lower). Eight of these schools offered fewer AP courses than predicted by the regression equation. Of the five schools within the middle 50th percentile, three offered more AP courses than predicted. Finally, four of the seven schools in the highest 25th percentile of MV/PI AR offered more AP courses than predicted.

Table 68

Outlier Residual Diagnostics Summary

Case	Size Classification	9-12 Enrollment	MV PI Aid Ratio	Std. Residual	Total AP Courses	Predicted Value	Residual
3	Medium Large	1144	0.775	2.266	12	4.34	7.663
20	Medium Large	1471	0.573	2.551	17	8.37	8.630
31	Large	2786	0.479	-2.269	7	14.67	-7.674
36	Medium Large	840	0.574	2.670	15	5.97	9.031
77	Medium Large	1448	0.285	-2.446	4	12.27	-8.272
102	Large	2582	0.268	2.418	25	16.82	8.178
108	Large	1720	0.574	3.458	21	9.33	11.696
110	Medium Large	1190	0.294	2.314	19	11.17	7.826
117	Medium Large	839	0.478	-2.156	0	7.29	-7.291
134	Medium Large	1421	0.236	2.113	20	12.85	7.148
136	Medium Large	1222	0.425	-2.801	0	9.48	-9.476
141	Medium Large	1522	0.337	-2.614	3	11.84	-8.840
147	Medium Large	1235	0.150	2.857	23	13.33	9.665
161	Large	3219	0.660	-2.605	5	13.81	-8.812
162	Large	2160	0.423	-3.569	1	13.07	-12.071
228	Large	2680	0.279	-2.970	7	17.05	-10.047
234	Large	1730	0.385	-3.240	1	11.96	-10.961
266	Medium Large	1068	0.424	-2.339	1	8.91	-7.911
294	Medium Small	506	0.721	2.762	12	2.66	9.341
316	Medium Small	716	0.721	2.230	11	3.46	7.542
334	Large	2001	0.646	-2.771	0	9.37	-9.374
343	Medium Small	614	0.150	2.077	18	10.97	7.026

Table 68 Cont.

346	Large	3335	0.886	-2.697	2	11.12	-9.121
368	Small	113	0.307	-2.037	0	6.89	-6.891
369	Medium Small	557	0.822	2.526	10	1.46	8.544
431	Medium Large	1168	0.323	3.050	21	10.68	10.316

Summary

The purpose of this study was to determine the relationship between high-school size, SES, and educational opportunities for students. This chapter described the results of the data analysis. Descriptive analysis provided an overall perspective on school configuration and classification. The results were tabulated and summarized for each research question. Data analysis was presented through descriptive and summary statistics for school size and classification. Bivariate correlations were computed for all interval/ratio independent and dependent variables. Multinomial regression analysis compared AP/Honors Course offerings with enrollment and SES. Overall, linking size, SES, and educational opportunities produced significant findings. Model summaries indicated a significant number of predictors for the dependent variables looking at student enrollment and MV/PI AR. There was a clear relationship between the size and SES of a school and the advanced-course offerings available to students. Furthermore, the number of interscholastic athletic opportunities available to students was also related to the size of the school and the SES. Most interesting was the relationship of the enrollments in these courses and athletics with school size and SES. A secondary analysis was also conducted to examine the schools that did not follow the pattern of most. Chapter V discusses the implications of the findings for school administrators, school boards, and legislatures.

CHAPTER V

FINDINGS, DISCUSSION, AND RECOMMENDATIONS

The idea that public education should be mandated for all children and provide equal access for them dates back to the 1700s (Cubberly, 1922). Theorists such as Jefferson, Rousseau, Mann, and Dewey all helped form our current educational system. A free and equal public education for all finally took hold nationally in the late 1800s, catalyzed by the work of Horace Mann (Sobe, 2011). The notion that public education should be relatively equal for all students regardless of their ethnicity, race, gender, or social status has since become fundamental to our society. But is our public education system really providing students an education of equal quality with equal access? The purpose of this study was to examine the relationship between the size of Pennsylvania high schools and their socioeconomic conditions with the educational opportunities, both academic and athletic, that they provide. This study answered the following questions:

1. What is the relationship between the size of a high school, the socioeconomic status of its population, and the number of advanced educational opportunities offered to students?
2. What is the relationship between the size of a high school, the socioeconomic status of its population, and students enrolling in advanced educational opportunities?
3. What is the relationship between the size of a high school, the socioeconomic status of its population, and the number of athletic opportunities (official school sports) available to students across genders?
4. What is the relationship between the size of a high school, the socioeconomic status of its population, and the number of students participating in athletic opportunities available across genders?

By examining data for 473 public high schools reported to the Pennsylvania Department of Education (PDE), this study built a deeper understanding of the extent of the role which the size of a school and its socioeconomic status play in the opportunities provided to students. In addition, this research sought to more clearly describe the relationship between a school's size, SES, and the rate at which its students participate in or access such offerings. Moreover, this study connects with previous research examining other aspects surrounding school size and structure. The findings discussed in this chapter both support and contradict other research in the field.

The study was designed to analyze four distinct sets of quantitative data. They were advanced level course offerings and enrollments (AP and honors), total school enrollment data for students in grades 9-12, interscholastic athletic offerings and enrollments, and financial indicators as defined by the Market Value/Personal Income Aid Ratio (MV/PI AR). Advanced level course work and athletics were used in this study as they have been shown to provide benefits for students. Research has shown that students who participate in advanced level courses while in high school derive many benefits. Those students are looked at more favorably by college admissions offices, are more prepared for college, and perform better in college (Dougherty, Mellor, & Jian, 2006; Keng & Dodd, 2008). In addition, these students graduate more rapidly and earn a higher lifetime wage (Geiser & Santelices, 2004; Morgan & Maneckshana, 2000; Sathre & Blanco, 2006) than those students who do not enroll in AP courses. Participating in athletics in high school has been linked to benefits for students including increased motivation, time management, engagement, parental involvement, achievement (Darling, Caldwell, & Smith, 2005; Fredericks & Eccles, 2006), and a decrease in disciplinary incidents (O'Bryan, Braddock, & Dawkins, 2008; Taliaferro, Rienzo, & Donovan, 2010). These links lay the foundation for explaining why such research is important. Although recent literature indicates that larger high schools increase opportunity for students, the question remains, by how much? Furthermore, literature into socioeconomic status also indicates that wealthy schools offer more for students, but again by how much? This study provides further clarity on these points regarding the effect of SES and size.

Summary of Research Findings

For the purpose of this study, large schools have enrollments of more than 1,600 students, medium-large schools enroll between 800 and 1,599, medium-small schools enroll between 401 and 799, and small schools have total enrollments of 400 or fewer. Presented below is a list of key findings that emerged through analysis of data from 473 Pennsylvania public high schools.

- The size of the school has an influence on the number of Advanced-Placement (AP) and honors-level offerings. Larger schools offer more AP and honors courses than smaller schools.
- The size of the school has an influence on the number of interscholastic athletic offerings. Larger schools offer more interscholastic athletic opportunities than smaller schools for both males and females.
- Socioeconomic status (SES) has an influence on advanced-course offerings. Regardless of size, schools with a higher SES (as measured by MV/PI AR) offer more AP and honors courses.
- Socioeconomic status has an influence on interscholastic athletic offerings. Regardless of size, schools with a higher SES (as measured by MV/PI AR) offer more athletic offerings for both males and females.

- The size of a high school has an influence on the student participation rates in advanced level courses. Larger schools have a higher per-student enrollment in AP and honors courses.
- The size of a high school has an influence on the student participation rates in interscholastic athletics. Smaller schools have a larger per-student enrollment in athletics of both males and females.
- The combined effect of size and SES with advanced level course offerings and participation is highly significant.
- The combined effect of size and SES with interscholastic athletic offerings and participation is highly significant.
- In Pennsylvania, there is large variation in size, structure, and socioeconomic status of high schools.
- In Pennsylvania, larger schools have a higher SES than smaller schools.
- Regardless of size or socioeconomic status, there are a number of schools one would consider outliers: small schools with more AP Course offerings, large schools with few AP offerings, and poorer schools with more AP offerings.
- In Pennsylvania, AP English is the most common AP course offered by public high schools.
- In Pennsylvania, AP Social Studies has the highest student enrollment in public high schools.

Discussion of Findings

In order to provide context to the discussions related to this study's research questions, general information revealed through the data analysis is presented. Pennsylvania has a wide variety of high schools in terms of size, structure, and socioeconomic status of the community. Previous research indicates that despite a movement towards large schools and consolidation, small- to medium-sized schools still outnumber large schools (Rooney & Augenblick, 2009). This researcher had similar findings. Examination of 473 public high schools revealed only 57 had more than 1,600 students. Two hundred seventy-one high schools had 800 students or fewer. The graduating class size ranged from 23 students per class to 841. Grade-level configuration also varied across the Commonwealth, but traditional high schools with students in grades 9-12 make up the majority of the high schools. There were 364 (77%) schools with students in grades 9-12 on one campus or building. The socioeconomic status also varies significantly within the state. Analysis revealed that the appraised market values of land and buildings in school districts ranged from over $91 million to just over $44 billion. This range is startling considering how much SES can impact students' achievement and opportunity.

When combining size and SES, the analysis revealed even more profound findings. Pennsylvania is one of the most rural states in our nation (Hillman, 2003), but it also has several large urban areas and a large number of suburban school districts with medium-large or large high schools. The average MV/PI AR found in this study was .560; however, the average MV/PI AR was .450 for large schools and .667 for small schools. Even more surprising is that of the school districts found in the top 25th percentile for wealth, only 14 (12%) of the 118 had fewer than 800 students. Of school districts in the lowest 25th percentile for wealth, only 24 (20%) of the 118 schools had more than 800 students. This indicates that larger schools in Pennsylvania are generally found in wealthy areas. These larger schools are most likely in suburban communities, while small schools are in rural areas. The diverse community settings in

Pennsylvania may account for this difference (Hillman, 2003). However, urban areas such as Philadelphia, Pittsburgh, Reading, and Allentown also have larger high schools.

Research Question #1

This section discusses specific findings of the dissertation as they relate to the existing literature. Research Question 1 was designed to find the relationship between the size of a high school, its SES, and the number of advanced educational opportunities offered to students. Both descriptive and inferential analyses were conducted. Previous research in the field indicated that as a school increases in student population or SES, the course offerings also increase (Leithwood & Jantzi, 2009; Monk & Haller, 1993; PSBA, 2011). Analysis for this dissertation revealed a clear and significant relationship between both the size of a school and SES to the number of advanced level courses offered. These findings are consistent with other research in the field.

Through examination of the four school size categories, some distinct patterns were discovered. As the size of the school increased, the number of AP and honors courses increased significantly. This showed a direct relationship between the size of a school and the number of advanced level course offerings it provided. Analyzing the continuum of high school size classifications indicates that, regardless of AP Course area, large schools offered more. This was also found to be true for honors courses. These findings are similar to other research which indicated that size plays a role in academic offerings (Hicks & Rusalkina, 2004; Lay, 2007; Leithwood & Jantzi, 2011; Monk & Haller, 1993; PSBA, 2011).

Further analysis of the AP Course offerings also provided interesting results. Monk and Haller (1993) found that regardless of size, math and science were the most common advanced level courses offered. They also found that the fewest AP courses offered were in social studies. This researcher found that AP English courses were the most commonly offered, with 76% of all high schools in Pennsylvania offering at least one AP English course. AP Science and AP Social Studies both were offered by the same percentage of high schools (68%). This finding is not consistent with the work of Monk and Haller (1993) but aligns with recent information provided by the College Board (2015) regarding AP exam participants. The differences could be explained by the fact that there is 25-year gap in the studies as well as methodology differences. Monk and Haller (1993) used a meta-analysis to examine all course offerings in a school, not just advanced level courses. This dissertation is specific to Pennsylvania and only looked at advanced level courses by examining AP and honors courses, which were not as frequently offered in the late 1980s and early 1990s. Combining the existing research demonstrating the positive effects of AP programs with the results of this study provides decision-makers in small schools with concrete data showing that students in their schools do not have the same benefits as students in larger schools (Hicks & Rusalkina, 2004; Lay, 2007; Leithwood & Jantzi, 2011; Monk & Haller, 1993; PSBA, 2011).

Duncombe and Yinger (2005) found that MV/PI AR has an even stronger correlation with advanced level courses than total student enrollment. The findings in this study are consistent with their results and employed a similar indicator to measure SES, in place of using free or reduced price lunch as the SES indicator. In short, MV/PI AR was a more significant predictor of the likelihood of advanced level courses being offered than school size. There was a clear and significant correlation between the wealth of a school district and the number of advanced level courses offered. This finding is also consistent with that of previous research in the field when using other SES indicators (Hicks & Rusalkina, 2004; Lay, 2007; Lindahl & Cain, 2012).

These results are extremely important when looking at providing students equal access to educational opportunities. Simply put, students who attend a medium-large to large school are likely to have a significant advantage over students who attend smaller schools in accessing advanced level courses. Even more disturbing, students who attend schools in lower-income communities have an even smaller opportunity to access these courses. This is indicated through this dissertation but also substantiated in the literature as important to academic success. Parental wealth is the strongest predictor of academic success (Hicks & Rusalkina, 2004). School SES has the strongest association with student achievement (NCES, 2010; Sirin, 2005).

Several factors could be inhibiting these schools from offering higher level courses. The finances of the district may significantly impact its ability to hire and train a qualified teaching staff to offer such courses. Furthermore, the demand for such courses may not be found in these schools. Students in these schools may not have the resources and rich learning experiences in their homes and communities to succeed in more rigorous coursework. This would account for some of the variation in offerings for both small and lower-SES schools. Although this finding is again consistent with that of other research in the field (Duncombe & Yinger, 2005; Hicks & Rusalkina, 2004; Lay, 2007; Lindahl & Cain, 2012), the strength of association between SES and offerings uncovered in this study cannot be overstated. When combining the effects of size and SES, decision-makers have tangible evidence to support the need for additional reforms designed to level the playing field for all students. In Pennsylvania, it is clear that students do not have equal access or opportunity to enroll in advanced level courses. Students in small and lower-SES schools should have just as much of a right to access these courses as their peers in higher-income communities.

Research Question #2

Comparing enrollments in advanced level courses was the focus of Research Question 2. It asked about the relationship between the size of the high school, the SES, and students' enrollment in advanced courses. Both descriptive and inferential analyses were conducted. Monk and Haller (1993), Duncombe and Yinger (2005), Lay (2007), and Leithwood and Jantzi, (2011) all found that school size and SES impact the per-student enrollment in advanced level courses. The findings in this study were consistent with those of previous research. There was a clear and significant connection between both the size of a school and the SES when comparing the per-student enrollment in advanced courses.

Using the four classifications relating to school size, there was a similar trend in per-student enrollments as with AP courses. The only exception to this trend was AP English. The larger the school, the higher the per-student enrollment in all AP courses except AP English. Interestingly, AP English is also the most common AP course offered by schools examined in this study. The fact that AP English is the most common course offered may also explain why medium-large schools had a higher per-student enrollment than large schools. These schools may have been encouraging students to enroll in AP English because it was the only AP course available. Furthermore, parent involvement in these schools could have been a factor in the enrollment in advanced level courses. Parent involvement has been shown to increase student participation (Lay, 2007; Lee & Smith, 1997; PSBA, 2011), so schools that can maximize parent participation in their children's education through high school are more likely to have higher participation rates in educational programs.

Although AP English courses were the most frequent courses offered in Pennsylvania high schools, AP Social Studies attracted the highest enrollments. AP Math and Science were the least likely to be offered and therefore had the lowest per-student enrollment ratio. The difference could have been a result of the lack of strong math and science curricula in school districts at the time of this study. Math and science standardized test scores have traditionally been lower than English scores. It would be interesting to see whether in 10 to 15 years this finding still holds true. The Common Core Standards have produced an increased emphasis on math and science in Pennsylvania and across the country.

The regression analysis of the specific advanced level courses indicated the importance of school size for enrollment per student. Shapiro et al. (2009) found that size of the school adversely affects student enrollment in course offerings. He found that the larger a school, the lower the enrollment percentages in advanced level courses. This researcher found highly significant correlations between AP Math, Social Studies, and honors enrollments per student with school size. The larger the school, the higher per-student enrollment in these courses. This information contradicts the finding of Shapiro et al. (2009).

The extent of the relationship between SES in terms of student enrollment is important for educational decision makers. For all AP and honors enrollments per student, SES was found to be a significant predictor. The link between the socioeconomic status of a community and outcomes for students cannot be overstated. The achievement link to SES has been indicated for years in the literature (Duncombe & Yinger, 2005; Lay, 2007; Leithwood & Jantzi, 2011; Monk & Haller, 1993). The findings of this dissertation reinforce the importance of SES. For example, as presented in Table 26, enrollment per student in AP Math courses decreased by 33% for every .1 increase in MV PI/AR. This is similar to AP Science, which saw an decrease of 27% (Table 28). These findings held true for all AP courses as well as honors offerings. This is profound information. Linking this dissertation to previous research surrounding SES should be a call for action on the part of policy-makers. Students from low socioeconomic communities continue to be provided with vastly unequal educational opportunities.

Summary Conclusions for Research Questions 1 and 2

Research has shown a link between school size and SES with advanced level course offerings (Hicks & Rusalkina, 2004; Lay, 2007; Leithwood & Jantzi, 2011; Monk & Haller, 1993; PSBA, 2011). Overall, this study confirms the prevailing research in this area and demonstrates a link between both school size and SES with advanced level course offerings and enrollment. There is a direct relationship between the size of the school and the number of advanced level courses offered. Larger schools offer more advanced level courses. This has been found to be the case from the time Conant (1959) found that schools with over 400 students provided more opportunities for students. This is also consistent with the work of more current researchers in the field (Lay, 2007; Leithwood & Jantzi, 2009; Monk & Haller, 1993). Furthermore, there is a direct relationship between the size of the school and enrollment in advanced level courses. Again, as the size of the school increases, enrollment per student in AP courses also increases in most of the subject areas (Math, Science, Social Studies, "Other") with the exception of AP English.

There is also a direct relationship between the SES of the school and the number of advanced level courses and enrollment. As SES increases, the number of advanced level courses offered also increases. This is consistent with the work of other researchers in the field (Lay, 2007; Leithwood & Jantzi, 2009; Monk & Haller, 1993). Furthermore, there is a direct relationship between the SES of the school and enrollment in advanced level courses. Again, as SES increases, enrollment per student in those courses also increases in each of the subject areas. The community structures within Pennsylvania may play a factor in this finding. Larger schools also have been found to have higher SES. This may give one an indication in as to why per-student enrollment also increases in high-level academic courses. The combined effect of SES and size could be the key to establishing why this effect exists and what can be done to help combat it.

Current literature supports the idea that larger schools will offer more courses for students. However, this dissertation also shows that larger schools had students enrolling in those courses at a greater percentage than smaller schools. This is contrary to the current literature that indicates that large schools have less participation. Shapiro (2009), for example, found that size impacts opportunity and participation. He found that as a school gets larger, participation will go down.

Research Question #3

Analysis of the athletic data produced several overall findings. The researcher found that athletic offerings across genders remained relatively consistent. Research Question 3 examined the relationship between the size of a high school, the SES, and the number of athletic opportunities available to students. Previous research has indicated that increases in student enrollment and SES will lead to increases to the number of athletic opportunities (Fredericks & Eccles, 2006; Lay, 2007; Lee & Smith, 1997). This dissertation was consistent with the current literature in finding that larger or wealthier schools offered more athletic opportunities.

The analysis of the descriptive findings indicates that larger schools or those with higher SES provide more athletic offerings. In general terms, larger and wealthier schools offer more interscholastic athletics. Not surprisingly, schools offered fewer 9th grade as compared to varsity athletic opportunities. The researcher found that as SES increased, so did the varsity and junior varsity athletic offerings for both male and female students. In addition, as school enrollment increased, so did the varsity and junior varsity athletic offerings for both male and female students. Furthermore, as SES and enrollment increased, the number of male 9th Grade athletic offerings also increased. The only area where this pattern did not hold true was for female 9th grade athletic offerings. In fact, on average, large schools (*m*=2.42) offered fewer female 9th grade athletic opportunities than small schools (*m*=2.71). The difference between female 9th grade athletics and junior varsity/varsity could most likely be explained by the lower number of schools offering female 9th grade athletic opportunities. Many small schools did not offer 9th grade sports, and students participated in junior varsity or varsity athletics in place of the 9th grade options.

The regression analysis indicated clear links between size, SES, and interscholastic athletic offerings. Junior varsity and varsity athletic options for both males and females showed moderate to strong correlation with size and SES. Again, this finding is not surprising and confirms previous research that size does matter in reference to the number of options available for students (Lay, 2007; Lee & Smith, 1997). Of interest for this research is the combined effect of size and SES. When combining the effect of size and SES, there are significant findings worth further discussion. When one combines size and SES to compare male varsity athletics, the result is significant. Overall, these two variables account for 59% of the overall variance. In other words, wealthy, large schools offered significantly more athletic options than small schools (wealthy or poor). This was also true for female varsity athletics. Size and SES again accounted for 59% of the variance in athletic offerings. While it was not surprising to see increased offerings based on size or SES alone, when size was combined with socioeconomic status, the stark differences in the number of offerings became staggering. This pattern is similar to the variations in the number of advanced educational offerings. Students attending either small or large, poor schools are not being provided with an equal opportunity. To a lesser degree, students attending small, wealthy schools are also not being provided equal opportunity.

Economies of size provide the best explanation of why large schools offer more. As school size increases, the amount of resources will also most likely increase, including staff, infrastructure, and support (Howley, 2008). In addition, wealthier schools have the ability to provide these increased resources to students (Duncombe & Yinger, 2005). Students who attend either small or large schools in low socioeconomic areas have a much harder time gaining access to certain opportunities. In poor, large schools, students may benefit from economies of scale based solely on the size of the school, but the impact is much less. Students who attend small schools do not have this advantage. However, some schools outside the pattern are finding ways to provide increased opportunities to students.

Research Question #4

Research Question 4 asked about the relationship between the size of the high school, SES, and students accessing athletic opportunities within their school. Previous research has indicted that there is a strong relationship among total student enrollment, SES, and enrollment in athletics (Coladacci & Cobb, 1996; Feldman & Matjeasko, 2007; Lay, 2007; McNeal, 1999). Consistent with previous research, this researcher found similar relationships. In general, larger schools had a lower rate of participation in athletics. In addition, as SES increased, so did student participation in athletics.

The regression analysis conducted for this research provided interesting findings. Consistent with Lay (2007), this study found that although large schools clearly offer more athletic opportunities, they also had a lower per-student enrollment in these activities. In addition, as school size increased, so did the athletic opportunities for both males and females.

Both patterns held true for 9th Grade, junior varsity, and varsity athletics. Coladacci and Cobb (1996), Feldman and Matjeasko (2007) and Lay (2007) all found a strong relationship between school size and extracurricular participation. They found that small schools have a higher participation rate than large schools.

Varsity athletic enrollment for males was the highest, with a .50 ratio, with female varsity athletic enrollment at .40. Another way to state this would be that for every 100 students of their gender, 50 males and 40 females respectively participated in varsity athletics. This finding is consistent with other research indicating that males still participate in sports at a higher rate than females (Coladacci & Cobb, 1996; Feldman & Matjeasko, 2007; Lay, 2007; McNeal, 1999).

The regression analysis was also key in determining that SES plays an important role in the access students have to athletics and their participation. Research has indicated that there is a strong relationship between the SES of the school and athletic enrollment (Duncombe & Yinger, 2005; Lay, 2007; Leithwood & Jantzi, 2011; Monk & Haller, 1993). This study helps to confirm this research by indicating that as the MV/PI AR goes up, the percentage of participants goes down. For participation rates, Lay (2007) found that schools with a low SES have lower participation rates than similar size schools. This study's findings were consistent with Lay's: as the MV/PI AR went up, student participation in athletics went down. This link is indicated through the percentage of change in relation to MV/PI AR change. An increase in .1 in MV/PI AR was accompanied by a 4% reduction in per-student athletic participation.

Summary Conclusions for Research Questions 3 and 4

These findings are significant because they give clarity on the ideal school size for student participation in athletics. Recent research has found that larger schools offer more opportunities but they have a smaller per-student participation than small schools (Coladacci, 2006; Lay, 2007; Leithwood & Jantzi, 2009). If one agrees with the research that indicates that participation in athletics benefits students, then knowing this will help policy makers with decisions regarding enrollment and school building size and configuration. In addition, and possibly more important, this information should spur more research into why participation in athletics declines as the size of a school increases.

Possibly, the findings of Leithwood and Jantzi (2009) and Ehrich (2000) are accurate. They concluded that smaller schools generally lead to a better sense of belonging for students and connectedness to staff, allowing the staff to know the students better, have greater involvement in student success, and better connect with students and the community. However, these findings must be combined with other research on the effects of school size and SES. Decisions made should be based on multiple measures to determine the best size of a school.

These findings help solidify the established research indicating the link between athletic participation and SES. Students from economically disadvantaged backgrounds have been found to have less parental involvement in their schools (Sirin, 2005). The parents may not be encouraging their children to participate in extra-curricular activities at the rate of schools with a higher SES. Policy changes in schools and in the legislature increasing student access to athletics may produce positive differences in student outcomes (Tajalli & Opheim, 2005)

Recommendations for Policy Implications

This study has presented information about the complex issue of providing equal educational opportunities to students through an examination of school size and SES. Pennsylvania is no different from other states with growing financial struggles related to public education (Howley, Johnson, & Petrie, 2011). Can schools provide equal opportunities for students given the vast differences in school structure, size, and economics? The decision on how schools should be structured, operated, and function should only come after careful, comprehensive review of all the current research. This study was designed to add value and depth to these decisions. In fact, this dissertation begins to point to factors indicating why the achievement gap continues to expand.

The current body of academic work suggests that the larger the school, the more educational opportunities provided to students (Conant, 1959; Lay, 2007; Leithwood & Jantzi, 2009; Monk & Haller, 1993). The results were consistent with the literature although viewed through a slightly different lens. This analysis was based on the availability of advanced level courses. This is of particular interest to legislatures, administrators, and local school boards. Students who participate in advanced level courses while in high school are looked at more favorably by college admissions offices, are more prepared for college, perform better in college, graduate more rapidly, and earn a higher lifetime wage (Dougherty, Mellor, & Jian, 2005; Keng & Dodd, 2008; Morgan & Maneckshana, 2000). If legislatures, local school boards, and administrators believe this to be true, then there is a need for small schools to find ways to increase their advanced level course options for students. This section presents a list of recommendations for state legislators, school administrators, and local school boards.

State Level

Policy-makers have the ability to instill meaningful change in educational opportunities through policy (Tajalli & Opheim, 2005). In Pennsylvania, this study reveals the inequities surrounding the opportunity to access and participate in advanced level courses. There may be little education entities can do in the short term to change the socioeconomic status of a community. However, the state government can help provide a more equal educational experience for all students. MV/PI AR was used as a more comprehensive measure of SES in this study. In essence, the MV/PI AR exists to provide communities with the resource funding to offer educational services to students they may not be able to afford through local tax revenues alone. This funding formula may be adequate to provide basic educational services for all students, yet it is not providing equal opportunity to access and participate in similar advanced education programs or activities. The state should reexamine the funding mechanisms for schools to assist those in communities with low socioeconomic status.

Separate from funding-formula changes, a second possible option for PDE could be to earmark grant money for schools with a low SES. This grant funding would be specifically designed to provide increased access to advanced level courses. This type of grant could be used in K-12 schools to provide the necessary foundation for success in advanced academic courses. The vertical alignment of curriculum is key in contributing to the success of students in higher level courses. There would need to be a multi-step process to ensure AP-program success. The curriculum from K-12 has to adopt rigorous standards to provide students with the fundamental skills they need to be successful in these high-level courses as they advance in grade level. The academic rigor necessary for advanced level courses does not begin in high school.

Small Schools

The literature has revealed the benefits of small schools. Small schools demonstrated higher student achievement (Hicks & Rusalanka, 2004), higher rates of staff engagement with students, and an increased connectedness between students and staff (Leithwood & Jantzi, 2009). Through this research, small schools also have a higher per student participation in athletic opportunities. However, this researcher found small schools at a disadvantage in both advanced level course offerings and enrollments.

School districts with small high schools should consider avenues to expand their advanced level course offerings. District administrators who believe that such opportunities are beneficial in closing the achievement gap can take action steps to increase these opportunities. The Economies of Scale theory (Duncombe & Yinger, 2005) helps explain why larger schools offer more advanced courses. This study indicates that the closer we get to medium-large or large schools, the more options will be available for students. Administrators and school boards should reach out to similar-size schools in their region to pool resources, expertise, and potentially increase advanced level course access for students.

Large Schools

The results of this study other research in the field indicate that large schools may impart certain benefits to students. Student achievement may increase in larger schools (Lindahl & Cain, 2012), and large schools can offer a greater variety of courses from specialized teachers (Lee & Smith, 1995; Leithwood & Jantzi, 2009; Monk & Haller, 1993). However, previous research has also revealed that large schools can contribute to depersonalization, alienation, truancy, and the drop-out rate (Shapiro, 2009).

Depersonalization or alienation may indicate why this study revealed per-student enrollment in athletics is substantially lower in large schools compared to small schools. Administrators in large schools should look for ways to increase student engagement and connectedness to their schools. This has been found to be a factor in small schools (Leithwood & Jantzi, 2009; Van Ryzin, Gravely, & Roseth, 2009). Perhaps school administrators in these large schools can connect with those from small schools to examine the aspects of small schools that contribute to engagement. The local Intermediate Units (IU) throughout the Commonwealth would be an excellent place to connect administrators from larger and smaller schools to build upon the others' unique experiences. Therefore, administrators from large schools can learn the strategies used in small schools to promote engagement and participation.

A second potential option for administrators in large schools could be to examine the school-within-a-school model (Duke, DeRobertero, & Trautvetter, 2009). This model has provided benefits to students in terms of achievement, engagement, participation, and lower dropout rates in New York City (Bloom & Unterman, 2012) as well as other areas nationally (Duke, DeRobertero, & Trautvetter, 2009). These schools are organized as smaller educational units, possibly giving students and staff a better opportunity to get to know each other (Bloom & Unterman, 2012). Building a sense of community for students and staff may lead to a higher participation rate in co-curricular activities. This approach coupled with the benefits found through this research on the positive attributes of large schools could potentially provide increased benefits for students.

Low Socioeconomic Schools

High schools in areas with a low socioeconomic status can also benefit from combining the findings of this study with the theory of Economies of Scale (Duncombe & Yinger, 2005). If administrators believe school SES has a strong link with student achievement (NCES, 2010; Sirin, 2005), then finding ways to increase advanced level opportunities and enrollments becomes critical. Combining the resources and expertise of multiple schools in impoverished areas will not necessarily increase advanced level course opportunities. These schools may not have the resources necessary to develop and sustain such programs. However, these low socioeconomic schools may be able to partner with one or several more affluent communities to increase advanced level course options for students. This may entail some political maneuvering to persuade the affluent district to help share some of its resources. Perhaps the state can provide guidance, incentives, and support for districts to create these types of partnerships.

Recommendations for Future Study

Although the findings in this dissertation add to the overall body of academic research surrounding equitable education for all students, there are several areas or suggestions for further research.

- Explore the outliers. Several schools did not follow the observed trend of educational offerings or enrollment.
- Combine the measures of SES. Researchers should use the National School Lunch Program's (NSLP) free and reduced price lunch as a factor of SES with that of community or school SES, such as MV/PI AR.
- Examine how size and SES affect enrollments in advanced level academics by gender.
- Undertake a similar study in states with county-wide school systems.

Outliers refers to schools that are not following the trend for the number of advanced courses offered. The regression analysis on the total number of AP courses offered found the outliers were not having an effect on the regression. However, a closer examination of these outliers through the residual statistics found a number that over- or under-predicted according to the regression analysis.

The secondary analysis produced some interesting results. The linear regression and residual statistics run for the total AP Course offerings indicated a strong regression with outliers that are worth further examination. The analysis met the assumptions to determine whether any of the values were having a major effect on the regression. The Durbin-Watson test indicated the regression was free of independent errors. Furthermore, there were no Cook's distances greater than one. Finally, there was only one Mahalanobis distance greater than 23.65. This indicates a strong regression where the outliers are not significant in relation to the strength of the regression. However, in examining the residual values, 26 schools were found to have under- or over-predicted their AP offerings significantly.

Of these 26 schools, half under-predicted and half over-predicted. This may be one of the most meaningful findings of this study. The effect of socio-economics combined with total student population becomes evident when examining the outliers. Three of the large schools in the lowest 25th percentile of MV/PI AR under-predicted their AP Course offerings. Medium-large schools in the lowest 25th percent displayed no difference in the predicted values. However, the predicted values do have significance when looking at the medium-small schools. All of the medium-small outliers had more AP courses than predicted. Based on the strength of this regression analysis, the factors contributing to these 26 schools missing their prediction by such a large portion should be examined in greater depth. Trends or patterns in respect to these schools would provide valuable information to administrators.

Based on the results of this dissertation, it is recommended that specific case-study research be conducted on the 26 schools determined to be outliers to investigate possible trends or patterns. Many factors could be influencing small or impoverished schools that are offering a large number of advanced level courses compared to schools of similar size or socioeconomic status. These factors may include school leadership, community values, teacher preparation or interests, and student preparedness for advanced academic work (Geiser & Santelices, 2004; Marks & Printy, 2003). These are all factors that could influence a school’s decision to enhance advanced level opportunities. The findings of such a study could be influential for those seeking to level access and equity for all students.

The preparedness of the teaching staff and the building leadership are most likely the key factors influencing these outliers. To find out how or why they have a strong emphasis on these programs, one would need to conduct in-depth qualitative research. This would include talking with staff, students, parents, and administrators. The teaching staff's experiences and preparation will be a large factor in offering AP courses (Geiser & Santelices, 2004). The level of knowledge and depth of understanding necessary for teaching these courses is immense. These factors are part of the reason why larger schools tend to offer more AP courses. Larger schools have more staff to work with on course development and training. However, the outlier schools still found a way. There may be a small group of teachers in these schools who have seen the value of these courses and found ways to start or expand the AP program.

A second likely factor in the ability of outlier schools to offer more advanced level programming is school leadership. The principal's role in the curriculum, culture, and success of the students is of utmost importance (Marks & Printy, 2003). Some of the outlier schools may be offering more than their counterparts due in large part to the school principal. If a principal is familiar with the research and values the benefits students receive from these types of courses, he or she will work with teachers to develop more rigorous course offerings. Therefore, building leadership is a critical component for providing the academic rigor and access for students with the goal of increased student achievement.

A second recommendation for further research includes the use of free and reduced price lunch numbers provided by the NSLP. This study did not use free and reduced price lunch as the factor in comparing SES in schools. Such numbers in secondary schools may not be a valid measure because they are the result of students self-identifying (Lindahl & Cain, 2012; NCES, 2014). In addition, the use of only one measure for SES may not provide the entire economic picture of a school district (NCES, 2014). NCES recommends the use of a more comprehensive approach to SES measures. This study used MV/PI AR as the factor for SES, as recommended by Dincombe and Yinger (2005). A second recommendation for further study would be to examine student achievement results with school size and MV/PI AR and how those results link to similar studies using free and reduced price lunch numbers. These numbers are widely used because of their availability and ease of understanding (NCES, 2014). However, when looking at high schools, is it the best measure? Running a parallel analysis could provide clarity about the accuracy of either measure (free and reduced price lunch or MV/PI AR).

A third recommendation for further research would include data collection and analysis of two additional pieces of information: gender and unique enrollments. An inherent design limitation of this study was using data collected by PDE. PIMS was utilized to collect the course-enrollment records in AP programs. Aggregate information was requested and utilized for data analysis. Although this study did collect information by gender for interscholastic athletics, it was not a variable in advanced level course enrollments. It would be valuable to gain a deeper understanding of how size and SES affect enrollments in these advanced level opportunities based on gender.

Exploring unique enrollments would involve collecting data about how many students participate in multiple courses or activities. This study collected total enrollments per course or activity. For a clear picture of the students who enroll in more than one course/sport, one would need to collect data from PDE on unique students. This type of research would most likely be best suited for a case study of several districts and the enrollment patterns of students in multiple activities/AP courses. This case study could include student, parent, and teacher surveys and/or interviews to get a deeper understanding of why students enroll or participate in certain opportunities.

The unique features of Pennsylvania schools and communities may inhibit the ability to generalize the findings to all other states. It would be beneficial to replicate this study in a state that operates school districts through a countywide system. Pennsylvania operates with 500 school districts and does not consolidate services through a county system. Conducting a similar study in state like Maryland or South Carolina would provide information to see if other environmental factors affect these educational opportunities for students. This could provide more generalizable meaning to the findings of this study. A similar study in a different state would also yield important information on the environmental effects for schools in Pennsylvania.

For example, Maryland operates with 25 school districts versus the 500 in Pennsylvania (MDE, 2015). What differences in offerings and enrollments would this research yield if using a more comprehensive measure for SES? Using MV/PI AR may not be a strong measure due to its reliance on school-district socioeconomic indicators. A state with a countywide system would most likely have a high level of variation in the community socioeconomic status. Another recommendation for SES could be the use of neighborhood SES measures (NCES, 2014 in place of MV/PI AR in states with countywide school districts for a better picture of socioeconomic status in the community in which the school is located.

Conclusions

This dissertation examined the complex issue of school environment. The study was designed to examine the extent of the relationship between high-school size, socioeconomic status, and educational opportunities (advanced academic and athletic) for students. This study is important as these opportunities have been shown to provide benefits to students and improve student achievement in high school and beyond. This examination also revealed the degree to which environmental factors impact the equity of opportunities for students. These environmental factors may be key in analyzing why the achievement gap continues to grow.

Several conclusions can be drawn from this research. For decades, researchers have looked into the achievement gap between students in impoverished communities compared to those in affluent areas. This study indicates possible reasons for why schools with a low SES do not offer the same advanced level courses or have the same participation rate in these courses. If one agrees about the benefits of advanced level courses, then one begins to put together part of the answer. This researcher found that students in schools with low SES may not have the same opportunities to succeed as students in more affluent areas. Access to and success in academic offerings may be related to why SES is highly linked to achievement. While a school district cannot control SES, it can look to provide enhanced opportunities for students to help narrow the achievement gap. The findings of this dissertation reveal that students in low socioeconomic schools or small rural schools are not provided with the same degree of high-level rigorous courses as their peers in large, affluent schools. These courses may help them both achieve in high school and prepare them for the challenges of college. Even when students in these schools have access to high-level rigorous courses, they are not accessing them. If we have a funding formula in PA that is designed to equal the resources provided to students, then why do we still see such a large difference in offerings and participation?

Research continues to link SES and student achievement and indicates that socioeconomic status is the single most important factor related to student outcomes (Duncombe & Yinger, 2005; Lay, 2007; NCES, 2014; Tajalli & Opheim, 2005). Schools with high socioeconomic status perform better than schools with low socioeconomic status (Tajalli &

Opheim, 2005). Yet the literature surrounding school size is not as conclusive with positive links to both large and small schools (Lay, 2007; PSBA, 2009). However, this study clearly confirms the work of others in terms of the importance of providing opportunities for students to access advanced level courses and athletics regardless of school size or SES. If providing all students across the state with an equal public education is important, then lawmakers and school administrators need to find ways to do so regardless of the size of the school students attend or the economics of the area in which they live. The evidence in this study is profound and strengthens that of other research showing how important size and SES are to access for students. This is critical to the success of students, especially in low socioeconomic communities.

This dissertation builds on previous research and indicates an even greater difficulty for students to access equal opportunities. Students in communities with low socioeconomic status have access to considerably less advanced level educational coursework. Moreover, students from these communities are accessing advanced level coursework at a lower percentage.

PSBA (2011) indicated that there is no consensus on what size school will meet the needs of all students. However, school size should not be examined as a single factor in school environmental studies. When comparing school size, one must also account for socioeconomic status (Tajalli & Opheim, 2005). The size and SES of a school play a pivotal role in student success. In addition, this study confirms the importance of school organization, which is at least as important as other factors such as curriculum and teacher quality; it is just not as widely researched (Lay, 2007).

Ultimately, what does the ideal school look like to maximize student achievement and success? The answer depends on the values of the community or administration. The values of a district will determine its environment for students. If higher academic rigor is important, then schools will need increased advanced level courses. The information provided by this research provides potential steps to help create and promote increased opportunities. In most communities where athletic teams are held in high esteem, the corresponding participation is likely to be greater than in those communities where athletics is not held in the same regard. If this is the case, then the recommendations in this study can help administrators increase participation.

This study examined seemingly unrelated factors of athletics and advanced level academic courses. However, when examined through the school environmental factors of size and socioeconomic status, one begins to see the connections. To gain a better understanding of the indicators to close the achievement gap, this study showed that public high schools are not providing equal opportunity for students in these areas. These findings could lead to a better understanding on why socioeconomic status is a critical variable in a child's academic success.

One of the most important findings of this study reveals the need to explore the outliers in greater depth. A number of schools do not follow the prevailing trend found in this dissertation. What are they doing differently to provide increased access for their students? School boards and administrators could learn from these schools, so school districts need to find more creative ways to share resources, expertise, and personnel to ensure that their students are being given equal opportunities regardless of where they live or the size of the school they attend. All students deserve the best from our educational system.

References

Azari-Rad, H., Philips, P., & Prus, M. (2002). Making hay when it rains: The effect prevailing wage regulations, scale economies, seasonal, cyclical and local business patterns have on school construction costs. *Journal of Education Finance, 27*(4), 997-1012.

Barker, R., & Gump, P. (1964) *Big school, small school: high school size and student behavior*. Stanford, CA: Stanford University Press.

Beadie, N. (2000). The promise and perils of community-based schooling. *American Journal of Education*, *109*(1), 112-124.

Berry, C. (2004). School inflation. *Education Next, 4*(4), 56-62.

Best, J., & Kahn, J. (1989). *Research in education* (6th ed.). Englewood Cliffs, N.J.: Prentice-Hall.

Black, S. (2006). The right size school: For some rural communities, small schools might be the right answer. *American School Boards Journal*, *193*(4), 63-65.

Bloom, H. S., & Unterman, R. (2012). *Sustained positive effects on graduation rates produced by New York City's small public high schools of choice*. NY: Building Knowledge to Improve Social Policy.

Brick, B. (2005). Changing concepts of equal educational opportunity: A comparison of the views of Thomas Jefferson, Horace Mann and John Dewey. *American Educational History Journal*, *32*(2), 166-174.

Byrd, C. E., & Ross, S. M. (1991). The influence of participation in junior high athletics on students’ attitudes and grades. *Physical Educator, 48*(4), 170-176.

Carlson, D., Scott, L., Planty, M., & Thompson, J. (2005). What is the status of high school athletes 8 years after their senior year? *Statistics in Brief*. NCES 2005-303.

Civic Research Alliance (2013). Feasibility study for a combined school district: Antietam School District and Exeter Township School District. Mechanicsburg, PA: Civic Research Alliance.

Civic Research Alliance (2012). Feasibility assessment for the study committee: Central Columbia School District and Bloomsburg Area School District. Mechanicsburg, PA: Civic Research Alliance.

Challenge Success (2013). *Stanford Survey of Adolescent School Experiences*. Stanford, CA: Stanford University.

Coladarci, T., & Cobb, C. D. (1996). Extracurricular participation, school size, and achievement and self-esteem among high school students: A national look. *Journal of Research in Rural Education*, *12,* 92-103.

Coladarci, T. (2006). School size, student achievement, and the "power rating" of poverty: Substantive finding or statistical artifact? *Education Policy Analysis Archives, 14*(28), 1-26.

College Board (2015). AP Program Guide 2015-2016. Retrieved from https://professionals.collegeboard.com/profdownload/pdf/ap-program-guide.pdf

Conant, J. (1959). The American High School Today: a First Report to Interested Citizens. New York: McGraw-Hill.

Cubberley, E. (1922). *A brief history of education*. Cambridge, MA: Riverside.

Darling, N., Caldwell, L. L., & Smith, R. (2005). Participation in school-based extracurricular activities and adolescent adjustment. *Journal of Leisure Research, 37*(1), 51-76.

Denault, A., Poulin, F., & Pederson, S. (2009). Predictors of adolescent participation in organized activities: A five-year longitudinal study. *Journal of Research on Adolescence, 19*(2), 287-311.

Dewey, J. (1944). *Democracy and education: An introduction to the philosophy of education*. New York: Macmillan.

Ding, C. S. (2008). Variations in academic performance trajectories during high school transition: Exploring change profiles via multidimensional scaling growth profile analysis. *Educational Research & Evaluation, 14*(4), 305-319.

Dougherty, C., Mellor, L., & Jian, S. (2005). The relationship between Advanced Placement and college graduation. National Center for Educational Accountability. NCEA Study Series Report 1. Austin, TX.

Duke, D. L., DeRoberto, T., & Trautvetter, S. (2009). Reducing the Negative Effects of Large Schools. Washington, DC: National Clearinghouse for Educational Research.

Duncombe, W., & Yinger, J. (2005). *Does school district consolidation cut costs?* Syracuse, NY: Center for Policy Research Maxwell School of Citizenship and Public Affairs, Syracuse University.

Duncombe, W., & Yinger, J. (2001). *Does school district consolidation cut costs?* Syracuse, NY: Center for Policy Research Maxwell School of Citizenship and Public Affairs, Syracuse University.

Education Management Group (2011). *Fiscal assessment study for a proposed merger of Fayette County school districts.* Pittsburgh, PA: Education Management Group.

Ehrich, R. (2000). *The impact of school size.* Blacksburg, VA: Department of Computer Science, Virginia Polytechnic Institute and State University.

Feldman, A. F., & Matjasko, J. L. (2007). Profiles and portfolios of adolescent school-based extracurricular activity participation. *Journal of Adolescence, 30*(2), 313-332.

Field, A. (2009) *Discovering statistics using SPSS* (3rd ed.). Thousand Oaks, CA. Sage Publications.

Finley, M. (1984). Teachers and tracking in a comprehensive high school. *Sociology of Education*, *57*, 233-243.

Fox, C. K., Barr-Anderson, D., Neumark-Sztainer, D., & Wall, M. (2010). Physical activity and sports team participation: Associations with academic outcomes in middle school and high school students. *Journal of School Health, 80*(1), 31-37.

Fredricks, J. A., & Eccles, J. S. (2006). Is extracurricular participation associated with beneficial outcomes? Concurrent and longitudinal relations. *Developmental Psychology, 42*(4), 698-713.

Gay, L. R., & Airasian, P. (2000). *Educational leadership*. Upper Saddle River, NJ: Prentice-Hall.

Geiser, S., & Santelices, V. (2004). *The role of Advanced Placement and honors courses in college admissions.* Berkeley, CA: Center for Studies in Higher Education, University of California, Berkeley.

Gregory, T. (2000). School reform and the no-man's-land of high school size. Retrieved from http://www.smallschoolsproject.org/articles/download/gregory.pdf

Groen, M. (2008). The Whig party and the rise of common schools, 1837-1854: Party and Policy Reexamined. *American Educational History Journal, 35*(2), 251-260.

Hicks, M., & Rusalkina, V. (2004) *School consolidation and education performance: An economic analysis of West Virginia's high schools*. Huntington, WV: Center for Business and Economic Research, Marshall University.

Hillman, A. (2003). The state of rural education in the Commonwealth of Pennsylvania, 2003. Presentation to the House Education Committee.

Howley, C. (2008). Don't Supersize Me: The Relationship of Construction Cost to School Enrollment in the U.S. *Educational Planning, 17(*2), 23-40.

Howley, C., Johnson, J., & Petrie, J. (2011). *Consolidation of schools and districts: What the research says and what it means*. Boulder, CO. National Education Policy Center.

Iatarola, P., Schwartz, A. E., Stiefel, L., & Chellman, C. C. (2008). Small schools, large districts: Small-school reform and New York City's students. *Teachers College Record*, 110(9), 1837–1878.

Jackson, S. A., & Lunenburg, F. C. (2010). School performance indicators, accountability ratings, and student achievement. *American Secondary Education, 39*(1), 27-44.

Keng, L., & Dodd, B. G. (2008). A comparison of college performances of AP and Non-AP student groups in 10 subject areas (College Board Research Report No. 2008-7). New York, NY: The College Board.

Kinney, D. W. (2008). Selected demographic variables, school music participation, and achievement test scores of urban middle school students. *Journal of Research in Music Education*, *56*(2), 145-161.

Lay, J. (2007). Smaller isn't always better: School size and school participation among young people. *Social Science Quarterly, 88*(3), 790-815.

Lee, V., & Smith, J. (1997). High school size: Which works best and for whom? *Educational Evaluation and Policy Analysis*, *19,* 205-227.

Leithwood, K., & Jantzi, D. (2009). A review of empirical evidence about school size effects: A policy perspective. *Review of Educational Research, 79*(1), 464-490.

Lindahl, R. A., & Cain, P. R. (2012). A study of school size among Alabama's public high schools. *International Journal of Education Policy and Leadership, 7*(1), 1-27.

Marks, H. M., & Printy, S. M. (2003). Principal leadership and school performance: An integration of transformational and instructional leadership. *Educational Administration Quarterly*, *39*(3), 370-397.

Maryland Department of Education (2015). Maryland Class Size Report. Retrieved from http://marylandpublicschools.org/MSDE/newsroom/special_reports/docs/2011_2012_MD_Class_Size_Report.pdf

Mass Insight Education & Research Institute (2010). Closing the achievement gaps: An annual Massachusetts report on performance-based high school interventions and turnarounds. Retrieved from http://www.massinsight.org/publications/general/3/file/1/pubs/2010/04/02/Closing_the_Achievement_Gaps.pdf

McNeal, R. B. (1999). Parental involvement as social capital: Differential effectiveness on science achievement, truancy, and dropping out. *Social Forces*, *78*(1), 117-144.

Mesquita, L. (2012). The Lancasterian monitorial system as an education industry with a logic of capitalist valorization. *Paedagogica Historica, 48*(5), 661-675.

Monk, D. H., & Haller, E. J. (1993). Predictors of high school academic course offerings: The role of school size. *American Educational Research Journal, 30*(1), 3-21.

Morgan, R., & Maneckshana, B. (2000). *AP students in college: An investigation of their course-taking patterns and college majors* (ETS Statistical Report No. 2000-09). Princeton, NJ: Educational Testing Service.

NCES (2014) Improving the Measurement of Socioeconomic Status: A Theoretical Foundation. Retrieved from https://nces.ed.gov/nationsreportcard/pdf/researchcenter/Socioeconomic_Factors.pdf

The Commonwealth of Massachusetts (2014) General Laws. Retrieved from https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXII/Chapter76/Section1

O'Bryan, S., Braddock, J., & Dawkins, M. P. (2008). An examination of the effects of school based varsity sport participation and parental involvement on male academic behaviors. *Challenge: A Journal of Research on African American Men, 14*(2), 1-27.

Ornstein, A. C. (1990). How big should schools and school districts be? *Education Digest, 56*(2), (44-48).

Pennsylvania Department of Education (2015a). Data and Statistics. Harrisburg, PA: Pennsylvania Department of Education. Retrieved from http://www.education.state.pa.us/portal/server.pt/community/school_services_office/9153/disclosure_of_interscholastic_athletic_opportunities/1419362

Pennsylvania Department of Education (2015b). Data and Statistics. Harrisburg, PA: Pennsylvania Department of Education. Retrieved from http://www.portal.state.pa.us/portal/server.pt/community/enrollment/7407/public_school_enrollment_reports/620541

Pennsylvania Department of Education (2015c). Data and Statistics. Harrisburg, PA: Pennsylvania Department of Education. Retrieved from http://www.portal.state.pa.us/portal/server.pt/community/financial_data_elements/7672

Pennsylvania Department of Education (2015d). Pennsylvania Information Management System (PIMS). Harrisburg, PA: Pennsylvania Department of Education.

Pennsylvania Department of Education (2013). *State 2012/2013 PIMS Manual*. V1.0.1 V2. Retrieved from http://www.education.pa.gov/Teachers%20-%20Administrators/PIMS/Pages/PIMS-Documents.aspx#.VuDUT_krK70

Pennsylvania General Assembly (2015). Pennsylvania School Code: 4 P.S. § 16-1601-C. Retrieved from http://www.legis.state.pa.us/cfdocs/legis/LI/uconsCheck.cfm?txtType=HTM&yr=1949&sessInd=0&smthLwInd=0&act=14&chpt=16C&sctn=3&subsctn=0

Pennsylvania School Boards Association PSBA (2011). *School building size: Is there a right size*? Mechanicsburg, PA. Education Research and Policy Center.

Pennsylvania School Boards Association PSBA (2009). *Merger/consolidation of school districts: Does it save money and increase student achievement?* Mechanicsburg, PA. Education Research and Policy Center.

Pittman, R. B., & Haughwout, P. (1987). Influence of high school size on dropout rate. *Educational Evaluation and Policy Analysis, 9* (4), 337-343.

Post, D., & Stambach, A. (1999). District consolidation and rural school closure: E Pluribus Unum? *Journal of Research in Rural Education, 15*(2), 106-20.

Rooney, K., & Augenblick, J. (2009). *An exploration of district consolidation*. Denver, CO. Augenblick, Palaich, and Associates, Inc.

Sathre, C. & Blanco, C. (2006). Policies and practices at postsecondary institutions. Boulder, CO. *In Western Interstate Commission for Higher Education*, pp. 25-36.

Sax, G. (2010). *Principles of educational and psychological measurement and evaluation.* Belmont, CA: Wadsworth (4th ed.).

Shapiro, A. (2009). *Making large schools work: The advantage of small schools*. Lanham, MD: Rowman & Littlefield Education.

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research*, *75*(3), 417-453.

Sobe, N. W. (2011). Concentration and civilization: Producing the attentive child in the age of Enlightenment. *Paedagogica Historica, 46*(1/2), 149-160.

Standard & Poor's (2007). *Study of the Cost Effectiveness of Consolidating Pennsylvania School Districts*. New York, NY: S&P School Evaluation Services.

Tholkes, R. J., & Sederberg, C. H. (1990). Economies of scale and rural schools. R*esearch in Rural Education, 7*(1), 9-15.

Tholkes, R. J. (1991). Economies of Scale in rural school district reorganization. J*ournal of Education Finance*, 497-514.

Tajalli, H., & Opheim, C. (2005). Strategies for closing the gap: Predicting student performance in economically disadvantaged schools. *Educational Research Quarterly*, *28*(4), 44-54.

Taliaferro, L. A., Rienzo, B. A., & Donovan, K. A. (2010). Relationships between youth sport participation and selected health risk behaviors from 1999 to 2007. *Journal of School Health, 80*(8), 399-410.

Tucker-Drob, E. M., & Harden, K. P. (2012). Intellectual interest mediates gene-by-socioeconomic status interaction on adolescent academic achievement. *Child Development*, *83,* 743-757.

United States Department of Education (2009). *School size. Programs/initiatives*. Retrieved from http://www2.ed.gov/about/offices/list/ovae/pi/hs/schoolsize.html

United States Department of Education, National Center for Education Statistics (2011). Number and percentage distribution of public elementary and secondary schools and enrollment, by type and enrollment size of school. Retrieved from http://nces.ed.gov/pubs2012/2012001.pdf

United States Department of Education, National Center for Education Statistics (2010). *Status and trends in education of racial and ethnic minorities*. Retrieved from http://nces.ed.gov/pubs2010/2010015/indicator3_14.asp

United States Department of Education, National Center for Education Statistics (2014). *Improving the measurement of socioeconomic status for the national assessment of educational progress: A theoretical foundation*. Retrieved from https://nces.ed.gov/nationsreportcard/pdf/researchcenter/Socioeconomic_Factors.pdf

Van Ryzin, M. J., Gravely, A. A., & Roseth, C. J. (2009). Autonomy, belongingness, and engagement in school as contributors to adolescent psychological well-being. *Journal of Youth and Adolescence*, *38*(1), 1-12.

Won, S., & Han, S. (2010). Out-of-school activities and achievement among middle school students in the U.S. and South Korea. *Journal of Advanced Academics, 21*(4), 628-661.

Werblow, J., & Duesbery, L. (2009). The impact of high school size on math achievement and dropout rate. *High School Journal*, *92*(3), 14-23.

Yan, W. (2006). *Is bigger better? A comparison of rural school districts*. Harrisburg, PA. Center for Rural Pennsylvania.