A Multi-year Study of the Effect of School Size on the College and Career Readiness of New Jersey Public High School Students

Shae-Brie M. Dow

Seton Hall University, shaebrie.dow@student.shu.edu

Follow this and additional works at: https://scholarship.shu.edu/dissertations

Part of the Other Education Commons, and the Secondary Education Commons

Recommended Citation
https://scholarship.shu.edu/dissertations/2652
A Multi-year Study of the Effect of School Size on the
College and Career Readiness of
New Jersey Public High School Students

Shae-Brie M. Dow

Dissertation Committee:
Luke Stedrak, Ed.D., Mentor
Barbara Strobert, Ed.D.
Adam Angelozzi, Ed.D.
Lavetta S. Ross, Ed.D.

Submitted in partial fulfillment of the requirements for the degree of
Doctor of Education

Seton Hall University
2019
SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
OFFICE OF GRADUATE STUDIES

APPROVAL FOR SUCCESSFUL DEFENSE

Shae-Brie M. Dow has successfully defended and made the required modifications to the text of the doctoral dissertation for the Ed.D. during this Spring Semester 2019.

DISSERTATION COMMITTEE
(please sign and date beside your name)

Mentor:
Dr. Luke Stodrak

Committee Member:
Dr. Barbara Strobert

Committee Member:
Dr. Adam Angelozzi

Committee Member:
Dr. Lavetta S. Ross

The mentor and any other committee members who wish to review revisions will sign and date this document only when revisions have been completed. Please return this form to the Office of Graduate Studies, where it will be placed in the candidate’s file and submit a copy with your final dissertation to be bound as page number two.
Abstract

According to the National Center for Public Policy and Higher Education & The Southern Regional Education Board (2010), there is a disparity between those who are college-eligible, and those who are actually college-ready. In New Jersey, a large percentage of students who graduate from its public schools are inadequately prepared for the academic rigors of college (NJDOE, 2012; Education Transformation Task Force Initial Report, 2011, p.3).

It has been suggested that school size may affect the parameters that constitute readiness (Moore, 2013). An examination of extent literature revealed that there is not an agreement on whether large schools or small schools best cultivate student readiness. This research seeks to fill that void.

The sample for this study consisted of 314 New Jersey public high schools excluding magnet, charter, alternative, and vocational schools. There were five college and career readiness indicators investigated, including the percentage of students who took the SAT (SAT Participation), the average SAT mathematics performance (SAT Performance), the average percentage of students who achieved College Board SAT benchmark score (Percent SAT Benchmark Achieved), the average Advanced Placement (AP) or International Baccalaureate (IB) participation (AP/IB Participation), and the percent (on average) of students that earned an AP scored of 3 or better or an IB score of 4 or better (AP/IB Benchmark Achieved).

The study was carried out for three consecutive school years (i.e. 2014–2015, 2015–2016 and 2016–2017) to ensure reliability of the results obtained.
A regression analysis was then carried out to understand the relationship between school size and each of the five quantities being considered. ANOVA was then employed to explore the relationship between these sizes and the five variables being considered as indicators of readiness.

This investigation found school size to have a statistically significant effect on SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved. The only exception to this general result was during the school year 2016–2017, when school size was shown to influence SAT participation as well. The ANOVA also showed that smaller school sizes may be counterproductive for college readiness.

An analysis of the results obtained in this study suggests that school size can have a significant impact on SAT performance, Percent SAT Benchmark Achieved, AP/IB participation and Percent AP/IB Benchmark Achieved. In general, a school size that is greater than 600 students appears to have a positive influence on these parameters. Since these parameters effect readiness, this study demonstrates that readiness is better achieved, on average, in relatively larger schools, that have student populations greater than 600 students, at least for the schools being studied in this thesis.

According to the results obtained, students from New Jersey schools with a larger number of students (i.e. greater than 600) were more likely to be college ready.

Keywords:
College Readiness, College Eligible, Economies of Scale, New Jersey Public Schools, School Connectedness, School Size
Acknowledgements

While completing my doctoral studies and writing this dissertation I received encouragement, guidance, love and support from my village; without whom none of this would have been possible. I would like to take the time to acknowledge those individuals who stand out among all those with whom I have interacted during my doctoral journey. I extend my heartfelt gratitude to each of these outstanding people.

My Seton Hall University mentors, colleagues, and friends, especially my advisor, Dr. Luke Stedrak for your guidance and support; my second reader, Dr. Barbara Strobert for your consistent gift of targeted guidance and patience to ensure my work made a contribution to our field; and the members of Cohort XVII who journeyed with me;

My committee members, also friends and colleagues: Dr. Lavetta S. Ross, for always reminding me to “follow the recipe” and to stay the course; and Dr. Adam Angelozzi, for your suggestions and positive comments;

Dr. James Caulfield, rest in peace, your loving memory lives on through the continuation of the Seton Hall University Ed.D. Program you founded and committed your life to for so many years; thank you for your vision and dedication to the field of education;

My husband, Sherlock Dow, my biggest cheerleader; thank you for loving me and holding me accountable so that failure and quitting were never options;

My mother, LaVerne McPhail, who planted in me a true love of learning and taught me the power of education; thank you Mom for each and every sacrifice you made so that I could grow and blossom – We got us a doctorate now;

My prayer warriors and bonus moms: Bernice Dow and Annette Taylor, thank you both for making sure my steps were always covered; and

My father, Andre McPhail, and my brothers, Andre II and Anwar, I love each of you; thank you for your love and support.

Again, to my village that is large and vast, thank you! You are my extended family of aunts and uncles, nieces and nephews, cousins and “cousins,” my sisters-in-love and brothers-in-love, and my Sorors and sistah-friends. You are my collective. Thank you for the many forms of support and encouragement you have extended to me as I labored to complete all that was required in becoming Dr. Shae-Brie M. Dow.
Dedication

“For me, becoming isn’t about arriving somewhere or achieving a certain aim. I see it instead as forward motion, a means of evolving, a way to reach continuously toward a better self. The journey doesn’t end.”

— Michelle Obama, Becoming

This work is dedicated to my children —
My daughters, Jordynn and Jocelynn, and my two bonus sons, Jonathan and Khamal. May each of you continue your forward evolution towards the best selves you are becoming, and do so together. You, like this work, are my legacy.
I love and celebrate each of you.
Table of Contents

Abstract .......................................................................................................................... i
Acknowledgements ........................................................................................................ iii
Dedication ....................................................................................................................... iv
Table of Contents .......................................................................................................... v
List of Tables .................................................................................................................. ix
List of Figures ................................................................................................................ xi
Chapter I ......................................................................................................................... 1
INTRODUCTION ............................................................................................................. 1
  Background ..................................................................................................................... 1
Statement of the Problem ............................................................................................... 6
Purpose of Study .............................................................................................................. 7
Research Questions ....................................................................................................... 8
Hypotheses ..................................................................................................................... 8
Null Hypotheses ............................................................................................................ 8
Design and Methodology ............................................................................................. 9
Conceptual and Theoretical Framework ....................................................................... 10
Significance of Study ................................................................................................... 11
Limitations .................................................................................................................... 11
Delimitations ............................................................................................................... 14
Definition of Terms ...................................................................................................... 15
Organization of Study ................................................................................................... 16
Chapter II ....................................................................................................................... 18
REVIEW OF THE LITERATURE ................................................................................... 18
  Introduction .................................................................................................................. 18
  Literature Search Procedures ..................................................................................... 20
  Inclusion and Exclusion Criteria for Literature ............................................................ 21
  Existing Studies on the Effect of School Size on Student Outcomes ......................... 22
  Focus of the Review .................................................................................................... 25
  Limitations of the Review .......................................................................................... 27
  Review of Literature Topics ....................................................................................... 29
  History of School Size and Consolidation ................................................................... 29
  School Size and Its Effect on Course Offerings .......................................................... 32
  School Size and Attendance ....................................................................................... 34
Chapter III ................................................................................................................. 51
METHODOLOGY ........................................................................................................ 51
  Introduction ........................................................................................................... 51
  Research Design .................................................................................................... 51
  Research Questions ............................................................................................... 52
  Hypotheses ............................................................................................................ 53
  Null Hypotheses .................................................................................................... 53
  Data Source/ Sample Population .......................................................................... 53
  Variables and Measures ....................................................................................... 56
  Reliability and Validity ......................................................................................... 57
  Instrumentation/Data Collection .......................................................................... 58
  Data Sampling Method ......................................................................................... 58
  Analysis Construct ............................................................................................... 60
  Data Analysis ....................................................................................................... 63
  Summary ............................................................................................................... 65
Chapter IV .................................................................................................................. 66
DATA ANALYSIS ......................................................................................................... 66
  Introduction ........................................................................................................... 66
  Research Questions ............................................................................................... 66
  Hypotheses ............................................................................................................ 67
  Null Hypotheses .................................................................................................... 67
  Analysis and Results ............................................................................................. 68
  Summary of Results ............................................................................................. 116
Chapter V ..................................................................................................................... 118
CONCLUSIONS AND RECOMMENDATIONS ......................................................... 118
  Introduction ........................................................................................................... 118
  Discussion ............................................................................................................. 119
Third analysis: 2016–2017 year

General Finding:

Percent AP/IB Benchmark Achieved

First analysis: 2014–2015 year

General Finding:

Second analysis: 2015–2016 year

General Finding

Third analysis: 2016–2017 year

General Finding:

References
List of Tables

Table 1. School Size of New Jersey Public High Schools (NJDOE, 2017b) .................. 55
Table 2. Description of the Variables Used in the Study (NJDOE, 2017b) .................. 56
Table 3. Correlations between School Size, SAT Participation, SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved ........................................................................................................ 69
Table 4. Regression Results: Predictor Variable—School Size .................................... 71
Table 5. Differences in value of SAT and AP/IB participation and performance between different groups of School Size........................................................................................................ 74
Table 6. Differences in value of SAT Performance between different groups of School Size ................................................................................................................................. 75
Table 7. Differences in value of Percent SAT Benchmark Achieved between different groups of School Size ........................................................................................................ 77
Table 8. Differences in value of AP/IB Participation between different groups of School Size ................................................................................................................................. 79
Table 9. Differences in value of Percent AP/IB Benchmark Achieved between different groups of School Size ........................................................................................................ 81
Table 10. Correlations between SAT Participation, Dropout Rate and School Size (First analysis with the 2014–2015 year included) ........................................................................................................ 84
Table 11. Regression Results: Criterion Variable—SAT Participation (First Analysis with the 2014–2015 year included) ........................................................................................................ 84
Table 12. Correlations between SAT Performance, Dropout Rate and School Size (First analysis with the 2014–2015 year included) ........................................................................................................ 85
Table 13. Regression Results: Criterion Variable—SAT Performance (First Analysis with the 2014–2015 year included) ........................................................................................................ 86
Table 14. Correlations between Percent SAT Benchmark Achieved, Dropout Rate and School Size (First analysis with the 2014–2015 year included) ........................................................................................................ 87
Table 15. Regression Results: Criterion Variable—Percent SAT Benchmark Achieved (First Analysis with the 2014–2015 year included) ........................................................................................................ 88
Table 16. Correlations between AP/IB Participation, Dropout Rate and School Size (First analysis with the 2014–2015 year included) ........................................................................................................ 89
Table 17. Regression Results: Criterion Variable—AP/IB Participation (First Analysis with the 2014–2015 year included) ........................................................................................................ 90
Table 18. Correlations between Percent AP/IB Benchmark Achieved, Dropout Rate and School Size (First analysis with the 2014–2015 year included) ........................................................................................................ 91
Table 19. Regression Results: Criterion Variable—Percent AP/IB Benchmark Achieved (First Analysis with the 2014–2015 year included) ........................................................................................................ 92
Table 20. Correlations between SAT Participation, Dropout Rate, Student Attendance and School Size (second analysis with the 2015–2016 year included) .................. 93
Table 21. Regression Results: Criterion variable— SAT participation (second analysis with the 2015–2016 year included) ........................................................................................................ 94
Table 22. Correlations between SAT performance, Dropout Rate, Student Attendance and School Size (Second analysis with the 2015–2016 year included) .................. 95
Table 23. Regression Results: Criterion Variable—SAT Performance (Second Analysis with the 2015–2016 year included) ........................................................................................................ 96
Table 24. Correlations between Percent SAT Benchmark Achieved, Dropout Rate, Student Attendance and School Size (Second analysis with the 2015–2016 year included) ................................................................. 97
Table 25. Regression Results: Criterion Variable—Percent SAT Benchmark Achieved (Second Analysis with the 2015–2016 year included) ................................................................. 98
Table 26. Correlations between AP/IB participation, Dropout Rate, Student Attendance and School Size (Second analysis with the 2015–2016 year included) ................. 99
Table 27. Regression Results: Criterion Variable—AP/IB Participation (Second Analysis with the 2015–2016 year included) ................................................................. 100
Table 28. Correlations between Percent AP/IB Benchmark Achieved, Dropout Rate, Student Attendance and School Size (Second analysis with the 2015–2016 year included) ................................................................. 101
Table 29. Regression Results: Criterion Variable—Percent AP/IB Benchmark Achieved (Second Analysis with the 2015–2016 year included) ................................................................. 102
Table 30. Correlations between SAT Participation, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included) ................................................................. 104
Table 31. Regression Results: Criterion Variable—SAT Participation (Third Analysis with the 2016–2017 year included) ................................................................. 104
Table 32. Correlations between SAT Performance, Dropout Rate, Student Attendance and School Size (Second analysis with the 2015–2016 year included) ................. 105
Table 33. Regression Results: Criterion Variable—SAT Performance (Third Analysis with the 2016–2017 year included) ................................................................. 106
Table 34. Correlations between Percent SAT Benchmark Achieved, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included) ................................................................. 108
Table 35. Regression Results: Criterion Variable—Percent SAT Benchmark Achieved (Third Analysis with the 2016–2017 year included) ................................................................. 108
Table 36. Correlations between AP/IB Participation, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included) ................................................................. 110
Table 37. Regression Results: Criterion Variable—AP/IB Participation (Third Analysis with the 2016–2017 year included) ................................................................. 112
Table 38. Correlations between Percent AP/IB Benchmark Achieved, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included) ................................................................. 113
Table 39. Regression Results: Criterion variable—Percent AP/IB Benchmark Achieved (Third Analysis with the 2016–2017 year Included) ................................................................. 114
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Independent versus dependent variables</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>Controlled student characteristic variables</td>
<td>61</td>
</tr>
<tr>
<td>3</td>
<td>Controlled school characteristic variables</td>
<td>62</td>
</tr>
<tr>
<td>4</td>
<td>Controlled significant student and school characteristics.</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>The relationship between the 2014-15 School Size and SAT Participation</td>
<td>136</td>
</tr>
<tr>
<td>6</td>
<td>Normal P-P plot of 2014-15 SAT Participation Regression Standardized Residual</td>
<td>136</td>
</tr>
<tr>
<td>7</td>
<td>2014-15 SAT Participation Homoscedasticity</td>
<td>137</td>
</tr>
<tr>
<td>8</td>
<td>The relationship between the 2015-16 School Size and SAT participation</td>
<td>138</td>
</tr>
<tr>
<td>9</td>
<td>Normal P-P plot of 2015-16 SAT Participation Regression Standardized Residual</td>
<td>138</td>
</tr>
<tr>
<td>10</td>
<td>2015-16 SAT Participation Homoscedasticity</td>
<td>139</td>
</tr>
<tr>
<td>11</td>
<td>The relationship between the 2016-17 School Size and SAT participation</td>
<td>140</td>
</tr>
<tr>
<td>12</td>
<td>Normal P-P plot of 2016-17 SAT Participation Regression Standardized Residual</td>
<td>141</td>
</tr>
<tr>
<td>13</td>
<td>2016-17 SAT Participation Homoscedasticity</td>
<td>141</td>
</tr>
<tr>
<td>14</td>
<td>The relationship between the 2014-15 School Size and SAT Performance</td>
<td>142</td>
</tr>
<tr>
<td>15</td>
<td>Normal P-P plot of 2014-15 SAT Performance Regression Standardized Residual</td>
<td>143</td>
</tr>
<tr>
<td>16</td>
<td>2014-15 SAT Performance Homoscedasticity</td>
<td>144</td>
</tr>
<tr>
<td>17</td>
<td>The relationship between the 2015-16 School Size and SAT Performance</td>
<td>145</td>
</tr>
<tr>
<td>18</td>
<td>Normal P-P plot of 2015-16 SAT Performance Regression Standardized Residual</td>
<td>146</td>
</tr>
<tr>
<td>19</td>
<td>2015-16 SAT Performance Homoscedasticity</td>
<td>146</td>
</tr>
<tr>
<td>20</td>
<td>The relationship between the 2016-17 School Size and SAT Performance</td>
<td>147</td>
</tr>
<tr>
<td>21</td>
<td>Normal P-P plot of 2016-17 SAT Performance Regression Standardized Residual</td>
<td>148</td>
</tr>
<tr>
<td>22</td>
<td>2016-17 SAT Performance Homoscedasticity</td>
<td>148</td>
</tr>
<tr>
<td>23</td>
<td>The relationship between the 2014–15 School Size and Percent SAT Benchmark Achieved</td>
<td>150</td>
</tr>
<tr>
<td>24</td>
<td>2014–15 Percent SAT Benchmark Achieved Homoscedasticity</td>
<td>151</td>
</tr>
<tr>
<td>25</td>
<td>The relationship between the 2015-16 School Size and Percent SAT Benchmark Achieved</td>
<td>152</td>
</tr>
<tr>
<td>26</td>
<td>Normal P-P plot of 2015-16 Percent SAT Benchmark Achieved Regression Standardized Residual</td>
<td>153</td>
</tr>
<tr>
<td>27</td>
<td>2015-16 Percent SAT Benchmark Achieved Homoscedasticity</td>
<td>153</td>
</tr>
<tr>
<td>28</td>
<td>The relationship between the 2016-17 School Size and Percent SAT Benchmark Achieved</td>
<td>154</td>
</tr>
<tr>
<td>29</td>
<td>Normal P-P plot of 2016-17 Percent SAT Benchmark Achieved Regression Standardized Residual</td>
<td>155</td>
</tr>
<tr>
<td>30</td>
<td>2016-17 Percent SAT Benchmark Achieved Homoscedasticity</td>
<td>155</td>
</tr>
<tr>
<td>31</td>
<td>The relationship between the 2014-15 School Size and AP/IB Participation</td>
<td>157</td>
</tr>
<tr>
<td>32</td>
<td>Normal P-P plot of 2014-15AP/IB Participation Regression Standardized Residual</td>
<td>157</td>
</tr>
</tbody>
</table>
Chapter I

INTRODUCTION

Background

Since 1918, both the concept and function of secondary education in the United States has been a subject of study (National Education Association of the United States, 1918). This field has involved studying the role of education in a democracy and ensuring that public education is organized to facilitate growth. Secondary education in particular should aim to facilitate productive growth and to enable students to pursue higher education if desired (National Education Association of the United States, 1918).

The American public education system of the 21st century was established to propagate the country’s democracy and to nurture future generations to exemplify the best of its political ideals. New Jersey’s public education system aligns with the mission set forth by the United States Department of Education (USDOE) and aspires to ensure that all children, regardless of their background or socio-economic status, graduate from high school ready for success in life, including post-secondary educational pursuits and the workforce (Education Transformation Task Force Initial Report, 2011, p. 3). To support these goals, districts in New Jersey spent, on average, $15,968 per pupil during the 2010–2011 school year compared to a national average of $10,560 per pupil (US Department of Commerce 2013) and is subsequently ranked as one of the five highest ranking states in graduation rates (Aud & Hannes, 2011, p.216).

In New Jersey, a large percentage of students that graduate from its public schools are inadequately prepared for the academic rigors of college. In fact, a report by the
National Center for Higher Education Management Systems (NCHEMS, 2010) states that while 88.6% of ninth graders graduate high school in New Jersey within four years, only 60.8% of these students enroll in college. The report by NCHEMS (2010), also found that only 25.7% of the graduates manage to get a college degree. Additionally, one third of these students who enrolled in state colleges and universities required remedial classes in order to bridge the gap between high school and college (NJDOE, 2012; Education Transformation Task Force Initial Report, 2011, p.3). Of the New Jersey SAT participants from the class of 2013, only 46.1% met the SAT College and Career Readiness benchmark (College Board, 2014). This benchmark is associated with a 65% probability of obtaining a first-year college grade point average of B- or higher. For the State’s African American and Hispanic students, the percentage of achievement was much lower; only 16.5% African American and 23.8% Hispanic SAT takers from the class of 2013 met this benchmark. According to the College Board, similar trends can be observed nationally; only 42.6% of SAT takers from the same sample nationally was able to meet the college and career readiness benchmark, a figure that has remained relatively unchanged for quite some time (College Board, 2014).

According to the National Center for Public Policy and Higher Education & The Southern Regional Education Board (2010), there is a disparity between those who are college-eligible, which is defined as having earned a high school diploma, and those who are actually college-ready, meaning they are capable of succeeding in credit-bearing courses without the need for remediation. In 2007–2008, approximately 36% of first year students reported having to take a remedial course. This percentage was higher for African American and Hispanic undergraduate students, standing at 45% and 43% respectively.
compared to 31% of White undergraduate students (The Condition of Education, 2011, p. 70).

One key issue in this disparity is the capacity of the schools in terms of their size or number of pupils. Keisling (1968) did a study of elementary schools in New York State and found a negative relationship between achievement tests and school size. In a 1972 study, Chambers concluded that a large school size possibly has a negative impact on the achievement and on the affective outcomes of student participation and satisfaction. Summers and Wolfe (1976) examined the school resources that may influence academic achievement. Summers and Wolfe (1976) also found that students’ socio-economic backgrounds largely determined their achievement. However, they was also found that learning increased in smaller elementary and high schools. Black elementary students seem to particularly benefit from being in smaller schools and low achievers also benefit from being in smaller senior high schools. Another study reporting an inverse relationship between school size and academic achievement was conducted in Indiana (Kuzienko, 2006). This study provides a methodologically sophisticated example of current research about the effects of elementary school size on both achievement in math and language arts, as well as average daily attendance.

The concept of school attachment or a student’s sense of belonging to his or her school community has been investigated across the fields of health, education, psychology and sociology under a variety of terms, including school bonding, school climate, teacher support and student engagement (McNeely, 2002; Blum & Libbey, 2004). An examination of the research literature across these fields revealed school connectedness is achieved when students experience high academic expectations and rigor with strong academic
support, physically and emotionally safe school environments and positive and respectful student-adult relationships (Blum, 2005). The Committee on Increasing High School Students’ Engagement and Motivation to Learn (2004) recommended the size of large comprehensive urban high schools be restructured to create smaller learning communities that foster close personal relationships and a sense of community between adults and students, and that promote students’ school connectedness.

According to Measuring Up 2004, the state-by-state report card on higher education, the timely completion of certificates and degrees remains one of the weakest aspects of performance in higher education (p. 9). While college enrollment has more than doubled since 1970, the completion rate of those enrolled has not demonstrated the same growth. In fact, of the first-time students who were enrolled in a 4-year institution full time in the fall of 2002 to pursue a bachelor’s degree, or its equivalent, only 57% achieved their goal within six years compared to 55% of an analogous cohort of students who sought the same in the fall of 1996 and earned their degrees within six years (The Condition of Education, 2011, p. 73–173).

A more educated workforce increases tax revenue and economic activity, reduces expenses for social services, improves savings for public health and recreational resources, and enhances civic responsibility and volunteerism (National Center for Public Policy and Higher Education, 2004). Able and Deitz (2014) determined that workers with an associate degree earned, on average, 21% more than those workers who had only earned a high school diploma over a four-decade period. For those workers with a bachelor’s degree, the average difference was 56% more than those with only a high school diploma over the same four-decades (p. 2–3).
According to Ruby K. Payne (2013), intellectual capital, which is defined as the ability to take existing information and turn it into useful knowledge and tools, has become the economic currency of the 21st century (p. 184). As more and more skilled labor is needed because of the advent of this knowledge-based global economy, the American educational system has to ensure that the market need for skilled workers is met (Bernark, 2007; Hunt & Tierney, 2006). Between 1998 and 2008, there was a decrease of over 600,000 jobs that were formerly available to those with a high school diploma. During the same time period, over 10 million jobs were created for people who had obtained a college or technical degree (Bureau of Labor Statistics, 2013). A college education can no longer be an opportunity reserved for the privileged, as it has now become a basic economic necessity (Century, 2007).

Educational leaders, policy makers and researchers are seeking ways to bridge the gap between the college-eligible and the college-ready students while working within the confines of budget shortfalls and the growing demands for fiscal efficiency (McDonough, 2004). Various states, including New Jersey, are considering school size among the educational reforms that they are considering to improve public education. Recommendations stemming from prior research (e.g. Coleman, 1966, Fowler & Walberg, 1991; Greenwald, et al., 1996) promote reducing enrollment in large high schools in order to promote increased student learning (Conley, 2005; Chopin, 2003; Kuo, 2010; Schwartz, Stiefel & Chellman, 2008), but there have been no studies investigating how these outcomes align with students’ academic preparedness for college in the state of New Jersey.
Statement of the Problem

The American education system, as a whole, struggles to provide quality education to students and to prepare them for the highly competitive global market while being constrained by budget cuts and insufficient funding (Guilfoyle, 2009). As a result of budgetary shortfalls, many states have again renewed conversations regarding the closing and consolidation of schools due to either the reported underutilization of the schools or the failure of the schools to meet accountability measures; these decisions impact school size. There is evidence to suggest that smaller class sizes can boost achievement. For example, a study by Fowler & Walberg (1991) studies 293 public secondary schools in New Jersey and concludes that irrespective of socio-economic characteristics and grade levels, smaller schools and smaller school districts generate better educational outcomes. However, small class sizes are difficult to sustain when schools are cutting teaching positions at the same time that enrollments are increasing (Oliff, P. & Leachman, M., 2011).

This problem is compounded by a decrease in fiscal aid. For example, in 2018, a combined $32 million aid reduction was implemented in New Jersey. In fact, even 19 districts that are not spending sufficient amounts as per state guidelines are suffering from financial cuts, putting them at a particular disadvantage (Clark, A. & Rizzo, O., 2018). The recession in 2008–2009 had a statistically significant adverse effect on New Jersey school district funding. Since then, the percentage gap between per pupil funding and per pupil expenditure has grown from 13% in 2010 to 21% in 2012 (Chakrabarti, & Livingston, 2013). New Jersey, previously one of the balanced states, now falls $2,619 below its 2007 funding level. As a result, expenditure cuts were made across the board. Whereas districts had previously avoided cutting instructional expenditure, in 2011 and 2012 instructional
spending fell sharply as the pressure on school funding increased (Chakrabarti, & Livingston, 2013).

The effects of school closures and consolidations are often compounded by the fact that they are more likely to affect communities that are already disadvantaged. The Chicago Public Schools planned to close 54 schools for the 2013–2014 school year because of a $1 billion education budget deficient. The majority of students (88%) in the closed schools were Black students and approximately another 10% were Latino. Most students (95%) were receiving free or reduced-price lunch and 17% were classified as diverse learners (Gordon, M. F. et. al., 2018). Caref et. al. (2012) highlights that, of the students who lost their school, 88% were African American and 94% were from low income households. While data specific to New Jersey is not available, similar concerns were also raised regarding closures in New Jersey (Weber & Baker, 2014). Understanding the effect of school size can help aid educators and decision makers in formulating policies that are likely to improve college readiness.

**Purpose of Study**

The purpose of this non-experimental, quantitative, multi-year study was to investigate the relationship between high school size in New Jersey and the college readiness indicators as defined by the New Jersey Department of Education (NJDOE) for school years 2014–2015, 2015–2016 and 2016–2017. The NJDOE recognizes that high school students demonstrate college readiness behaviors prior to their graduation from high school. This includes taking college entrance exams and participating in rigorous coursework such as Advanced Placement (AP) or International Baccalaureate (IB) classes.
Research Questions

This study sought to determine the extent to which high school size impacts the college readiness of public students in the state of New Jersey. To do so, the following research questions were examined for three consecutive school years (i.e. 2014–2015, 2015–2016 and 2016–2017):

1. What is the effect of school size on college readiness of New Jersey public schools students when readiness is indicated by student participation and performance on the SAT and Advanced Placement (AP) or International Baccalaureate (IB) courses and exams?

2. How is the effect of school size on college readiness influenced by the school factors of student attendance, teacher retention and dropout rate?

Hypotheses

An analysis of the following hypotheses was conducted for each of the three school years examined in this study:

1. A statistically significant difference in the participation and performance of New Jersey public school students on the SAT or AP/IB courses and exams will be present as a function of high school size and college readiness.

2. A statistically significant relationship of high school size on college readiness will be present as influenced by the school factors of student attendance, teacher retention and dropout rate.

Null Hypotheses

An analysis of the following null hypotheses was conducted for each of the three school years examined in this study:
1. A statistically significant difference in the participation and performance of New Jersey public school students on the SAT or AP/IB courses and exams will not be present as a function of high school size and college readiness.

2. A statistically significant relationship of high school size on college readiness will not be present as influenced by school factors of student attendance, teacher retention and dropout rate.

**Design and Methodology**

This quantitative, causal-comparative study utilized annually published data from the NJDOE’s website representing the 2014–2015 through 2016–2017 school years and published during the 2015–2017 school years. This type of design was appropriate since I examined how a number of variables related to a major complex variable and to what degree this relationship existed (Gay, Mills, & Airasian, 2012). This design allowed me to predict the influence of the variables on the major complex variable.

The sample for this study consisted of 314 New Jersey public high schools excluding magnet, charter, alternative and vocational schools. All data representing each of the 314 schools were utilized in a multiple regression analysis and a hierarchical regression analysis.

Challenges surfaced in my examination of the extant literature on school size as a result of ambiguous labels of “large” and “small” being applied to the same size school by different researchers. In an effort to avoid misinterpretation of my study, I chose to avoid these terms all together when referring to school size and discussed my findings strictly in terms of the actual enrollment sizes of the schools using the range proposed by Lee and
Smith (1997), specifically enrollment of 600 students or less, 601–1,000 students, 1001–1,500 students and enrollment of over 1,500 students.

**Conceptual and Theoretical Framework**

Two theoretical frameworks provided the foundation for the conceptual framework of this investigation. The theories related to economies of scale and school connectedness were used to understand the connection between school size and the post-secondary preparedness of high school students in this study.

**Economies of Scale**

Economies of scale exist when the unit cost of producing a particular good or service is inversely related to the size of the organization or facility producing it (i.e. the larger an organization is, the lower the cost to make a given product or deliver a given service). Conversely, diseconomies of scale exist when the cost of unit production increases with larger size. Fox (1981) summarized our earliest evidence of economics of size in schools and districts and identifies that economies of scale exist over ranges of enrollment. For urban high schools the general cost-minimizing size was said to be in excess of 1,500 students. In rural schools the cost-minimizing size was smaller.

**School Connectedness**

Blum (2005) defined school connectedness as a student’s belief that the adults in their school care about their learning and individual well-being. The Center for Disease Control and Prevention (2009) expanded this definition to include the influence of peers on students’ feelings of being connected to their school. According to research, when students feel connected to school, they are less likely to engage in delinquent behavior like
substance abuse and violence (McNeely, 2002; Blum, 2004), while concurrently demonstrating higher levels of academic success, school persistence, extracurricular participation and better attendance than their peers who report feeling less connected (Cotton, 2001).

Blum (2005) focuses on the advantages of a smaller school’s size such as connectedness, better safety and a more positive environment. Fox (1981) studies how having a larger school size can be beneficial in terms of cost of education, better management, specialization and similar concerns. This study combines aspects of the studies by Fox (1981) and Blum (2005) to develop a holistic understanding of school size and its effect on readiness.

**Significance of Study**

Research conducted prior to this study has garnered preliminary data regarding the impact of school size on various school and student characteristics and outcomes. Predominantly established in 2000, under the funding support of the Bill & Melinda Gates Foundation, the effectiveness of small schools to enhance the educational outcomes for students has received mixed reviews (Camera, 2017). This study provides policymakers, practitioners and researchers with information regarding the impact of school size on students’ college readiness.

**Limitations**

This study tries to identify and understand the relationship between school size and readiness using the theoretical frameworks provided by school connectedness and economies of scale. According to Gay et al. (2012), as this is a causal-comparative study, other interpretations for the findings must be considered (Gay et al, 2012, p.229). There
may be other factors that are influencing the results. The groups of causal-comparative research samples are naturally formed before the initiation of this research. Another limitation of the study is that the sample groups may not be similar, as the subjects of the study may differ along some other variable not taken into consideration in this study (Gay et. al., 2012, p.232).

In 2010, the New Jersey State Board of Education abandoned the Core Curriculum Content Standards (CCCS), replacing them with the Common Core State Standards (CCSS), which were designed to provide practitioners with grade-level expectations from kindergarten through high school about what students should know and be able to do in the areas of English Language Arts (ELA) and mathematics. Unlike the NJSBE’s CCCS, CCSS were specifically authored to target what students needed to know in order to be successful in college and in their careers (Muller & Bowman, 2014). This study did not take into consideration the effect these new standards had on student performance on the defined College and Career Readiness Indicators.

Readiness is a complicated quality to measure, so college entrance tests such as the SAT were used as a metric. It was acknowledged in this study that college readiness and career readiness were not solely functions of academic scores. However, a detailed exploration on how non-academic parameters, like engagement in extracurricular activities, affect readiness was beyond the scope of this research. Additionally, this study did not take the socioeconomic conditions of the schools or students into account. Essentially, a student from a socially or economically disadvantaged family is treated as equal to one from a family that does not have such constraints. Furthermore, this study does not account for the effects of urbanization. It was assumed that since the data was
from the same region, any such anomalies were evened out. Since academic excellence is a significant factor in determining readiness, it is assumed that these scores effectively reflected student readiness.

The unavailability of certain data points also posed a limitation. For example, teacher retention data was only available for 2016–17 year. Additionally, there were specific changes to the SAT exams in 2016, so that the test assessed reading and writing skills in a combined section. As a result, SAT performance data for the SAT mathematics exams alone were available for all three consecutive years. This caused some discrepancy between data from 2014–15 and the other two years. Specifically, while SAT exams reported a single benchmark before 2016 including areas such as mathematics, reading and writing, after 2016 there were individual benchmarks for each subject area. However, since the aim of this study was merely to assess how often the benchmarks were achieved, each year was analyzed using the corresponding benchmark, specifically for 2014–2015 school year the benchmark of 1550 was used, and for 2015–2016 and 2016–2017 school years the math benchmark of 530 was used.

Lastly, this study did not seek to take into account the differences that exist within schools of different sizes, including curriculum and instructional practices; the type, quality, or quantity of AP or IB classes offered to students; or the impact of the organization of faculty, administration, or students. This study did not distinguish between large schools housing schools within schools, or the differences in how small schools were created and organized (i.e. small by design versus small by default).
Delimitations

This study was restricted to comprehensive public high schools with grade configurations of 9–12 in the state of New Jersey. Private, charter, alternative, parochial, faith-based and vocational schools were not included in this study because of their unique characteristics. Additionally, this study only investigates the effects of school size on high school education. It is likely that school size in all grades may have some influence on college readiness. However, given the scope of this work, only high schools were considered.

The data used in this study was retrieved from the 2015 through 2017 NJDOE School Performance Reports for all public high schools within the state. The school size and the college and career readiness indicators drawn from the NJDOE school performance reports are the primary data sources. All data pertained to the 2014–2015, 2015–2016 and 2016–2017 school years. It should also be noted that readiness was measured using the dropout rate, and not the graduation rate, since any student who remains in school will eventually graduate. Therefore, the student dropout rate provides a valid indicator of the number of students who do not graduate and, therefore, are not ready. The New Jersey Department of Education defines a dropout as a student who “has terminated his or her education before graduation or when a district cannot verify that the student is pursuing an education toward a regular diploma in another educational location” and the dropout rate is a percentage of dropouts in a class (NJDOE, 2017a). For the purposes of this study, the dropout rate is used for calculations.
Definition of Terms

1. Advanced Placement (AP)/International Baccalaureate (IB) results refer to the results of the College Board’s Advanced Placement examinations and the International Baccalaureate Diploma Program examinations taken by New Jersey public high school students. These students may take one or more of these examinations and may receive advanced placement or credit, or both, upon entering college (NJDOE, 2017c).

2. College and career eligible is the fulfillment of state established criteria to earn a high school diploma (Conley, 2010).

3. College and career readiness is the level of preparation a student needs to enroll and succeed without remediation in a credit bearing, general education course in a postsecondary program that offers a certificate, associate degree, or baccalaureate without requiring remediation (Conley, 2007).

4. Chronic absenteeism is calculated by taking the number of chronically absent students, those that have missed 10% or more days of school and dividing that number by the total number of students enrolled at the school or district. (NJDOE, 2017c)

5. Dropout rate is the percentage of students that withdrawal from school prior to attaining their high school diploma (NJDOE, 2017a).

6. Economies of Scale exist when the unit cost of producing a particular good or service is inversely related to the size of the organization or facility producing it (Fox, 1981).
7. *High School* for the purpose of this study refers to public schools, grades 9-12, excluding private, magnet, charter, alternative, parochial, faith-based and vocational schools.

8. *New Jersey performance report* is a report produced annually by the New Jersey Department of Education communicating numerous school-based variables, including enrollment size, attendance, dropout rate, annual teacher retention, SAT performance and the like (NJDOE, 2017d).

9. *SAT scores* refer to the performance results that contain the information provided by the College Board’s SAT examination (Dorans, 1999).

10. *School connectedness* is defined as a student’s belief that adults and their peers in the school care about their learning and individual well-being (CDC, 2009).

**Organization of Study**

Chapter 1 of this study presents a brief review of the role of public education in the United States and an overview of the problems with the discrepancy between students that are college-eligible versus college-ready and its relationship to school size. Chapter 2 presents a review of the literature pertaining to school size and college readiness. An examination of extant literature on the history of school size related to economic, sociological and achievement studies was presented, as well as a review of the definitions of college readiness, existing preparation programs and student indicators of college readiness. Chapter 3 details the design methods and procedures for this study. Data was collected from the NJ School Performance Report. In Chapter 4 the data and statistical findings that emerged from this study were presented. Chapter 5 contains a statistical summary of this study and its findings, conclusions drawn from the findings, a discussion
of the implications and recommendations for educational policies and practice moving forward. The conclusion of the study is based on the research question: *What is the strength and direction of the relationship between high school size and the college readiness indicators as reported on the New Jersey School Performance Report?*
Chapter II

REVIEW OF THE LITERATURE

Introduction

During the 1930s, as America grappled with the economic hardships of the Great Depression, there were approximately 260,000 public schools in the United States that served 26 million students. A decade later, as America emerged slowly out of the depression, the number of public schools decreased to 220,000 schools. This was largely because the Great Depression made it necessary to minimize school expenditures, especially with regards to construction and the salaries of employees (Hendrick, 1972). Additionally, at the time, smaller schools often did not have enough pupils to organize into grade levels. Larger schools allowed for this possibility. This, in turn, resulted in teachers becoming more specialized in teaching different grade levels and subjects (Cubberley, 1922). After the Depression, this trend continued as both schools and school districts continued to be consolidated.

By 2011, the number of public schools in the country dwindled to 98,000 schools that had the charge of educating 48 million students (National Center for Education Statistics, 1993; 2014). Proponents of the school consolidation movement advocated for this change by suggesting that schools would be more efficient and effective if they were larger. Specifically, they argued that “single plants housing 500–2,000 students presumably could offer greater variety in subject matter, would provide teachers with the opportunity to track their students according to ability, and might put less strain on community resources” (Wasley & Fine, 2000). Larger schools could have better infrastructure, improved facilities, more experienced faculties, superior administrators and
could offer greater diversity in curricular and extra-curricular opportunities (Conant, 1959). While the Great Depression resulted in profound consequences for American schools, most significantly so during the early 1930s, the struggles of this time also served as the catalyst for modernizing public education and also standardizing it as a profession (Baughman, et al., 2001).

The 21st century finds many states across America and their school districts struggling to overcome budget shortfalls and significant funding constraints despite counter demands to prepare even more students for future success in a now globally competitive market. As a result, the fiscal retrenchment of the 1930s has returned and statesmen, district administrators and the like have reengaged in conversations to increase the efficiency and effectiveness of schools through consolidation, specifically the elimination of schools and school districts; these decisions impact school size.

It has also been argued that this increase in school size, while economically enticing, may harm students and limit their achievements. Poor student performance has been linked to increased size of schools and school districts (Berry & West, 2008), which, over time, has led to serious consequences. The failure of students to complete college creates economic consequences for taxpayers and society as a whole (Belfield, 2008). A more educated workforce increases tax revenue and economic activity, reduces expenses for social services, improves savings for public health and recreational resources, and enhances civic responsibility and volunteerism (National Center for Public Policy and Higher Education, 2004). Given the serious repercussions that can result from the lack of readiness, the study presented here sought to explore the role of school size in various
performance parameters to understand the effect of school size on college and career readiness.

The purpose of this non-experimental, quantitative, multi-year study is to investigate the effect of high school size on the college and career readiness indicators as defined by the New Jersey Department of Education (NJDOE) between the 2014–2015 and 2016–2017 school years. This review of literature is comprised of the following sections: the history of school size and consolidation; the effects that school size has on course offerings, attendance, teacher retention, student outcomes, dropout rate and college readiness; theoretical frameworks, synthesis; and the conclusion.

The purpose for the review is to identify studies that attempted to determine the significance of the school variable of school size and student variables of college readiness. The desire is to inform policymakers, government officials, educational leaders and researchers of the influences that school size has on students’ preparedness for postsecondary pursuits.

**Literature Search Procedures**

Searches were conducted to identify robust, relevant literature on each variable in this study. The literature reviewed for this study came from a variety of texts, government reports and academic articles obtained from EBSCOhost, ERIC, JSTOR, Sage, the Census Bureau, the United States Department of Education (USDOE) website and the New Jersey Department of Education’s (NJDOE) website. From the NJDOE website, New Jersey Performance Report data were examined to review the variables that were used in this study. Other data from the NJDOE website included school size, the percentage of students participating in the SAT, the percentage of students scoring 1550 or above on the SAT, the
percentage of students enrolled one or more AP or IB courses, the percentage of students that earned an AP Test score greater than or equal to 3 or IB Test score greater than or equal to 4 on at least one exam, and dropout rates. General intent-based searches were also conducted, utilizing Google Scholar.

Keywords used in the study included American Diploma Project, American public education, college preparedness, college readiness, district consolidation, dropout rate, economies of scale, graduation rate, high school size, history of school size, school connectedness, school consolidation, socioeconomic status, student achievement, student engagement and student outcomes.

Inclusion and Exclusion Criteria for Literature

In order to understand the effect of school size on college readiness, this work relied on available literature. However, in order to ensure reliability, only studies meeting certain criteria were contained in the review. Since this study was conducted on the public school system in the United States, only literature involving such schools were considered. Additionally, this literature review also used government reports, dissertations and peer-reviewed publications. The literature reviewed here employed experimental, quasi-experimental, correlational, and meta-analysis designs to understand the effect of school size. When needed, federal and state legislation were used to provide background and contextual information. Also, as far as possible, literature older than 30 years has been employed solely to illustrate the beginnings of trends that later culminated in the present-day school system. All information used in this study strives to clarify and enhance the understanding of the problem of school size and its effect on readiness. A review of relevant literature is provided in the next section.
Existing Studies on the Effect of School Size on Student Outcomes

The effect of school size on such student outcomes like achievement and graduation rates have been of interest to parents, teachers, administrators and policymakers alike. The number of schools nationwide has decreased by 70% while the average school size has increased by a factor of five within the last 50 years (Nguyen, 2004). This nationwide trend of increased school size was the result of restructuring and consolidation initiatives. The impact of this restructuring and similar initiatives on student outcomes is now in question.

Fowler and Walberg (1991) summarized the findings of school size effects of studies published between the 1960s and 1980s. Those in favor of the small school reform effort purport that student achievement in schools labeled as small is equal to, if not greater than, that of student achievement in schools labeled as large. The researchers examined the effect of high school size on educational outcomes while also taking into consideration district socioeconomic status and teacher qualifications. The outcomes examined included standardized test scores, retention rates, suspensions, employment and college enrollment. In their study, they found school size was one of the most significant factors effecting school outcomes. Their analysis revealed a negative relationship between school size and outcomes, which reinforced the studies cited in their research, which suggested that smaller schools may be more effective at improving students' educational outcomes (Fowler and Walberg, 1991).

Leithwood and Jantzi (2009) conducted a meta-analysis of 57 studies published after 1990 that observed the relationship between school size and various student and organizational outcomes. In their analysis, the majority of the evidence reflected favorably on smaller schools and found that students who typically struggle in school and students
from disadvantaged backgrounds benefit the most from enrollment in small schools. The study by Leithwood and Jantzi (2009) recommends that if a large proportion of an elementary school’s pupils is underprivileged, then school size should be limited to around 300 students. Similarly, schools catering to diverse groups of students should also be limited to less than 600 students. The recommended size for a high school is around 1000 students in area where diverse, socio-economically weaker students are present.

Howley and Bickel (1999) analyzed the correlation between the likelihood of academic excellence and the size of schools and school districts. Their research was carried out by formulating equations that allow test scores to be predicted from school size and socioeconomic status. The study ultimately related the size of the school to academic excellence and equity. It was seen that in poorer communities, smaller schools produce better results. The correlation between small school size and academic performance was so significant that it was seen to negate the effect of poverty by as much as 70%. Equity was also better in smaller schools in all states studied. However, the effect of district size was much weaker. Howley and Bickel’s study (1999) recommends policy options such as recommending upper limits to school size, rescaling the school system, and exploring the relationship between district size and school size in greater detail.

Werblow and Duesbery (2009) studied how the size of a school relates to performance of students in mathematics and dropout rates. The two research questions centered on whether smaller school sizes result in better performance in mathematics or lower dropout rates. No rationale is given for choosing mathematics as the subject for study. However, the studies cited by the researchers indicate that by concentrating on a single, easily quantifiable and objective subject, it may be possible to obtain more precise
results. A total of 16,081 students who took ELS (10th Standard) exams in 2002 were chosen for the study. These students came from 752 US schools. This study used school size as the independent variable and employed six control variables employed, including ethnicity, socioeconomic status and gender. Interestingly, this study reports a nonlinear relationship between mathematics learning and school size, with both small and large schools outperforming medium sized ones. Werblow and Duesbery (2009) also note that dropout rates were better controlled by smaller schools.

School size has also been linked to student attendance. Using data from Texas schools Jones, Toma, & Zimmer (2008) develop a model linking school size and student attendance. This extensive study employs data from all public schools in Texas for 9 years, between 1993 and 2001. The study clearly illustrates that attendance is inversely related to class size, school size and school district size. Essentially, students were much more likely to attend classes in smaller schools with small class sizes. The results presented by Jones, Toma, & Zimmer (2008), though limited to a single state, are data intense and highlight the importance of smaller school sizes.

Using data from 2006 for North Carolina, Nelson (2008) establishes a link between school size and annual teacher attrition rate. This study identified that as the size of the school increased, the number of teachers who left the school increased simultaneously. Additionally, the study noted that as school size increased, class sizes also became unmanageable, lowering teachers’ job satisfaction. Therefore, increased school size is likely to lower job satisfaction and student performance, leading to low job satisfaction among teachers, which in turn can lead to low teacher retention.
From a brief survey of literature, it is clear that school size affects multiple parameters related to college and job readiness. These include factors like school attendance, performance of students and dropout rates. Before understanding the relationship between school size and college readiness, it is essential to explore existing literature in this field in order to develop a better understanding on how the various factors that may affect readiness are influenced by school size. The rest of this chapter primarily explores the necessary literature that links school size to dropout rates, achievement, teacher turnover, student attendance, etc. Additionally, the review will also explore the history of consolidation movement in the United States. This includes understanding the motivation and societal factors that facilitated the movement and the current direction of public school management in United States. This exploration of consolidation is aimed at giving context to the present study. However, before proceeding, it is essential to briefly discuss the focus and limitations of this literature review.

**Focus of the Review**

The literature review presented here focuses on the effect of high school size on college and career readiness. Since readiness cannot be measured directly, this review explores various metrics constituting readiness such as student dropout rate and teacher retention. It is hoped that these will help ascertain student readiness as the field develops. These metrics are already identified as factors influencing readiness. For example, Subedi and Powell (2016) identify student outcome and retention as factors affecting college readiness. Similarly, Rodriguez, (2009) states that high teacher turnover can have an adverse effect on readiness of students. The effect of course offerings and extracurricular participation on readiness is also well known (Greene & Forster, 2003). It is therefore
possible to study these parameters and understand the effect of school size on readiness. Therefore, given the lack of literature on the effect of school size on readiness, the logical approach is to study the effect of school readiness on these parameters.

Since the focus of this study is on public high schools in New Jersey schools, metrics such as annual school performance reports, SAT scores and student performance on various tests are used to measure readiness. Such objective metrics are chosen as they provide a quantifiable method for measuring readiness. Additionally, both college and career readiness are, to a great extent, dependent on academic performance.

Advance Placement (AP) exam scores, for example, have been linked to the likelihood of college enrollment by Chajewski, Mattern and Shaw (2011). In fact, using a national sample of 1.5 million students, these researchers reported that students who took AP classes and attended exams were 171% more likely to pursue a college degree than their peers. Dodd, Fitzpatrick, De Ayala and Jennings, (2002) report that of those who enter college, AP students were likely at least 10% more than their non-AP counterparts to attend college. Additionally, Keng and Dodd (2007) found that AP scores were a good predictor of college scores, especially in the corresponding subjects. Mattern, Marini, & Shaw (2013) related AP scores to student retention and found that students with AP scores were significantly more likely to graduate, even when accounting for other socioeconomic factors. For example, female students from minority ethnic groups with AP scores had a graduation rate of 41% while their counterparts had a lower graduation rate of 30%. Based on these studies, it is safe to assume that AP scores can be used to measure college readiness as they positively affect enrollment (Chajewski, Mattern, & Shaw, 2011), grades (Dodd, ...
Fitzpatrick, De Ayala, & Jennings, 2002) and graduation rates (Mattern, Marini, & Shaw, 2013).

Similarly, Conley et al., (2014) found that International Baccalaureate (IB) students are more likely to graduate college than their non-IB counterparts, since they find their post-secondary workload more manageable. Inkelas et al., (2013) reports that IB students were more prepared for college level courses than their counterparts, including those who took AP classes and earned high scores. Having an IB diploma clearly leads to better college readiness. In fact, Bergeron (2015) reports that 95% IB students enroll in 4-year university courses as opposed to 69% nationally in the US. Of these, IB students have a 79% college graduation rate compared to a national average of 39% (Bergeron, 2015).

Much like AP and IB exams, SAT scores can also be a valid indicator of college readiness. Kobrin (2007) linked SAT scores to college GPA and established that students with SAT score above 1180 were likely to obtain at least a B- in their first year of college, while those with a score lower than 800 were likely to get grades C or below. Studies (DeAngelo et al., 2011; Ober et al., 2018) also establish a positive correlation between SAT scores and college graduation rates.

This review focuses on the metrics employed by researchers such as SAT scores, AP Scores and IB scores to understand readiness and associated parameters. Efforts have been made to concentrate on US high schools. However, this review does have certain limitations as explained in the next section.

Limitations of the Review

The next section attempts to understand the current scientific understanding regarding the effect of school size on student readiness. However, the literature review
presented here is not without limitations. The studies make little distinction between urban and rural schools. Additionally, most of the literature presented does not directly address the question of college or career readiness. Since there is a lack of such literature, the review focuses on parameters that are likely to affect student readiness such as teacher retention, dropout rates, etc. The review also does not distinguish between students of various ethnic groups. Additionally, the effect of poverty and other socioeconomic indicators such as the crime propensity of the school neighborhood are not explored in detail.

Another point worth noting is that this review only considers five components of readiness (attendance, teacher turnover, dropout rate, student outcomes and course offerings) and their relation to school size. It is possible that readiness may be affected by other varied parameters as well. Occasionally, when literature is scarce, this review also relies on studies exploring the relationship between these parameters and elementary and middle school. Though this work concentrates on high school, it is assumed that the relationships in middle school will continue to hold good for high school as well. It should also be noted that readiness also has non-academic parameters such as participation in extracurricular activities. While the review does touch upon this topic, it is not investigated in detail. Such a study is beyond the scope of this thesis.

Despite these limitations, an attempt has been made to highlight the effect of school size on these parameters. Care has also been taken to ensure that studies that present opposing viewpoints are included whenever possible to highlight the complex effects school size and other characteristics can have on the parameters being presented.
Review of Literature Topics

In this section, literature pertaining to school size and its effect on parameters that are likely to affect readiness are discussed. This discussion starts off with a brief history of school consolidation. This background will help understand the reasons and motivations for consolidation and their evolution over time. The remaining review will deal with the effect of school size on attendance, teacher turnover, student outcomes and dropout rate before tackling the effect of these factors on readiness itself.

History of School Size and Consolidation

In the United States, a school of thought that saw consolidating schools as advantageous emerged in the early 1900s. In 1913, for example, a government official argued that there are a number of schools in North Dakota with small numbers of students, untrained teachers, poor attendance and lack of infrastructure. He suggested that by consolidating these schools, the pooled resources could provide for better conditions and resources (Macdonald, 1913). In general, consolidation proponents argued that larger schools required less infrastructure expenses and were easier to administer. At the time, since most schools were small, it was argued that resources and teachers could be better concentrated in bigger schools, thereby providing better educational facilities (Cubberley, 1922). It also gave leaders opportunity to transfer power from local leaders to trained educators and professionals. This was widely viewed as a step in the right direction (Tyack, 1974).

Over time, schools and school districts were consolidated into larger bodies. From an economic perspective, such an approach made sense. However, as the nation progressed, the quality of education became a more critical factor than monetary and administrative
investment. In the 1980s, there was a clear shift in literature from the economics of larger schools to the dependence of student outcome on school size. Most of the studies on school size and outcome did not favor larger school size. In fact, while many studies identified a nonlinear correlation between school size and outcome, a larger school size was always detrimental to quality. A detailed review in this regard can be found in Andrews et al. (2002). Naturally, as a result of these studies, multiple initiatives have emerged in recent years that focus on small-sized schools. While large schools and school districts are still the norm, there is a clear interest in understanding how student outcomes can be optimized with respect to school size.

Additionally, the notion that larger schools are more cost effective has also come under scrutiny. In 2011, the legislative analyst’s office of California observed that there is no evidence supporting school and school district consolidation (Legislative Analyst's Office, 2011). Additionally, removing schools from their local environment weakens the ties between the local community and school. This may decrease community participation in events like PTA fundraisers and school meetings, thereby affecting outcomes. Removing a school may also reduce business in an area and decrease the value of surrounding property (Green, 2013). All these factors have prompted the recent interest in optimizing school size.

By the 1990s, popular reformers and researchers were pushing districts and the public to consider the advantages of small schools. For example, in 1989, the Carnegie Corporation released a report urging a shift to smaller schools. The report suggested that strength of a middle school be limited to 200 to 300 students so as to maintain intimacy (Carnegie Corporation, 1989). A leading movement in this area, the Coalition of Essential
Schools (CES), has received widespread support. The Bill and Melinda Gates foundation provided 18.7 million dollars towards their CES small school project (CES, ND). Additionally, the Bill and Melinda Gates Foundation invested nearly $800 million to create 2,000 small high schools, particularly focusing on establishing schools that focus on underserved children of color.

At this stage, it can be said that there seems to be a reliable academic literature highlighting the adverse effects that larger schools may have on students. In fact, a large-scale study (Raywid, 1998). A key finding of Raywid (1998) was that small schools help bridge the gap created by socioeconomic stratification. In essence, students from all socioeconomic classes were likely to perform equally well in smaller schools while larger schools often failed to support students from weaker socioeconomic strata. It has been established that smaller schools promote better learning across ages. They are also less likely to engage in violence and marginalized students perform better in an intimate small school than they do in a large one. Reforms have been motivated by evidence of how smaller schools’ learning settings promote a better degree of student engagement, that in turn, facilitates greater achievement, better graduation rates and increased the likelihood of post-secondary attendance (National Research Council the Institute of Medicine, 2004).

Since a timeline for school consolidation and research on school size has been discussed, the next step is to explore the relationship between factors contributing to college or career readiness of students and the size of the school. The primary focus will be on high school size though literature pertaining to all schools will be covered.
School Size and Its Effect on Course Offerings

There are multiple studies on how course offerings are affected by school size. A key paper by Conant (1967) argued that larger schools were better equipped to provide students with diverse courses that would better prepare them for work or college. This study was focused on high schools and Conant argues that smaller schools would incur much larger expenses as they are trying to provide similar course offerings to students. This view however, began to shift as body of literature on the subject grew. Monk & Haller (1993) takes a less critical approach towards smaller schools and course offerings. This study established that there is a relationship between high school size and course offerings. This study considers data from 1032 US schools in the 1980s. It was seen that larger schools offered more courses to students. In general, English and science were found to be equally popular in schools of all sizes. However, smaller schools had a higher focus on mathematics and social science. While larger schools provided these courses, there was a greater focus placed on offering more diverse courses such as foreign language and visual arts. One option for bridging this gap suggested by this study is mandating a minimum number of courses in every school. However, the Monk & Haller (1993) points out the drawbacks of this approach including unequal demand for various subjects (such as visual arts and foreign languages) in various settings. Additionally, the study also raises doubts regarding consolidating schools in order to increase course offerings. There is an economic tradeoff between the cost incurred for larger schools and the expense necessary to provide more courses in selected small schools. This study does not attempt to judge the quality of the courses offered or their effect on readiness of students.
Even in the 1960s, researchers pointed out that the mere fact that a larger school offers more courses may not be reason enough to see the school’s large size as beneficial. In most cases, the increase in course offerings was not proportional to the increase in school strength. Baker & Grump (1964) studies secondary schools of diverse sizes, ranging from 35 students to over 2000 students. This study found that when the size of the school grew sixty-five-fold, the number of courses offered merely doubled.

In fact, Monk (1987) studied the relationship between course offerings and school size and found that the positive relationship between course offerings and school size plateaus when school size reaches 400 students. In general, most researchers agree that the optimal school size in relation to course offerings is around 400–500 students per school. Larger school sizes, then, do not promote variety in course offerings, since the school merely increases the number of sections for same courses instead of adding new ones. It has also been argued that there may not be a positive correlation between a larger number of courses and student readiness. A school with a larger number of course offerings may dilute the focus on core courses as students may focus on electives. Therefore, a small school offering a strong and comprehensive basic curriculum may be better for student readiness than a large school offering more diversity in its course offerings (Howley, 1994).

Effectively, literature clearly highlights that while there is a relationship between course offerings and school size, it is not a linear one. In fact, this effect seems to plateau when school size grows beyond 500 students. Interestingly, a larger number of courses may not translate to corresponding student participation. It has been reported by Slate & Jones (2005) that only 12% of students in large schools opted to enroll for courses that were not offered in smaller schools. Therefore, it has been demonstrated that while school sizes of
400–500 students are ideal for maximizing course offerings, this may not translate to more student involvement in these extra courses. Of note, with only a small percentage of students opting for these courses, the cost of running these courses may outweigh the benefits involved. Smaller schools with a strong core curriculum may provide students with better opportunities once they leave the school system. Therefore, if the objective is to improve student readiness, it may be ideal to limit school size to under 500 students. Smaller schools do not seem to be at a particular disadvantage in terms of readiness, provided that they are able to provide a strong core curriculum. It should be noted that the research discussed does not account for the quality of the courses offered in any way.

**School Size and Attendance**

This section explores previous scholarship on the effect of school size on student attendance. The literature had found a strong correlation between school size and attendance. Baker and Grump (1964) were among the first to observe that smaller schools were better at making students feel safe within the school environment and these students subsequently were found to have better attendance records than those in larger schools. Smaller schools usually manage to create a sense of intimacy that may be lacking in larger schools. Lindsay (1982) observed that students in their senior year of high school in schools with student enrollment of less than 100 had better attendance than those in schools with a higher student count. In fact, this effect was uniform in both urban and rural schools explored by the study. In order to link readiness to attendance, it is also necessary to look at participation in extracurricular activities. Participation in both curricular and extracurricular activities is linked to an increased likelihood of college readiness. These studies found that smaller schools fared better in getting students interested in
extracurricular activities. These findings were further strengthened by Lindsay (1984), whose research posited that school size should be measured in relation to the size of the community that is served by the school by examining data from US public schools in 1972.

More recent research shows that students from underprivileged homes are more likely to attend classes and participate in activities in small sized schools. Such students also tend to be better adjusted and suffer from fewer behavioral problems (Hedges & Laine, 1996). This is also attributed to the ability of small schools to provide a better learning environment. Small schools are an integral part of the community, and teachers, staff and parents form relationships that increase community involvement. This dynamic, in turn, is helpful to students (Lee & Lobe, 2000). The mathematical model by Jones, Toma, & Zimmer (2008) uses data from Texas high schools for a 9-year period. The regression model presented in this work also suggests a definite negative correlation between school size and student attendance and discusses how critical attendance is to student outcomes. A detailed study on Chicago schools by Wasley et al. (2000) shows that small schools can be credited with higher attendance rates, increased student persistence and supported much lower dropout rates. Wasley et al. (2000) found that a high school strength of 350 pupils is ideal for maximizing these advantages to students.

All these studies show that smaller schools increase student participation and attendance. These factors correspond to better job and college readiness. There is no consensus on the ideal number of students, though the numbers tend to vary from 100 to 400 depending on the study. In general, it is seen that the effect of decreased attendance rate with increased school size is more pronounced in impoverished or disadvantaged communities. Additionally, students from such homes tend to be more affected by school
size than those from affluent homes. Therefore, smaller schools are likely to provide better career or college readiness than larger schools. This effect is more pronounced in schools catering to diverse and underprivileged students.

**School Size and Teacher Retention**

Teacher retention is an important characteristic contributing to student outcome (Ronfeldt, Loeb, & Wyckoff, 2013). It is seen that retaining high quality teachers is one of the challenges faced by schools across the United States. This is especially pronounced in schools catering to minority and low-income students (Shields et al., 1999). In fact, high teacher turnover has been linked to education disruption, a low quality educational experience and instability among students who are already subjected to less than ideal social and economic conditions (Shields et al., 1999). Teacher turnover has been linked to a number of characteristics ranging from the ethnic and demographic composition of students to the size of school district. Naturally, school size is one of the many parameters that can affect teacher retention rate. Therefore, the effect of school size on teacher retention has also been explored by various researchers. However, there is no agreement in the literature regarding the effect of school size on teacher retention.

For example, Hughes (2012) studies various organizational, teacher and school characteristics in order to understand teacher retention. The method employed is block entry regression and the data is from 782 teachers who were surveyed. These teachers were selected by randomly sampling an equal number of middle schools, primary and high schools in the public sector in a Southern state. Nearly 87% of the participants were female and everyone had a college degree. Hughes (2012) defined a small school as one with less than 500 students. Interestingly, Hughes (2012) finds no significant relationship between
teacher retention and school size. Additionally, it is also noted that teachers in impoverished schools are more likely to remain in the profession longer than those in more affluent schools. This may be due in part to the lack of other professional opportunities. This extensive study found that characteristics like salary and parent and student cooperation were greater factors in teacher retention than facilities at school, the attitudes of administrators and school size. However, school size did play a minor part in the modeling carried out, since the results from models including school size were slightly more accurate than those of the model that did not consider school size. Therefore, it can be assumed that while this study does not demonstrate any statistically significant relationship between teacher retention and school size, school size is at least a minor factor of influence. Since Hughes (2012) considers a multitude of factors (teacher characteristics, administrative characteristics and school characteristics), it is possible that stronger, more influential factors dominated the model, thereby nullifying the effect of school size.

Another study by Ingersoll (2001) found that teachers from smaller schools have a higher turnover rate than larger schools, though the relationship was a weak one. However, this study does argue that larger schools may indeed have lower attrition rates than smaller schools. This could be attributed to better facilities, more opportunities for career development and the potential to specialize that are provided by large urban schools. Large urban schools often provide better professional settings and are generally better funded. Therefore, they are more likely to retain teachers. Ingersoll’s (2001) findings slightly contrast the findings of Monk (2007), who found that small rural schools have lower teacher attrition rates. This view of smaller schools being more beneficial for teacher retention is also supported by the findings of Borman & Dowling (2008). This study found
that teachers are more likely to stay in smaller rural schools that large urban ones. However, this could also be due to the lack of alternative career options in small rural settlements. Research by Scheerens, Hendriks, & Luyten, (2014) on elementary schools concludes that a school size of 300 pupils is ideal for teacher retention. However, this is based on available literature and not an independent analysis.

The views of researchers on the relationship between school size and teacher retention is clearly varied. However, it should be noted that none of these studies were concentrating specifically on the relationship between school size and teacher retention. Additionally, the effect of school size on teacher retention was mild in all these models. These results could also be influenced by lack of alternate employment opportunities, personal factors and administrative reasons. At this stage, it is safe to conclude that the relationship between teacher retention is yet to be understood fully. Given that teacher retention has been linked to student outcome, a study exploring the effect of school size and teacher retention will be of significance.

**School Size and Student Outcomes**

The success of an educational system is best judged by the quality of academic outcomes it generates. In the earlier history of public school, it was assumed that larger schools were more capable of providing facilities and resources to students. However, over time, this view has been challenged by various researchers. Cotton (2001) noted that smaller schools that provided an intimate educational experience resulted in better academic performances than larger schools. However, there is no agreement among researchers on this topic. Considering high schools, Durbin (2002) used the results of metropolitan achievement test (MAT) to judge the relationship between school size and
student performance. Data was obtained from 192 South Carolina Public High Schools. The Durbin (2002) study is critical as it accounts for conditions such as poverty and compensates for the effect of compromised socioeconomic conditions. It was seen that when these factors were removed, students from larger high schools consistently outperformed those from smaller high schools. Given that this study compensates for the effect of poverty, the results are likely to be more neutral and unbiased.

A different study by Stevenson, Main, & Koon (2001) studied how the physical characteristics of the school (including size) affect student outcome. Initially, school size was identified as a significant factor influencing school size. In essence, they found larger schools had better student outcomes. However, once the researchers accounted and compensated for poverty, they observed no significant relationship between student outcome and school size. Much like the study by Durbin (2002), this study also utilized data from public high schools and a total of 168 high schools participated. Both these studies found poverty to be the defining characteristic when it comes to student achievement. However, once the effect of poverty was accounted for, Durbin (2002) found a positive correlation between school size and poverty while Stevenson (2001) found none. A much older study by Crenshaw (1969) tried to relate multiple parameters such as student outcome and teacher retention to school size. Again, poverty was found to be the major indicator of academic success and school size had little effect. The researcher concluded that while larger schools do tend to outperform smaller ones, affluent schools always outperformed poor schools irrespective of school size. This result agrees with the findings of Durbin (2002) and both these studies focus on South Carolina High Schools. In effect, the relationship between school size and student outcome has not changed much over time.
Other studies have linked small school size with better results. Wasley et al. (2000) considers various ethnographic parameters along with school size to assess the performance of small schools in Chicago. Wasley et al. (2000) shows that students in small schools tend to outperform those from larger schools. This difference is largely attributed to the ability of such schools to provide a safe and nurturing environment to students. Wasley et al. (2000), however, studied only elementary schools. Similar results were also provided by Schwarz, Stiefel, and Wiswall (2013), who studied New York high schools (the largest school district). Schwarz, Stiefel, and Wiswall (2013) found that new small schools produced better student outcomes than older, pre-existing large schools. This negative correlation between school size and student performance is also supported by a number of more specific studies (Kuziemko, 2006; Egalite & Kisida, 2016). For example, a study involving 96 students in Indiana over three years noted that for each one standard deviation increase in school strength (measured as enrollment), the average score in mathematics dropped by 0.15 standard deviations. This study, conducted over three years, tracked students from 3rd grade to 6th grade (Kuziemko, 2006).

An extensive study by Egalite and Kisida, (2016) used data from 2679 schools for the period ranging from 2007 to 2011. As Egalite and Kisida’s study (2016) covers multiple diverse school districts, the results are likely to be more generic. This study identifies small schools as those with less than 400 students and large schools as those with more than 750 students. Egalite and Kisida, (2016) found an overall negative correlation between school size and student achievement. This effect was more pronounced in high schools. In fact, a 100 person increase in student enrollment corresponded to a 5% of a standard deviation decrease in mathematics test scores. The decline was only 1% for the overall sample
including elementary, middle and high schools. It should however, be noted that even a 5% standard deviation decline is rather small, and the effect of school size is shadowed by multiple other factors. However, it is safe to assume that school size is one of the parameters that is likely to affect student outcome (and by extension, readiness) in schools. This effect is more pronounced in high schools than lower grades.

**School Size and Dropout Rate**

The relationship between school size and dropout rate is relatively well established. A study by Cibulka (1986) was among the first to find that school size (along with poverty) was a strong determinant of student dropout rates. Larger schools in general exhibited higher dropout rates. Fetler (1989) studied high schools in California trying to relate school atmosphere to student dropout rate. Fetler (1989) found that dropout rate had a significant attachment to the community in which the school functions. Essentially, if dropouts are normal and socially accepted, they are more likely to happen. It was seen that a better school atmosphere corresponds to lower dropout rates. In general, it was seen that larger schools are subject to a higher degree of administrative complexity. This in turn means that these schools are often ill-equipped to address student misconduct and discipline. This, in turn, leads to a negative school atmosphere, causing higher dropout rates. In this case, dropout rate is an indirect function of school size. This is also reflected in more recent studies.

Sebring, Bryk, and Easton (1995) studied schools in Chicago and found that even when all the socioeconomic and cultural characteristics were accounted for, small schools resulted in better student achievement than larger schools. This is largely because the small school environment is more conducive to studying than the environment in larger schools.
In fact, Bryk (1999) reports that on average, students in small Chicago schools are ahead in performance by an entire year in mathematics and reading when compared to their counterparts in larger schools. Vander Ark (2002) identifies school size as a key factor to address dropout rate. This study reports that students across the US studying in small schools have higher academic scores and lower dropout rates. An example of a Rhode Island School which has 200 students (half of whom are economically disadvantaged) boast of 33% lower dropout rate than its neighbors. Additionally, every student graduating made it to college. Given the potential of smaller schools to provide better results, it is argued that any economic disadvantage associated with smaller schools is usually negated by the expense incurred by the remedial measures necessitated by larger schools. Recently, these results were further confirmed by Wood et al. (2017). Wood et al. (2017) considers high school students across the country and found that factors that were earlier thought to be significant, such as the region and degree of urbanization, were no longer important. Instead, socioeconomic factors, gender and participation were the factors governing dropout rate. This study has a large dataset of over 14,000 high school students from across the country, thus increasing the relevance of the results obtained. One of the recommendations for increasing the retention rate in this study is limiting school size.

It can be said that literature spanning decades clearly shows a clear relationship between school size and dropout rate. Clearly, dropouts have an adverse effect on student readiness. Therefore, limiting school size may lower the dropout rates, consequently increasing student readiness.
School Size and College Readiness

There are a few studies that directly address the effect of school size on student readiness. A dissertation by Moore (2013) studies Texas high schools from grade 9 to 12 after categorizing schools into small, (< 400 students), medium sized (400–1500 students) and large (<1500 students). These students were then assessed for college readiness. Moore (2013) presented a multi-year study that included students of diverse ethnicities. Moore’s study found that students of all ethnicities were more college ready if they were from larger schools and it is among the few that directly addresses college readiness and its relationship to school size. In the study by Moore (2013), it was possible that the multi-ethnic makeup of the group influenced the overall results, since average values for the entire group are considered for analysis. Therefore, a study concentrating only on white students from Texas by Moore, Combs, & Slate (2014) produced similar results. In essence, it was noted that white students from larger schools were more likely to be college ready than those from smaller schools. This was true for English, mathematics and art.

While these studies clearly indicate that there is a positive relationship between college readiness and school size, not all researchers agree. A key example is Funk & Bailey (1999) who identified a negative correlation between school size and college readiness, though indirectly. This was one of the first studies that focused on using the number of students graduating as a measure of school efficiency. The author suggests that since the objective of a school is to ensure that students graduate, it is better to divide the expenses incurred by the number of who have successfully graduated from school instead of total number of students enrolled. Naturally, the cost goes up when this happens. However, the cost increase per graduating student in small schools is only 3% higher than
the cost incurred per student enrolled in that batch. This increase, however, is 20% in large schools. Clearly, then, students in small schools are more likely to graduate than those at large schools. There is a clear discrepancy between the results obtained by Moore (2014) and those of Funk & Bailey (1999), however, there are no other studies on this topic at present. It is possible that some assumptions in each of the studies have affected their conclusions. For example, larger schools in affluent neighborhoods may function better than small rural schools, increasing student readiness in larger schools. Alternatively, the positive learning atmosphere in smaller schools may enable them to outperform larger schools in the same socioeconomic strata. Unfortunately, the literature available does not provide enough insight into the effects of school size on school or college readiness.

As a result of this apparent lack of data on college readiness and school size, it is not possible to draw a valid conclusion regarding the effect of school size of college readiness. Additionally, it is also important to note that college readiness and career readiness are different constructs. While they are similar, they do differ in certain characteristics. For example, college admissions are largely based on academic and non-academic achievements, while being employed may depend on the kind of skills and work training a person possesses (Steedle, Radunzel, & Mattern, 2017). However, literature contains little data on how school size affects career readiness. In general, it can be seen that while there are studies presenting the effect of school size on various factors such as attendance and dropout rates, there are only few inconclusive studies on how school size affects career and college readiness directly. Additionally, even when factors such as attendance are considered, results from various sources provide conflicting results. There is therefore a clear research gap in the understanding of how school size affects readiness.
Lack of readiness is a source of economic load on the general public. Therefore, understanding the effect of school size could potentially help minimize the lack of readiness, and by extension, the expense incurred by the government for remedial measures. In order to address this research gap, it is essential to choose a theoretical framework for analyzing the various factors associated with school readiness. This analysis is carried out in the next section.

Theoretical Frameworks

Researchers have employed multiple theoretical frameworks to study the effect of school size on various parameters. However, two of the most common theories are based on the economies of scale and school connectedness. A brief survey of literature pertaining to these theories is provided in this section. The application of both will help understand the effect of school size on readiness. As the name implies, the economies of scale theory focuses on the economic aspects of school size and associated parameters. The school connectedness theory grounds its recommendations on whether or not changes in school size affect the intimacy that is prevalent in a school atmosphere. A combination of both these approaches is likely to give a balanced understanding of the effect of school size.

Economies of Scale

The theory of economies of scale is commonly applied to understand the effects of school size. The idea behind applying this theory to school size is that larger schools have lower overhead expenses and the fixed expenses are distributed over a large number of students. Therefore, an argument can be made that larger schools cost less per capita than smaller schools (Young & Green, 2005). Proponents of this theory often use this to support school consolidation. For example, a study by Dodson & Garrett (2004) on public schools
in Arkansas found that larger schools can educate students to the same quality as smaller schools at a much lower cost. In fact, Dodson & Garrett (2004) found that promoting larger schools can lead to a cost savings of up to 30% per student because of the reduction in teachers’ salaries by promoting larger schools. Adversely, not all applications of economies of scale produce a positive argument for consolidation. Studying the California school district, Imazeki (2006) found that while the cost incurred per student will decrease (to an extent with consolidation) there is a point after which further consolidation only leads to increased expenses. The results presented by Imazeki (2006) could be attributed to the lack of necessary funds and resources needed to cater to a large student enrollment. Additionally, it is also possible that administrative costs also increase beyond a certain district size. There are also unique problems that arise when applying economies of scale to a school instead of a school district. The expenses of a school can be affected by unique local factors, like the presence of special needs students, local economic conditions and the quality and needs of teachers. These factors may not respond to economies of scale as expected. This observation by Ferris & West (2004) should also be considered while exploring the application of economies of scale to school size. In opposition to these studies, Howley (2008) found that smaller schools are in fact more cost effective than larger schools. The higher cost was attributed to the higher infrastructure expenses associated with larger schools. In short, there is little agreement regarding how school size affects cost per student. Despite these limitations, applying economies of scale is likely to provide insight into the financial effects of school size and how school size impacts readiness. Such a study will help understand if there is an optimal school size which can generate optimal student readiness at a minimum cost. Such an understanding will be valuable to researchers.
and policy makers. However, in order to gain a more complete understanding of the effect of school size, it is necessary to apply the theory of school connectedness as well.

**School Connectedness**

Many researchers have argued that the atmosphere of a school is more critical to student achievement than infrastructure or school connectedness. There are a few studies that explore the effect of school connectedness on student performance and school size. Blum (2005) noted that in general, school connectedness is higher in smaller schools where students and teachers have a real connection to each other and the local community. Blum (2005) noted that children who were frequently displaced (in this case, children of military personnel) fared much better in smaller schools with a high degree of school connectedness than in larger schools. Similar results were also obtained by Cotton (2001). Cotton (2001) argued that teachers have much more intimate knowledge of individual students in smaller schools. A teacher who is able to assess each student for specific learning shortcomings can better compensate for them. Additionally, this connection between students and teachers also reduces violence and crime in such schools. At the very least, there is consistency in the literature regarding how school size relates to connectedness. Smaller schools fair better than larger schools. The challenge here is to identify the optimal tradeoff between economic efficiency and school connectedness with regards to school size.

**Synthesis**

The above literature review has been divided into two major sections. The first section deals with the history of school size and consolidation, while the second section focuses on various factors that affect readiness and their relationship with school size. It
can be seen that while the relationship between school size and some of these factors such as course offerings is well understood, research is divided on how other factors respond to school size. Even when the relationship is well explored, most studies do not take steps to isolate other socioeconomic characteristics such as poverty and degree of urbanization from the results. The present study hopes to address this shortcoming by limiting its investigative scope to schools of a single region. With that, it is the hope of this researcher that the discrepancy posed by socioeconomic parameters can be avoided. Additionally, there is often disagreement on how these factors relate to readiness. For example, while course offerings increase to a degree with the increase in school size, the relationship between increased course offering and college readiness is still not entirely understood. This study also identified a substantial gap in the literature relating readiness directly to school size. Considering the social consequences of students not being college ready, it is essential to understand this phenomenon better. Such a study can identify the optimal school size for maximizing readiness. This result can in turn help policymakers design schools such that students are well-equipped to function productively in the world after high school.

The methods that can be employed to study the effect of school size on the parameters that constitute readiness are described in the next section. The methods in general can be classified based on their focus on connectedness and economies of scale. When the theory of economies of scale is considered, each decision is governed by whether or not that decision will make the school more economically viable in the long run. For example, an economies of scale centered approach may view teacher turnover as an economic loss, as significant resources are to be expended in finding and training a
replacement. The theory of school connectedness takes a different approach and views problems based on how they affect connectedness or attachment to the school. In this case, teacher turnover may adversely affect student morale and degrade the school atmosphere. This will in turn reduce school connectedness. Both these approaches have their own merits and have been employed to study the effect of school size on readiness. The theoretical basis offered by these diverse approaches has ensured that school size and its effect on readiness has been explored holistically in this dissertation.

**Conclusion**

The literature pertaining to the effect of school size on readiness is discussed in this chapter. There are studies that highlight the positive effects of school consolidation such as lower expenditures per student and ease of management (Macdonald, 1913). However, studies also show that smaller schools are safer, have better learning environments and often have better teacher retention rates (Raywid, 1998). All these factors contribute to making a student college or career ready. Given the importance of readiness, the effect of school size on readiness needs to be better understood. Little work has been done in understanding how school size affects this readiness. This gap is addressed by this study, as lack of readiness puts an enormous burden on society. In that light, the chapter proceeded to understand the theories that could be employed to study the effect on school size on readiness.

The method employed for data collection and the analysis carried out on the data will be explained in the next chapter. Results obtained from data analysis shed light on the effect of school size. The insights that can be gained from this study and the limitations were also presented. It was the intent of this study that insights gained from it will help
policymakers in making decisions related to school consolidation. Better understanding of the effect of school size on readiness can help design schools that avoid the significant burden to society associated with youth who are ill-prepared for their post-secondary pursuits.
Chapter III

METHODOLOGY

Introduction

The purpose of my non-experimental, quantitative, multi-year study was to investigate the relationship, if any, between high school size in New Jersey and the college readiness indicators as defined by the New Jersey Department of Education (NJDOE) for the school years 2014–2015, 2015–2016 and 2016–2017.

The NJDOE recognizes that high school students demonstrate college readiness behaviors prior to their graduation from high school by taking college entrance exams and participating in rigorous coursework such as Advanced Placement (AP) classes (NJDOE, 2017c). However, the relationship between school size and college or career readiness has yet to be investigated. The literature was silent on any connection between school size and college readiness. This research sought to fill that void in order to inform policymakers, educational leaders, practitioners and researchers alike of the influence school size has on students’ preparedness for their postsecondary pursuits. The parameters used by NJDOE to measure college readiness provided a valuable opportunity to study the effect of school size on college readiness. This chapter discusses the research design, validity and reliability of the chosen approach and explains why certain parameters were chosen to study the effect of school size on college readiness. The chapter concludes with a summary of the research methodology before continuing to the next chapter.

Research Design

The present economic and political atmosphere requires a larger number of students to be college and career ready upon exiting high school (Conley, 2010). However,
empirical data shows that the American public education system is far from achieving this requirement (USDOE, 2014). A better understanding of readiness and its relationship to various factors can help future educators and planners improve readiness. School size is one of the many factors that may contribute to readiness, therefore the relationship between readiness and school size is worthy of investigation.

This quantitative, causal-comparative study utilized annually published data from the NJDOE’s website representing the 2014–2015 through 2016–2017 school years and published during 2016–2018. The design of this research was appropriate as my examination consisted of a review of how a number of variables related to a major complex variable and to what degree this relationship existed (Gay, Mills, & Airasian, 2012).

**Research Questions**

This study sought to determine the extent to which high school size impacts the college readiness of students in the state of New Jersey. To do so, the following research questions were investigated for three consecutive school years (i.e. 2014–2015, 2015–2016 and 2016–2017):

1. What is the effect of school size on the college readiness of New Jersey public schools students when readiness is indicated by student participation and performance on the SAT and Advanced Placement (AP) or International Baccalaureate (IB) courses and exams?

2. How is the effect of school size on college readiness influenced by the school factors of student attendance, teacher retention and the dropout rate?
Hypotheses

An analysis of the following hypotheses was conducted for each of the three school years examined in this study:

1. A statistically significant difference in the participation and performance of New Jersey public school students on the SAT or AP/IB courses and exams will be present as a function of high school size and college readiness.

2. A statistically significant relationship of high school size on college readiness will be present as influenced by the school factors of student attendance, teacher retention and dropout rate.

Null Hypotheses

An analysis of the following null hypotheses was conducted for each of the three school years examined in this study:

1. A statistically significant difference in the participation and performance of New Jersey public school students on the SAT or AP/IB courses and exams will not be present as a function of high school size and college readiness.

2. A statistically significant relationship of high school size on college readiness will not be present as influenced by school factors of student attendance, teacher retention and dropout rate.

Data Source/ Sample Population

The data used in this study were obtained from the New Jersey School Performance Reports, which are published by the NJDOE. In addition to this researcher’s familiarity with New Jersey school districts, New Jersey public schools provide a healthy ethnic and
socioeconomic mix in terms of student demographics (Education Law Center, ND), making the state ideal for a representative study. The information used in this study is made available to parents, students and school communities annually to provide an illustration of the overall performance of schools beyond their test scores to generate local discussions about their students’ progress and trajectory towards success (NJDOE, 2017d). New Jersey Standards Measurement and Resource for Teaching (NJ SMART) is the comprehensive statewide longitudinal data system solution used for staff and student identification, data warehousing, data reporting and analytics to meet federal reporting requirements.

Within New Jersey there are a total of 590 public school districts. Within those public school districts, there are a total of 2,516 public schools. Of those 2,516 public schools, 511 of them are classified as high schools consisting of grades 6–12, 7–12, 8–12, 9–12, as well single grade 9 schools. The enrollment within these schools ranges from just under 200 students to upward of 3,000 students (NJDOE, 2017b).

The sample for this study consisted of 314 comprehensive public high schools in the state of New Jersey that housed students in grades 9 through 12 (see Table 1). School size is the main predictor variable of interest in this study. The ambiguous labels of “large” and “small” were excluded from this study when referring to schools of the same size to thwart misinterpretation of my study. Instead, the enrollment ranges proposed by Lee and Smith (1997) were used to conduct this study; specifically, enrollment of 600 students or less students, 601–1,000 students, 1001–1,500 students and those with enrollment of over 1,500 students.
The sample for school year 2014–2015 is consisted of 67 high schools with 600 students or less students, 86 high schools with 601–1000 students, 92 high schools with 1001–1500 students and 66 high schools with over 1500 students.

For the 2015–2016 school year the sample consisted of 72 high schools with 600 students or less students, 87 high schools with 601–1000 students, 92 high schools with 1001–1500 students and 63 high schools with over 1500 students.

The sample for school year 2016–2017 is consisted of 70 high schools with 600 students or less students, 88 high schools with 601–1000 students, 93 high schools with 1001–1500 students and 63 high schools with over 1500 students.

Excluded from this study were schools categorized as magnet, charter, alternative and vocational schools. Additionally, private and parochial schools were omitted from this study as well. The schools included in this study were all public high schools that did not restrict admission based on students’ performance on standardized achievement exams, special education status, or English Language Learner status; nor were there any specialized entrance criteria required for enrollment.
Variables and Measures

A brief description of the variables used in this study is provided in Table 2. The definitions are in accordance with those provided by the NJDOE. For the purpose of analysis, the variables are classified broadly as independent variables, dependent variables and control variables. For the present study, the independent variable is school size. This study investigated the effect of school size on readiness as indicated by various academic measures. Therefore, the variables related to AP/IB and SAT test scores and participation are the key dependent variables. Other variables such as the teacher retention, chronic absenteeism of students and dropout rate variables were treated as control variables as they were not directly studied in this research work.

Table 2. Description of the Variables Used in the Study (NJDOE, 2017b)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Level of Measurement</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Size</td>
<td>Enrollment size of New Jersey comprehensive public high schools comprised of grades 9–12</td>
<td>Continuous</td>
<td>Predictor Variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Independent Variable</td>
</tr>
<tr>
<td>SAT Participation</td>
<td>Percentage of students taking the SAT, or the Scholastic Aptitude Test</td>
<td>Ordinal</td>
<td>Criterion Variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dependent Variable</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>Average school SAT mathematics performance</td>
<td>Ordinal</td>
<td>Criterion Variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dependent Variable</td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>Percentage of students scoring at or above the College Board established SAT benchmark associated with a 65% probability of obtaining a first-year college grade point average of B- or higher</td>
<td>Ordinal</td>
<td>Criterion Variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dependent Variable</td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>Percentage of students, grades 11–12, enrolled in one or more AP or IB courses</td>
<td>Ordinal</td>
<td>Criterion Variable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dependent Variable</td>
</tr>
<tr>
<td>AP/IB Benchmark Achieved</td>
<td>Percentage of grade 11–12 AP test takers scoring greater than or equal to 3 on at least one AP exam, or IB test</td>
<td>Ordinal</td>
<td>Criterion Variable</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Reliability</td>
<td>Validity</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>Student Attendance</td>
<td>Percentage of students, grades 9–12, who were considered chronically absent (i.e. students who were absent for 10% or more of the days enrolled during the school year). Specifically, any student who is not present for any reason, excused, unexcused or for disciplinary action, is considered absent unless permitted by statute or regulation.</td>
<td>Ordinal</td>
<td>Controlled Variable</td>
</tr>
<tr>
<td>Teacher Retention</td>
<td>Percentage of teachers assigned to the district during the 2015–16 school year that were still assigned to the same district in 2016–17</td>
<td>Ordinal</td>
<td>Controlled Variable</td>
</tr>
<tr>
<td>Dropout Rate</td>
<td>Percentage of students in grades 9 through 12 that discontinued their high school enrollment prior to earning a high school diploma. This rate is calculated by taking all students in grades 9 to 12 who have dropped out during the school year and dividing by the total end-of-year enrollment for grades 9 to 12 for that school year.</td>
<td>Ordinal</td>
<td>Controlled Variable</td>
</tr>
</tbody>
</table>

**Reliability and Validity**

By definition, reliability refers to the degree of consistency with which a quantity can be measured. If a particular outcome is repeated every time a test is conducted, then the test has high reliability and the values obtained can be better trusted. In essence, reliability measures the agreement between multiple measures of the same quantity (Hammersley, 1987).

Validity, on the other hand, refers to that quality that ensures that the property that is to be measured is indeed the quantity being measured (Hammersley, 1987). Both reliability and validity are necessary for any scientific investigation. The researcher should
be able to first establish the validity of the methods employed. In essence, the research methodology and methods chosen should ensure that the quantity being measured is indeed the one to be measured. Similarly, the results should be reliable and multiple attempts at measuring the quantity should not produce drastically different results. In the case of this study, the quantity being measured was college and career readiness compared to the variation in readiness, if any, when the size of the school is investigated. The data was obtained from the New Jersey School Performance Reports from the NJDOE website. Each performance report has multiple quantities that have been demonstrated to measure college and career readiness; an AP exam score of 3 or higher is one of the seven indicators of college readiness (Von Secker & Liu, 2010). Similarly, a SAT score of 1550 indicates at least a 65% chance that a student will perform well in the first year of college (with at least a B- average), which in turn increases a student’s the likelihood of graduating (The College Board, 2013).

Instrumentation/Data Collection

The data analyzed were obtained from the New Jersey School Performance Reports from the NJDOE website. Each school’s performance report provided data on the size of each school’s student enrollment, dropout rates, SAT participation and performance, AP/IB course enrollment and exam performance data, as well as student and staff information.

Data Sampling Method

This study relied on data, specifically AP/IB and SAT scores as provided by the NJDOE for academic years 2014–2015, 2015–2016 and 2016–2017. The data was directly available as part of performance reports from the NJDOE website. However, the choice of
both SAT and AP/IB as indicators was based on the fact that they are likely to give a more complete sample. Other tests such as the Partnership for Assessment of Readiness for College and Careers (PARCC) are often linked to factors such as student mobility (Rhode Island Kids Count, 2017). Additionally, the confidence level related to PARCC performance being used as a reliable indicator of college and career readiness is diminished as a result of parents beginning able to waive their students from having to take the summative assessment (Thompson, 2015). They are also singular tests conducted annually. The SAT and AP/IB tests, on the other hand, have a longer history and are more well known. Additionally, these scores indirectly account for factors like student attendance, teacher attendance and dropout rate (Gallagher, Hayes, & Parr, 2017).

This study collected data comprehensively from all NJ schools. This ensured that the sample population contained students of all socioeconomic backgrounds. The only schools not considered were unique entities such as vocational schools and special education schools where the metrics chosen for this study do not apply. These excluded high schools had an element of specialization that held the potential of skewing results. For example, these schools may provide additional academic guidance and may conduct their own entrance exams. Additionally, they may cater to students who need special programming (i.e. special educational programs) or specialize in students who have interests in vocational pursuits. Charter schools that function independently of the school district were also excluded. Alternative schools that provide instruction in non-traditional settings or methods too have been excluded from this study. After excluding these specialized, vocational and alternative schools, the sample size of 314 high schools in New Jersey was attained. The data from these schools such as AP/IB test scores and SAT scores
were employed in this study to find a relationship between college and career readiness, and school size.

**Analysis Construct**

The data analysis of this study is illustrated in Figure 1 to Figure 4.

![Diagram showing Independent and Dependent Variables](image)

*Figure 1. Independent versus dependent variables.*

The effect of high school size on college readiness was examined by dividing the data available into dependent and independent variables. In this case, the variable to be determined, or the dependent variable is college readiness. This study measured college readiness using academic performance parameters. The independent variable examined was high school size.
The effect of school size on college readiness of New Jersey public school students was measured using student participation and performance on the SAT, or the Scholastic Aptitude Test and Advanced Placement (AP)/International Baccalaureate (IB) courses and exams. Both these scores have established relationship with readiness (Mattern, Shaw, Xiong, 2009).
The effects of high school size on college readiness are influenced by the school factors of student attendance, teacher retention and dropout rate. However, it was possible to isolate the influence of these variables using appropriate statistical methods.
The influence of high school size on college readiness can be explored by controlling for significant student and school characteristic variables. This control was achieved by isolating the effect of these key variables and accounting for their effect on the final dependent variable, college readiness.

**Data Analysis**

All data representing each of the 314 schools was used in a hierarchical linear regression analysis followed by an analysis of variance (ANOVA). The ANOVA was employed to ascertain that there was a statistically significant relationship between school size and college and career readiness.

In order to describe the relationship between the size of New Jersey public high schools and college readiness, this researcher used the Pearson correlation coefficient. According to Witte & Witte (2010) the Pearson Correlation Coefficient (r) is a measure of the degree of linear relationship between two quantitative variables (p. 133). The
correlation coefficient may have any value between plus and minus one (i.e. \(-1.00 \leq R \leq +1.00\)). The closer the R value is to ± 1.00, the stronger the relationship, with \(R = \pm 1.00\) indicating a perfect relationship. Conversely the closer to 0 that a value is, the weaker the relationship, with \(R = 0\) indicating there is no relationship between the two quantitative variables under consideration. An R value of ±0.50 or more represents a very strong relationship (Witte & Witte, 2010). Once R was determined, the researcher then examined the variance \((r^2)\) in order to determine the percentage of the variance associated with college readiness variables that was attributed to the variance in the size of New Jersey public high schools.

Multiple regression analysis was then carried out to understand how school size affected dropout rate. Regression analysis essentially identifies the dependence of one variable on another. Multiple regression is employed to predict a normal dependent variable using a multitude of other variables with varying distributions (Morgan et al., 2013). In the case of this study, the objective was to understand the dependence of readiness on school size while accounting for various student and school variables. Multiple regression analysis is ideally suited for such an analysis. In order to perform this analysis, various characteristics such as student attendance and teacher retention were used as control variables and the effect of school size alone on dropout rate was analyzed. The p value was used to identify whether or not there was a statistically significant relationship between school size and dropout rate. Additionally, the nature of the relationship (whether large school size promotes or discourages dropout rates) was studied afterwards using statistical coefficients.

In order to understand the effect of factors such as teacher retention, chronic
absenteeism of students and other such factors on the relationship between school size and readiness, a hierarchical regression analysis was carried out. This analysis introduced these variables to the regression model sequentially and studied the significance of each on the $R^2$ value so a more complete picture of the influence of school size on readiness could be obtained.

**Summary**

This chapter details the research design and method employed to study the effect of school size on college readiness. Since college readiness cannot be measured directly, academic measures such as SAT performance and AP/IB test scores that have already been linked to readiness were employed. The data was obtained from all public high schools in New Jersey excluding specialized and vocational schools. This was necessary to get a uniform sample that included students from all socioeconomic and backgrounds. Once the data was obtained from the NJDOE website, statistical methods such as ANOVA and regression analysis were employed to identify the nature of the relationship between school size and readiness. Multiple regression analysis was then used to understand the nature of the relationship between school size and readiness. Finally, hierarchical regression analysis was employed in order to examine the effect of other related variables such as dropout rate can have on the relationship between school size and readiness. The next chapter deals with the data analysis itself.
Chapter IV
DATA ANALYSIS

Introduction

The previous chapter presents the methodology employed to understand the relationship between school size and college readiness. As explained, readiness in this study was measured using indicators such as participation and results of the SAT (formerly known as the Scholastic Amplitude Test) and enrollment in Advanced Placement (AP) or International Baccalaureate (IB) courses. The methodology employed included regression analysis, ANOVA and hierarchical regression analysis to study the effect of each variable separately. This chapter presents the relationships between these indicators and readiness for three consecutive school years to ensure reliability of the results obtained. The basic approach was to identify the correlation and regression coefficients that exist between school size and various indicators of readiness. Factors such as student attendance, teacher retention and dropout rate were also considered.

Research Questions

This study sought to determine the extent to which high school size impacts the college readiness of public school students in the state of New Jersey. To do so, the following research questions were examined for three consecutive school years (i.e. 2014–2015, 2015–2016 and 2016–2017):

1. What is the effect of school size on the college readiness of New Jersey public school students when readiness is indicated by student participation and performance on the SAT and Advanced Placement (AP)/International Baccalaureate (IB) courses and exams?
2. How is the effect of school size on college readiness influenced by the school factors of student attendance, teacher retention and dropout rate?

**Hypotheses**

An analysis of the following hypotheses was conducted for each of the three school years examined in this study:

1. A statistically significant difference in the participation and performance of New Jersey public school students on the SAT or AP/IB courses and exams will be present as a function of high school size and college readiness.

2. A statistically significant relationship between high school size and college readiness will be present as influenced by the school factors of student attendance, teacher retention and dropout rate.

**Null Hypotheses**

An analysis of the following null hypotheses was conducted for each of the three school years examined in this study:

1. A statistically significant difference in the participation and performance of New Jersey public school students on the SAT or AP/IB courses and exams will not be present as a function of high school size and college readiness.

2. A statistically significant relationship of high school size on college readiness will not be present as influenced by school factors of student attendance, teacher retention and dropout rate.
Analysis and Results

This section presents the data analysis for each of the three school years considered. The outline for analysis was uniform across years; each analysis begins by calculating the correlation coefficients between participation in SAT and AP/IB tests, the results obtained and the benchmarks achieved. A higher correlation coefficient implied a strong correlation between the two variables being studied. A regression analysis was then carried out to understand the relationship between school size and each of the five quantities being considered such as AP/IB results, SAT participation, etc. The underlying assumptions for regression analysis (Linearity, Normality, Homoscedasticity and Multi-Collinearity) have been met and the results of tests of underlying assumptions are attached in the appendix. The schools were classified into groups based on size and ANOVA (F-test) was then employed to explore the relationship between these sizes and the five variables being considered as indicators of readiness, specifically average SAT math performance (SAT Performance), average percentage of students who achieved the SAT College Readiness Benchmark score (Percent SAT Benchmark Achieved), average AP/IB participation (AP/IB Participation) and percent (on average) of students that earned an AP scored of 3 or better or an IB score of 4 or better (AP/IB Benchmark Achieved). It was assumed that the results of these analyses for a three-year period would provide insights into how school size affects readiness.

Hypothesis 1: Correlation between School Size and Readiness Parameters

The results of Pearson’s correlation between the variables are presented in Table 3.
Table 3. Correlations between School Size, SAT Participation, SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved

<table>
<thead>
<tr>
<th>Criteria Variable</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic year 2014–2015</strong></td>
<td></td>
</tr>
<tr>
<td>SAT Participation</td>
<td>.070</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>.233**</td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>.217**</td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>.166**</td>
</tr>
<tr>
<td>Percent AP/IB Benchmark Achieved</td>
<td>.286**</td>
</tr>
<tr>
<td><strong>Academic year 2015–2016</strong></td>
<td></td>
</tr>
<tr>
<td>SAT Participation</td>
<td>.090</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>.240**</td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>.223**</td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>.150**</td>
</tr>
<tr>
<td>Percent AP/IB Benchmark Achieved</td>
<td>.266**</td>
</tr>
<tr>
<td><strong>Academic year 2016–2017</strong></td>
<td></td>
</tr>
<tr>
<td>SAT Participation</td>
<td>.141*</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>.243**</td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>.222**</td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>.125**</td>
</tr>
<tr>
<td>Percent AP/IB Benchmark Achieved</td>
<td>.186**</td>
</tr>
</tbody>
</table>
The results showed that there are statistically significant correlations between School Size and the SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved (all p values are statistically significant on the level of .01).

The results of the analysis revealed a high significant positive correlation in all three years between School Size and SAT Performance (r= .233, r=.240, r = .243; p<.01), between School Size and Percent SAT Benchmark Achieved (r= .217, r=.233, r = .222; p<0.01), between School Size and AP/IB Participation (r= .166, r=.150, r = .125; p<.01) and between School Size and Percent AP/IB Benchmark Achieved (r= .286, r=.266, r=.186; p<.01). In addition, in the year 2016–2017, a significant correlation was also observed between School Size and SAT Participation (r= .141, p<.05)

The data were then analyzed using regression analysis. This work uses five regression models. In the first regression model, predictor was School Size, while the criterion variable was SAT Participation. In the second regression model, predictor was School Size, while the criterion variable was SAT Performance. In the third regression model, the predictor was School Size, while the criterion variable was Percent SAT Benchmark Achieved. In the fourth model, the criterion variable was AP/IB Participation and in the fifth regression model, the criterion variable was Percent AP/IB Benchmark Achieved. Lower p values (lower that 0.05 and 0.01) show a statistically significant relationship between the variable being studied and school size while higher values indicate the lack of a statistically significant relationship. The results are shown in Table 4 below.
Table 4. Regression Results: Predictor Variable—School Size

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Academic year 2014–2015</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SAT Participation</td>
<td>.070</td>
<td>.005</td>
<td>.070</td>
<td>.221</td>
</tr>
<tr>
<td>2</td>
<td>SAT Performance</td>
<td>.233</td>
<td>.054</td>
<td>.233**</td>
<td>.000</td>
</tr>
<tr>
<td>3</td>
<td>Percent SAT Benchmark Achieved</td>
<td>.217</td>
<td>.047</td>
<td>.217**</td>
<td>.000</td>
</tr>
<tr>
<td>4</td>
<td>AP/IB Participation</td>
<td>.166</td>
<td>.027</td>
<td>.166**</td>
<td>.004</td>
</tr>
<tr>
<td>5</td>
<td>Percent AP/IB Benchmark Achieved</td>
<td>.286</td>
<td>.082</td>
<td>.286**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td><strong>Academic year 2015–2016</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SAT participation</td>
<td>.090</td>
<td>.008</td>
<td>.090</td>
<td>.115</td>
</tr>
<tr>
<td>2</td>
<td>SAT Performance</td>
<td>.240</td>
<td>.058</td>
<td>.240**</td>
<td>.000</td>
</tr>
<tr>
<td>3</td>
<td>Percent SAT Benchmark Achieved</td>
<td>.223</td>
<td>.050</td>
<td>.223**</td>
<td>.000</td>
</tr>
<tr>
<td>4</td>
<td>AP/IB Participation</td>
<td>.150</td>
<td>.023</td>
<td>.150**</td>
<td>.008</td>
</tr>
<tr>
<td>5</td>
<td>Percent AP/IB Benchmark Achieved</td>
<td>.266</td>
<td>.071</td>
<td>.266**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td><strong>Academic year 2016–2017</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SAT Participation</td>
<td>.141</td>
<td>.020</td>
<td>.141*</td>
<td>.013</td>
</tr>
<tr>
<td>2</td>
<td>SAT Performance</td>
<td>.243</td>
<td>.059</td>
<td>.243**</td>
<td>.000</td>
</tr>
<tr>
<td>3</td>
<td>Percent SAT Benchmark Achieved</td>
<td>.222</td>
<td>.049</td>
<td>.222**</td>
<td>.000</td>
</tr>
<tr>
<td>4</td>
<td>AP/IB Participation</td>
<td>.125</td>
<td>.016</td>
<td>.125*</td>
<td>.027</td>
</tr>
<tr>
<td>5</td>
<td>Percent AP/IB Benchmark Achieved</td>
<td>.186</td>
<td>.035</td>
<td>.186**</td>
<td>.001</td>
</tr>
</tbody>
</table>

**Note:** *— Statistically significant on the level of .05
**— Statistically significant on the level of .01

The results showed that the first regression model (School Size as a predictor of SAT Participation) is not statistically significant (p>.05) for years other than 2016–2017. It has been demonstrated that school size is not a statistically significant predictor of participation on the SAT. The results from 2016–2017 however, show a statistically significant relationship between the two. In this case, the beta value is positive, which means the larger the value of School Size in the relationship the higher participation on the SAT. The overall proportion of explained variance of SAT Participation was 2.0% in the first model.

The results of second regression model showed that School Size is statistically significant predictor of performance on the SAT exam (p<.001) in all years. The beta value is positive, which means there is a direct relationship between school size and SAT Performance. In other words, as school size increases, students are more likely to perform better on the SAT exam. The overall proportion of explained variance of SAT Performance was 5.4%, 5.8 % and 5.9 % respectively for years 2014–15, 2015–15 and 2016–17 in the second model.

The results of the third regression model showed that School Size is a statistically significant predictor of Percent SAT Benchmark Achieved (p<.001) every year. The beta value is positive, which means that as School Size increases the more likely students will obtain a first-year college grade point average of B- or higher as demonstrated by the increase in the percentage of students that met or exceeded the established SAT benchmark
indicative of such. The overall proportion of explained variance of Percent SAT Benchmark Achieved was 4.7%, 5.0% and 4.9% respectively for years 2014–2015, 2015–2016 and 2016–2017 in the third model.

School Size is a statistically significant predictor of participation in AP/IB courses (p<0.01) in the fourth model, as well. The beta value is positive, which means the larger the value of School Size, the higher the student enrollment in AP/IB courses. The overall proportion of explained variance of AP/IB Participation was 2.7%, 2.3% and 1.6% respectively for years 2014–15, 2015–15 and 2016–17 in the fourth model.

The results also showed that School Size is a statistically significant predictor of performance on the AP/IB exams, specifically Percent AP/IB Benchmark Achieved, (p<.001) for all three years considered. The beta value is positive which means the larger the value of School Size the greater the percentage of students that met or exceeded College Board established benchmarks on the AP/IB exams. The overall proportion of explained variance of Percent AP/IB Benchmark Achieved was 8.2%, 7.1% and 3.5% respectively for years 2014–15, 2015–16 and 2016–17 in the fifth model.

It has been demonstrated that School Size is statistically significant predictor of SAT Performance, Percent SAT Benchmark Achieved and of participation and performance on the AP/IB courses and exams. The only exceptional result is from school year 2016–2017, where School Size also influenced SAT Participation.

In order to determine whether there are statistically significant differences in the value of SAT and AP/IB participation and exam performance between different groups of School Size, ANOVA (F-tests) were used.
<table>
<thead>
<tr>
<th>Variable</th>
<th>F statistic</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic year 2014–2015</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT Participation</td>
<td>1.138</td>
<td>.334</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>9.528</td>
<td>.000**</td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>8.947</td>
<td>.000**</td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>5.973</td>
<td>.001**</td>
</tr>
<tr>
<td>Percent AP/IB Benchmark Achieved</td>
<td>13.795</td>
<td>.000**</td>
</tr>
<tr>
<td><strong>Academic year 2015–2016</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT Participation</td>
<td>1.044</td>
<td>.373</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>8.725</td>
<td>.000**</td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>8.808</td>
<td>.000**</td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>3.203</td>
<td>.024*</td>
</tr>
<tr>
<td>Percent AP/IB Benchmark Achieved</td>
<td>9.393</td>
<td>.000**</td>
</tr>
<tr>
<td><strong>Academic year 2016–2017</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT Participation</td>
<td>2.434</td>
<td>.065</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>9.434</td>
<td>.000**</td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>9.226</td>
<td>.000**</td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>2.294</td>
<td>.078</td>
</tr>
</tbody>
</table>
The results showed that there are no statistically significant differences in the value of SAT Participation between different groups of School Size for any of the years. However, there seems to be a significant effect on AP/IB Participation for the year 2014–2015 and 2015–2016 (p<.05 and p< .01 respectively). Apart from this exception, data from all years showed that there are statistically significant differences in the value of SAT Performance, Percent SAT Benchmark Achieved and Percent AP/IB Benchmark Achieved between different groups of School Size (p<.01).

Detailed results for statistically significant variables for various years are as shown below. The analysis has been done in cases where the ANOVA demonstrated a statistically significant difference in value with School Size variation.

**SAT Performance**

*Table 6. Differences in value of SAT Performance between different groups of School Size*

<table>
<thead>
<tr>
<th>Variable</th>
<th>(I) Group of School Size</th>
<th>(J) Group of School Size</th>
<th>(I-J) Mean Difference</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic year 2014–2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>601–1000</td>
<td>-33.26</td>
<td>.004**</td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>1001–1500</td>
<td>-42.59</td>
<td>.000**</td>
<td></td>
</tr>
<tr>
<td>SAT Performance</td>
<td>≤600</td>
<td>&gt;1500</td>
<td>-49.39</td>
<td>.000**</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>≤600</td>
<td>601–1000</td>
<td>601–1000</td>
<td>≤600</td>
<td>601–1000</td>
</tr>
<tr>
<td></td>
<td>-24.32</td>
<td>-24.32</td>
<td>≥600</td>
<td>601–1000</td>
</tr>
<tr>
<td></td>
<td>-39.30</td>
<td>-39.30</td>
<td>≤600</td>
<td>601–1000</td>
</tr>
<tr>
<td>SAT Performance</td>
<td>≤600</td>
<td>&gt;1500</td>
<td>601–1000</td>
<td>1001–1500</td>
</tr>
<tr>
<td></td>
<td>-43.37</td>
<td>-43.37</td>
<td>≤600</td>
<td>&gt;1500</td>
</tr>
<tr>
<td></td>
<td>601–1000</td>
<td>1001–1500</td>
<td>1001–1500</td>
<td>&gt;1500</td>
</tr>
<tr>
<td></td>
<td>&gt;1500</td>
<td>&gt;1500</td>
<td>&gt;1500</td>
<td>&gt;1500</td>
</tr>
</tbody>
</table>

**Note:**  *
— Statistically significant on level of 0.05  
**— Statistically significant on level of 0.01
The results of ANOVA show that there are statistically significant differences between the first group (≤600) and all of the larger groups (601–1000, 1001–1500, >1500) in average SAT performance. In all of these cases, SAT Performance is higher in larger groups, but there are no statistically significant differences in SAT Performance between the second (601–1000) and third (1001–1500) group and between the second and fourth (>1500) groups. Also, there are no statistically significant differences between third and fourth group. The p values of all the larger groups are significantly above the set values of 0.05 and 0.01.

Percent SAT Benchmark Achieved

*Table 7. Differences in value of Percent SAT Benchmark Achieved between different groups of School Size*

<table>
<thead>
<tr>
<th>Variable</th>
<th>(I) Group of School Size</th>
<th>(J) Group of School Size</th>
<th>(I-J) Mean Difference</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic year 2014–2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>601–1000</td>
<td>-11.86</td>
<td>.003**</td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>1001–1500</td>
<td>-14.64</td>
<td>.000**</td>
<td></td>
</tr>
<tr>
<td>Percent SAT Benchmark Achieved</td>
<td>≤600</td>
<td>&gt;1500</td>
<td>-16.33</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>601–1000</td>
<td>1001–1500</td>
<td>-2.77</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>601–1000</td>
<td>&gt;1500</td>
<td>-4.46</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>1001–1500</td>
<td>&gt;1500</td>
<td>-1.69</td>
<td>1.000</td>
</tr>
</tbody>
</table>
### Academic year 2015–2016

<table>
<thead>
<tr>
<th>Percent SAT Benchmark Achieved</th>
<th>≤600</th>
<th>601–1000</th>
<th>-10.44</th>
<th>.012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤600</td>
<td></td>
<td>1001–1500</td>
<td>-15.30</td>
<td>.000**</td>
</tr>
<tr>
<td>≤600</td>
<td>&gt;1500</td>
<td>1001–1500</td>
<td>-15.53</td>
<td>.000**</td>
</tr>
<tr>
<td>601–1000</td>
<td>1001–1500</td>
<td>-4.86</td>
<td>.688</td>
<td></td>
</tr>
<tr>
<td>601–1000</td>
<td>&gt;1500</td>
<td>-5.08</td>
<td>.814</td>
<td></td>
</tr>
<tr>
<td>1001–1500</td>
<td>&gt;1500</td>
<td>-.22</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

### Academic year 2016–2017

<table>
<thead>
<tr>
<th>Percent SAT Benchmark Achieved</th>
<th>≤600</th>
<th>601–1000</th>
<th>-12.41</th>
<th>.002**</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤600</td>
<td></td>
<td>1001–1500</td>
<td>-15.77</td>
<td>.000**</td>
</tr>
<tr>
<td>≤600</td>
<td>&gt;1500</td>
<td>1001–1500</td>
<td>-16.75</td>
<td>.000**</td>
</tr>
<tr>
<td>601–1000</td>
<td>1001–1500</td>
<td>-3.35</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>601–1000</td>
<td>&gt;1500</td>
<td>-4.34</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>1001–1500</td>
<td>&gt;1500</td>
<td>-.99</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**  
*— Statistically significant on level of 0.05  
**— Statistically significant on level of 0.01

The results of ANOVA show that there are statistically significant differences in the percent of students that met or exceeded the SAT benchmark between the first group...
(<600) and all of the larger groups (601–1000, 1001–1500 and >1500). In all of these cases, Percent SAT Benchmark Achieved is higher in larger groups, but there are no statistically significant differences in Percent SAT Benchmark Achieved between the second (601–1000) and third (1001–1500) groups and between second and fourth (>1500) groups. Also, there are no statistically significant differences between the third and fourth groups.

**AP/IB Participation**

*Table 8. Differences in value of AP/IB Participation between different groups of School Size*

<table>
<thead>
<tr>
<th>Variable</th>
<th>(I) Group of School Size</th>
<th>(J) Group of School Size</th>
<th>(I-J) Mean Difference</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic year 2014–2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>601–1000</td>
<td>-9.24</td>
<td>.017*</td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>1001–1500</td>
<td>-10.12</td>
<td>.005**</td>
<td></td>
</tr>
<tr>
<td>AP/IB Participation</td>
<td>≤600</td>
<td>&gt;1500</td>
<td>-12.86</td>
<td>.001**</td>
</tr>
<tr>
<td>601–1000</td>
<td>1001–1500</td>
<td>-.88</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>601–1000</td>
<td>&gt;1500</td>
<td>-3.62</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>1001–1500</td>
<td>&gt;1500</td>
<td>-2.74</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Academic year 2015–2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>601–1000</td>
<td>-5.86</td>
<td>.383</td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>1001–1500</td>
<td>-8.42</td>
<td>.043*</td>
<td></td>
</tr>
</tbody>
</table>
The results of ANOVA for the 2014–2015 academic year illustrate that there are statistically significant differences between the AP/IB participation of the first group (≤600) and all of the larger groups (601–1000, 1001–1500 and >1500). For the year 2015–2016, results show that there are statistically significant differences between the first (≤600) and third (1001–1500) groups and between the first and fourth (>1500) groups. In all of these cases, AP/IB Participation is higher in larger groups, but there are no statistically significant differences in AP/IB Participation between the second (601–1000) and third (1001–1500) groups, and between the second and fourth (>1500) groups. Also, there are no statistically significant differences between the third and fourth group. In 2015–2016, there is no statistically significant differences in AP/IB Participation between the first and second (601–1000) groups either.
### Percent AP/IB Benchmark Achieved

*Table 9. Differences in value of Percent AP/IB Benchmark Achieved between different groups of School Size*

<table>
<thead>
<tr>
<th>Variable</th>
<th>(I) Group of School Size</th>
<th>(J) Group of School Size</th>
<th>(I-J) Mean Difference</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic year 2014–2015</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>601–1000</td>
<td>-15.44</td>
<td>.000**</td>
<td></td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>1001–1500</td>
<td>-19.81</td>
<td>.000**</td>
<td></td>
</tr>
<tr>
<td><strong>Percent AP/IB Benchmark Achieved</strong></td>
<td>≤600 ≤600 ≤600 ≥1500</td>
<td>≤600 ≥1500 ≥1500 ≥1500</td>
<td>-22.97</td>
<td>.000**</td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>601–1000</td>
<td>1001–1500</td>
<td>-4.37</td>
<td>1.000</td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>601–1000</td>
<td>≥1500</td>
<td>-7.53</td>
<td>.247</td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>1001–1500</td>
<td>≥1500</td>
<td>-3.16</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>Academic year 2015–2016</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>601–1000</td>
<td>-13.21</td>
<td>.006**</td>
<td></td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>1001–1500</td>
<td>-17.92</td>
<td>.000**</td>
<td></td>
</tr>
<tr>
<td><strong>Percent AP/IB Benchmark Achieved</strong></td>
<td>≤600 ≤600 ≤600 ≥1500</td>
<td>≤600 ≥1500 ≥1500 ≥1500</td>
<td>-20.12</td>
<td>.000**</td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>601–1000</td>
<td>1001–1500</td>
<td>-4.71</td>
<td>1.000</td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>601–1000</td>
<td>≥1500</td>
<td>-6.91</td>
<td>.475</td>
</tr>
<tr>
<td>≤600 ≤600</td>
<td>1001–1500</td>
<td>≥1500</td>
<td>-2.20</td>
<td>1.000</td>
</tr>
<tr>
<td>Academic year 2016–2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>601–1000</td>
<td>-9.03</td>
<td>.008**</td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>1001–1500</td>
<td>-11.17</td>
<td>.000**</td>
<td></td>
</tr>
<tr>
<td>≤600</td>
<td>&gt;1500</td>
<td>-11.31</td>
<td>.001**</td>
<td></td>
</tr>
<tr>
<td>601–1000</td>
<td>1001–1500</td>
<td>-2.14</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>601–1000</td>
<td>&gt;1500</td>
<td>-2.28</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>1001–1500</td>
<td>&gt;1500</td>
<td>-.14</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** *— Statistically significant on level of 0.05
**— Statistically significant on level of 0.01

The results of ANOVA show that there are statistically significant differences between the Percent AP/IB Benchmark Achieved of the first group (≤600) and all of the larger groups (601–1000, 1001–1500 and >1500). In all of these cases, Percent AP/IB Benchmark Achieved is higher in larger groups, but there are no statistically significant differences in Percent AP/IB Benchmark Achieved between the second (601–1000) and third (1001–1500) groups and between the second and fourth (>1500) groups. Also, there are no statistically significant differences between third and fourth groups.

**Generalized Results for First Hypothesis**

The results of ANOVA illustrate that there are statistically significant differences between the first group (≤600) and all of the larger groups (601–1000, 1001–1500 and >1500) in the value of SAT Performance, Percent SAT Benchmark Achieved and Percent
AP/IB Benchmark Achieved. In all of these cases, the results are lowest in the smallest group. It has been demonstrated that a smaller school size (≤600) can adversely affect a school’s average student SAT performance, the percent of students that meet or exceed the SAT benchmark indicative of earning a first-year college average of a B- and the percent of students that meet or exceed AP/IB exam benchmarks.

School Size is a statistically significant predictor of SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved in each of three included school years. School Size is also a statistically significant predictor of SAT Participation for the 2016–2017 school year. Also, the results of ANOVA show that smaller school size (≤600) can result in lower student SAT scores (on average), lower percentage of students the meet the SAT College Readiness benchmark, lower student enrollment in AP/IB classes and lower percentages of students that meet the benchmark score of a 3 on AP exams or a 4 on IB exams.

**Hypothesis 2:**

For the second hypothesis, the analysis was done individually for each of the years considered, specifically, 2014–2015, 2015–2016 and 2016–2017. The objective was to understand annual changes, if any, highlighted by the hierarchical regression analysis.

**First Analysis for Year 2014–2015**

**SAT Participation**

The results of Pearson’s correlation between the variables SAT Participation, Dropout Rate and School Size are presented in Table 10 below. The results showed that
there are statistically significant correlations between SAT participation and Dropout Rate (p<.01)

Table 10. Correlations between SAT Participation, Dropout Rate and School Size (First analysis with the 2014–2015 year included)

<table>
<thead>
<tr>
<th>SAT Participation (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
</tr>
<tr>
<td>- .455**</td>
</tr>
<tr>
<td>School Size</td>
</tr>
<tr>
<td>.070</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on level of .05  
**— Statistically significant on level of .01

The results of the analysis revealed a highly significant negative correlation between SAT participation and the Dropout Rate (r= -.455, p<.01).

The data were then analyzed using hierarchical regression analysis. In the first model, the predictor was Dropout Rate and in the second model, the predictor was School Size. The criterion variable was SAT Participation. Tests of all the underlying assumptions of regression were carried out first and the results are presented in the appendix. The results are presented in Table 11.

Table 11. Regression Results: Criterion Variable—SAT Participation (First Analysis with the 2014–2015 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.455</td>
<td>.207</td>
<td></td>
<td></td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.455**</td>
<td></td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.456</td>
<td>.208</td>
<td>.001</td>
<td>.656</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.453**</td>
<td></td>
<td></td>
<td>.000</td>
</tr>
</tbody>
</table>
Hierarchical regression analysis was used to explore if the School Size is statistically significant predictor of SAT participation, even if the variable Dropout Rate is controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of SAT Participation was 20.7% in the first model. The overall proportion of explained variance of SAT Participation was 20.8% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of just 0.1% of variance when variable Dropout rate is controlled. These results suggest that School Size is not a statistically significant predictor of SAT Participation if Dropout Rate is controlled.

**SAT Performance**

The results of Pearson’s correlation between the variables are presented in Table 12 below. The results showed that there are statistically significant correlations between SAT Performance and Dropout Rate and between SAT Performance and School Size (all p values are statistically significant on the level of .01).

*Table 12. Correlations between SAT Performance, Dropout Rate and School Size (First analysis with the 2014—2015 year included)*

<table>
<thead>
<tr>
<th></th>
<th>SAT Performance (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.408**</td>
</tr>
<tr>
<td>School Size</td>
<td>.233**</td>
</tr>
</tbody>
</table>

**Note:** *— Statistically significant on level of .05
**— Statistically significant on level of .01
The results of the analysis revealed a high significant negative correlation between SAT performance and the Dropout rate (r = -.408, p < .01), while the correlation between SAT performance and School Size is positive (r = .233, p < .01).

The data were then analyzed using hierarchical regression analysis. In the first model, the predictor was Dropout Rate and in the second model, the predictor was School Size. The criterion variable was SAT Performance. Tests of all underlying assumptions of regression were carried out first and the results are presented in the appendix. The results are presented in Table 13.

Table 13. Regression Results: Criterion Variable—SAT Performance (First Analysis with the 2014–2015 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R² change</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.408</td>
<td>.167</td>
<td></td>
<td></td>
<td>-.408**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.451</td>
<td>.203</td>
<td>.037</td>
<td>.000</td>
<td>-.388**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.193**</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on the level of 0.05
**— Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if School Size is a statistically significant predictor of SAT Performance even if variable Dropout Rate is controlled by regression. The results showed that the first regression model is statistically significant (p < .001). The overall proportion of explained variance of SAT Performance was 16.7% in
the first model. The overall proportion of explained variance of SAT Performance was 20.3% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 3.7% of variance when variable Dropout Rate is controlled. That is statistically significant R square change (p<.001). These results suggest that School Size is a statistically significant predictor of SAT Performance if Dropout Rate is controlled.

**Percent SAT Benchmark Achieved**

The results of Pearson’s correlation between the variables are presented in Table 14 below. The results showed that there are statistically significant correlations between Percent SAT Benchmark Achieved and Dropout Rate and between Percent SAT Benchmark Achieved and School Size (all p values are statistically significant on the level of .01).

*Table 14. Correlations between Percent SAT Benchmark Achieved, Dropout Rate and School Size (First analysis with the 2014–2015 year included)*

<table>
<thead>
<tr>
<th></th>
<th>Percent SAT Benchmark Achieved (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.359**</td>
</tr>
<tr>
<td>School Size</td>
<td>.217**</td>
</tr>
</tbody>
</table>

**Note:**  *— Statistically significant on level of .05  
**— Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between Percent SAT Benchmark Achieved and the Dropout Rate (r= -.359, p<.01), while the correlation between Percent SAT Benchmark Achieved and School Size is positive (r=
.217, p<.01). The data were then analyzed using hierarchical regression analysis. In the first model, the predictor was Dropout Rate and in the second model, the predictor was School Size. The criterion variable was Percent SAT Benchmark Achieved. Tests of all underlying assumptions of regression were carried out first and the results are presented in the appendix. The results are presented in Table 15.

Table 15. Regression Results: Criterion Variable—Percent SAT Benchmark Achieved (First Analysis with the 2014–2015 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.359</td>
<td>.129</td>
<td></td>
<td></td>
<td>-.359**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.401</td>
<td>.161</td>
<td>.032</td>
<td>.001</td>
<td>-.340**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.181**</td>
<td>.001</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on the level of 0.05  
  **— Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if the School Size is statistically significant predictor of Percent SAT Benchmark Achieved even if variable Dropout Rate is controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of Percent SAT Benchmark Achieved was 12.9% in the first model. The overall proportion of explained variance of Percent SAT Benchmark Achieved was 16.1% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 3.2% of variance when variable Dropout Rate is controlled. That is statistically significant R square change (p<.001). These results suggest that School Size is
a statistically significant predictor of Percent SAT Benchmark Achieved if Dropout Rate is controlled.

**AP/IB Participation**

The results of Pearson’s correlation between the variables are presented in Table 16 below. The results showed that there are statistically significant correlations between AP/IB participation and Dropout Rate and between AP/IB Participation and School Size (all p values are statistically significant on the level of .01).

*Table 16. Correlations between AP/IB Participation, Dropout Rate and School Size (First analysis with the 2014–2015 year included)*

<table>
<thead>
<tr>
<th>AP/IB Participation (R)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.307**</td>
</tr>
<tr>
<td>School Size</td>
<td>.166**</td>
</tr>
</tbody>
</table>

**Note:** *— Statistically significant on level of .05  
**— Statistically significant on level of .01*

The results of the analysis revealed a significant negative correlation between AP/IB Participation and the Dropout Rate (r= -.307, p<.01), while the correlation between AP/IB Participation and School Size is positive (r= .166, p<.01).

The data were then analyzed using hierarchical regression analysis. In the first model, the predictor was Dropout Rate and in the second model, the predictor was School Size. The criterion variable was AP/IB Participation. Tests of all underlying assumptions of regression were carried out first and the results are presented in the appendix. The results are presented in Table 17.
Table 17. Regression Results: Criterion Variable—AP/IB Participation (First Analysis with the 2014–2015 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>sig F change</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drop Rate</td>
<td>.307</td>
<td>.095</td>
<td>.000</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.336</td>
<td>.113</td>
<td>.013</td>
<td>.013</td>
<td>-.293**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.135*</td>
<td>.013</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on the level of 0.05
**— Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if the School Size is statistically significant predictor of AP/IB Participation score even if variable Dropout Rate is controlled by regression. The results showed that the first regression model is statistically significant ($p<0.01$). The overall proportion of explained variance of AP/IB Participation score was 9.5% in the first model. The overall proportion of explained variance of AP/IB Participation score was 11.3% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 1.8% of variance when the variable Dropout Rate is controlled. That is statistically significant $R$ square change ($p<.001$). These results suggest that School Size is a statistically significant predictor of AP/IB Participation score if Dropout Rate is controlled.
Percent AP/IB Benchmark Achieved

The results of Pearson’s correlation between the variables are presented in Table 18 below. The results showed that there are statistically significant correlations between Percent AP/IB Benchmark Achieved score and Dropout Rate and between Percent AP/IB Benchmark Achieved and School Size (all p values are statistically significant on the level of .01).

Table 18. Correlations between Percent AP/IB Benchmark Achieved, Dropout Rate and School Size (First analysis with the 2014–2015 year included)

<table>
<thead>
<tr>
<th>Percent AP/IB Benchmark Achieved (R)</th>
<th>Dropout Rate</th>
<th>School Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>.409</strong></td>
<td>-.409**</td>
<td>.286**</td>
</tr>
</tbody>
</table>

Note: * — Statistically significant on level of .05  
** — Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between Percent AP/IB Benchmark Achieved and the Dropout Rate ($r = -.409, p<.01$), while the correlation between Percent AP/IB Benchmark Achieved and School Size is positive ($r = .286, p<.01$).

The data were then analyzed using hierarchical regression analysis. In the first model, the predictor was Dropout Rate and in the second model, the predictor was School Size. The criterion variable was Percent AP/IB Benchmark Achieved. Tests of all underlying assumptions of regression were carried out first and the results are presented in the appendix. The results are presented in Table 19.
Table 19. Regression Results: Criterion Variable—Percent AP/IB Benchmark Achieved (First Analysis with the 2014–2015 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.409</td>
<td>.167</td>
<td></td>
<td></td>
<td>-.409**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.476</td>
<td>.227</td>
<td>.060</td>
<td>.000</td>
<td>-.383**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.246**</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on the level of 0.05
**— Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if School Size is a statistically significant predictor of Percent AP/IB Benchmark Achieved score, even if the variable Dropout Rate is controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of Percent AP/IB Benchmark Achieved was 16.7% in the first model. The overall proportion of explained variance of Percent AP/IB Benchmark Achieved was 22.7% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 6% when variable Dropout Rate is controlled. That is statistically significant R square change (p<.001). These results suggest that School Size is a statistically significant predictor of Percent AP/IB Benchmark Achieved if Dropout Rate is controlled.

Summary of First Analysis for Year 2014–2015

School Size is a statistically significant predictor of SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved...
even if Dropout Rate was controlled. The analysis illustrates that, on average, a larger school size (above 600 students) results in higher performance on the SAT mathematics assessment and a greater percentage of students who meet or exceed the SAT College Readiness benchmark. In addition, a greater percentage of the student body enrolled in AP/IB courses in schools with enrollments greater than 600 students compared to those schools with less than 600 students. Of those students enrolled in AP/IB courses, a higher percentage of them score a 3 or higher on at least one AP exam or a 4 or better on at least one IB exam. This relationship holds even when dropout rate was accounted for.

Second Analysis for Year 2015–2016

SAT Participation

The results of Pearson’s correlation between the variables are presented in Table 20. The results showed that there are statistically significant correlations between SAT Participation and Dropout Rate and between SAT Participation and Student Attendance (p<.01).

Table 20. Correlations between SAT Participation, Dropout Rate, Student Attendance and School Size (second analysis with the 2015–2016 year included)

<table>
<thead>
<tr>
<th></th>
<th>SAT Participation (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.322**</td>
</tr>
<tr>
<td>Student Attendance</td>
<td>-.241**</td>
</tr>
<tr>
<td>School Size</td>
<td>.090</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on level of .05  
**— Statistically significant on level of .01
The results of the analysis revealed a significant negative correlation between SAT Participation and the Dropout Rate ($r = -0.322$, $p < 0.01$). There is a statistically significant negative correlation between SAT Participation and Student Attendance, too ($r = -0.241$, $p < 0.01$).

The data were then analyzed using hierarchical regression analysis. In the first model, the predictors were Dropout Rate and Student Attendance and in the second model, the predictor was School Size and the criterion variable was SAT Participation. The results are presented in Table 21.

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>sig F change</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.328</td>
<td>.107</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.277**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.331</td>
<td>.110</td>
<td>.002</td>
<td>.378</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.076</td>
<td>.257</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.048</td>
<td>.378</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on the level of 0.05  
**— Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if the School Size is statistically significant predictor of SAT Participation even if variable Dropout Rate is controlled by regression. The results showed that the first regression model is statistically significant ($p < 0.01$). The overall proportion of explained variance of SAT Participation was
10.7% in the first model. The overall proportion of explained variance of SAT Participation was 11% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of just 0.2% of variance when the variables Dropout Rate and Student Attendance are controlled. These results suggest that School Size is not a statistically significant predictor of SAT Participation if Dropout Rate and Student Attendance is controlled.

**SAT Performance**

The results of Pearson’s correlation between the variables are presented in Table 22. The results showed that there are statistically significant correlations between SAT Performance and Dropout Rate, between SAT Performance and Student Attendance and between SAT Performance and School Size (p<.01).

<table>
<thead>
<tr>
<th></th>
<th>SAT Performance (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.469**</td>
</tr>
<tr>
<td>Student Attendance</td>
<td>-.677**</td>
</tr>
<tr>
<td>School Size</td>
<td>.240**</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on level of .05  
**—Statistically significant on level of .01

The results of the analysis revealed a high significant negative correlation between SAT Performance and the Dropout Rate (r= -.469, p<.01) and between SAT Performance and Student Attendance (r= -.677, p<.01), while the correlation between SAT Performance and School Size is statistically significant and positive (r= .240, p<.01).
The data were then analyzed using hierarchical regression analysis. In the first model, the predictors were Dropout Rate and Student Attendance and in the second model, the predictor was School Size and the criterion variable was SAT Performance. The results are presented in Table 23 below.

Table 23. Regression Results: Criterion Variable—SAT Performance (Second Analysis with the 2015–2016 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.682</td>
<td>.465</td>
<td></td>
<td></td>
<td>-.104**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.615**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.696</td>
<td>.485</td>
<td>.020</td>
<td>.001</td>
<td>-.097</td>
<td>.058</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.598**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.143**</td>
<td>.001</td>
</tr>
</tbody>
</table>

**Note:** *— Statistically significant on the level of 0.05

**— Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if School Size is a statistically significant predictor of SAT Performance, even if the variables Dropout Rate and Student Attendance are controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of SAT Performance was 46.5% in the first model. The overall proportion of the explained variance of SAT Performance was 48.5% in the second model, meaning that School Size contributes
to the explanation of total percentage of variance in the proportion of 2% of variance when
the variables Dropout Rate and Student Attendance are controlled. That is a statistically
significant R square change (p<.001). These results suggest that School Size is a
statistically significant predictor of SAT Performance, even if Dropout Rate and Student
Attendance are controlled.

*Percent SAT Benchmark Achieved*

The results of Pearson’s correlation between the variables are presented in Table
24. The results showed that there are statistically significant correlations between the
Percent SAT Benchmark Achieved and Dropout Rate and between the Percent SAT
Benchmark Achieved and Student Attendance and between the Percent SAT Benchmark
Achieved and School Size (p<.01).

*Table 24. Correlations between Percent SAT Benchmark Achieved, Dropout Rate, Student Attendance and School Size
(Second analysis with the 2015–2016 year included)*

<table>
<thead>
<tr>
<th>Percent SAT Benchmark Achieved (R)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.428**</td>
</tr>
<tr>
<td>Student Attendance</td>
<td>-.652**</td>
</tr>
<tr>
<td>School Size</td>
<td>.223**</td>
</tr>
</tbody>
</table>

*Note:* *—Statistically significant on level of .05
**—Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between
Percent SAT Benchmark Achieved and the Dropout Rate (r= -.428, p<.01), between
Percent SAT Benchmark Achieved and Student Attendance ($r = -0.652, p<.01$). Also, the Percent SAT Benchmark Achieved is a statistically significant, but positively correlated with School Size ($r = 0.223, p<.01$).

The data were then analyzed using hierarchical regression analysis. In the first model, the predictors were Dropout Rate and Student Attendance, while in the second model, the predictor was School Size. The criterion variable was Percent SAT Benchmark Achieved. The results are presented in Table 25.

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>.654</td>
<td>.428</td>
<td></td>
<td></td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Dropout Rate</td>
<td></td>
<td></td>
<td>-.063</td>
<td>.241</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td>-.614**</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>.667</td>
<td>.444</td>
<td>.017</td>
<td>.003</td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Dropout Rate</td>
<td></td>
<td></td>
<td>-.057</td>
<td>.283</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td>-.599**</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td>.131**</td>
<td>.003</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *—Statistically significant on the level of 0.05

**—Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if the School Size is a statistically significant predictor of Percent SAT Benchmark Achieved, even if the variables Dropout Rate and Student Attendance are controlled by regression. The results showed that the first regression model is statistically significant ($p<.001$). The overall proportion of explained variance of Percent SAT Benchmark Achieved was 42.8% in the
first model. The overall proportion of explained variance of Percent SAT Benchmark Achieved was 44.4% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 1.7% when the variables Dropout Rate and Student Attendance are controlled. That is statistically significant R square change (p<.01). These results suggest that School Size is a statistically significant predictor of Percent SAT Benchmark Achieved even if Dropout Rate and Student Attendance are controlled.

*AP/IB Participation*

The results of Pearson’s correlation between the variables are presented in Table 26 below. The results showed that there are statistically significant correlations between AP/IB Participation score and Dropout Rate and between AP/IB Participation and School Size (all p values are statistically significant on the level of .01).

*Table 26. Correlations between AP/IB participation, Dropout Rate, Student Attendance and School Size (Second analysis with the 2015–2016 year included)*

<table>
<thead>
<tr>
<th></th>
<th>AP/IB Participation (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.437**</td>
</tr>
<tr>
<td>Student Attendance</td>
<td>-.445**</td>
</tr>
<tr>
<td>School Size</td>
<td>.150**</td>
</tr>
</tbody>
</table>

*Note: *— Statistically significant on level of .05
**— Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between AP/IB Participation and the Dropout Rate (r= -.437, p<.01), between AP/IB Participation and Student Attendance (r= -.445, p<.01). While the correlation between AP/IB Participation and School Size is statistically significant but positive (r= .150, p<.01). The
data were then analyzed using hierarchical regression analysis. In the first model, the predictors were Dropout Rate and Student Attendance, while in the second model, the predictor was School Size. The criterion variable was AP/IB Participation. The results are presented in Table 27.

*Table 27. Regression Results: Criterion Variable—AP/IB Participation (Second Analysis with the 2015–2016 year included)*

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>.479</td>
<td>.229</td>
<td></td>
<td></td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dropout Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.246**</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.273**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>.487</td>
<td>.237</td>
<td>.008</td>
<td>.069</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dropout Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.245**</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.262**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.092</td>
<td>.069</td>
</tr>
</tbody>
</table>

*Note: *—Statistically significant on the level of 0.05

**—Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if the School Size is not statistically significant predictor of AP/IB Participation score if variables Dropout rate and Student attendance are controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of AP/IB Participation score was 22.9% in the first model. The overall proportion of explained variance of AP/IB Participation score was 23.7% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion
of 0.8% of variance, when the variables Dropout Rate and Student Attendance are controlled. That is not statistically significant R square change (p<.001). These results suggest that School Size is not a statistically significant predictor of AP/IB Participation score if Dropout Rate and Student Attendance are controlled.

**Percent AP/IB Benchmark Achieved**

The results of Pearson’s correlation between the variables are presented in Table 28 below. The results showed that there are statistically significant correlations between Percent AP/IB Benchmark Achieved score and Dropout Rate, between Percent AP/IB Benchmark Achieved and Student Attendance and between Percent AP/IB Benchmark Achieved and School Size (all p values are statistically significant on the level of .01).

<table>
<thead>
<tr>
<th>Percent AP/IB Benchmark Achieved (R)</th>
<th>Dropout rate</th>
<th>-.512**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student attendance</td>
<td>-.519**</td>
<td></td>
</tr>
<tr>
<td>School Size</td>
<td>.266**</td>
<td></td>
</tr>
</tbody>
</table>

Note: * — Statistically significant on level of .05  
** — Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between the Percent AP/IB Benchmark Achieved and the Dropout Rate (r= -.512, p<.01), between the Percent AP/IB Benchmark Achieved and the Student Attendance (r= -.519, p<.01), while the correlation between the Percent AP/IB Benchmark Achieved and the School Size is positive (r= .266, p<.01). The data were then analyzed using hierarchical regression analysis. In the first model, the predictors were Dropout Rate and Student Attendance,
while in the second model, the predictor was School Size and the criterion variable was Percent AP/IB Benchmark Achieved. The results are presented in Table 29.

*Table 29. Regression Results: Criterion Variable—Percent AP/IB Benchmark Achieved (Second Analysis with the 2015–2016 year included)*

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R² change</th>
<th>R² change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.574</td>
<td>.329</td>
<td></td>
<td>-.310**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td>-.328**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.619</td>
<td>.384</td>
<td>.055</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td>-.308**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td></td>
<td>-.316**</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: *—Statistically significant on the level of 0.05
**—Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if the School Size is a statistically significant predictor of Percent AP/IB Benchmark Achieved score, even if the variables Dropout Rate and Student Attendance are controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of Percent AP/IB Benchmark Achieved was 32.9% in the first model. The overall proportion of explained variance of Percent AP/IB Benchmark Achieved was 38.4% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 5.5%, when the variables Dropout Rate and Student Attendance are controlled. That is a statistically significant R square change (p<.001). School Size is therefore a statistically significant predictor of
Percent AP/IB Benchmark Achieved even if Dropout Rate and Student Attendance are controlled.

*Summary of Second Analysis for Year 2015–2016*

School Size is a statistically significant predictor of SAT performance, Percent SAT Benchmark Achieved and Percent AP/IB Benchmark Achieved, even if the variables Dropout rate and Student Attendance are controlled. School Size is not a statistically significant predictor of SAT and AP/IB Participation if the variables Dropout Rate, Student Attendance and Teacher Retention are controlled.

The analysis conducted illustrated that, on average, a school size of greater than 600 students resulted in higher student performance on the SAT mathematics assessment (on average) and a higher percent of students who met or exceeded the SAT College Readiness benchmark. Additionally, schools with over 600 students had higher percentages of AP/IB students score a 3 or higher on at least one AP exam or a 4 or better on at least one IB exam. This relationship held even when dropout rate, chronic student absenteeism and teacher retention were accounted for.

*Third analysis for Year 2016–2017.*

*SAT Participation*

The results of Pearson’s correlation between the variables are presented in Table 30. The results showed that there are statistically significant correlations between SAT Participation and Dropout Rate, between SAT Participation and Student Attendance and between SAT Participation and Teacher Retention and School Size (p<.05).
Table 30. Correlations between SAT Participation, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included)

<table>
<thead>
<tr>
<th>SAT Participation (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
</tr>
<tr>
<td>-.434**</td>
</tr>
<tr>
<td>Student Attendance</td>
</tr>
<tr>
<td>-.351**</td>
</tr>
<tr>
<td>Teacher Retention</td>
</tr>
<tr>
<td>.205**</td>
</tr>
<tr>
<td>School Size</td>
</tr>
<tr>
<td>.141*</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on level of .05
**— Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between SAT Participation and the Dropout Rate (r = -.434, p < .01), between SAT Participation and Student Attendance (r = -.351, p < .01). There is a statistically significant positive correlation between SAT Participation and Teacher Retention (r = .205, p < .01) and SAT Participation and School Size (r = .141, p < .05). The data were then analyzed using hierarchical regression analysis. In the first model, predictors were Dropout Rate, Student Attendance and Teacher Retention, while in the second model, the predictor was School Size and the criterion variable was SAT Participation. The results are presented in Table 31 below.

Table 31. Regression Results: Criterion Variable—SAT Participation (Third Analysis with the 2016–2017 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.453</td>
<td>.205</td>
<td></td>
<td></td>
<td>-.346**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.131*</td>
<td>.042</td>
</tr>
<tr>
<td></td>
<td>Teacher Retention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.065</td>
<td>.211</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.463</td>
<td>.214</td>
<td>.009</td>
<td>.067</td>
<td>-.343**</td>
<td>.000</td>
</tr>
</tbody>
</table>

104
Hierarchical regression analysis was used to explore if the School Size is statistically significant predictor of SAT Participation even if variables Dropout Rate, Student Attendance and Teacher Retention are controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of SAT Participation was 20.5% in the first model. The overall proportion of explained variance of SAT Participation was 21.4% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of just 0.9% of variance when the variables Dropout Rate, Student Attendance and Teacher Retention are controlled. School Size is therefore not a statistically significant predictor of SAT Participation if Dropout Rate, Student Attendance and Teacher Retention are controlled.

**SAT Performance**

The results of Pearson’s correlation between the variables are presented in Table 32.

<table>
<thead>
<tr>
<th>SAT Performance (R)</th>
<th>Dropout Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.613**</td>
<td></td>
</tr>
</tbody>
</table>
The results of the analysis revealed a high significant negative correlation between SAT Performance and the Dropout Rate ($r = -0.613$, $p<.01$) and between SAT Performance and Student Attendance ($r = -0.553$, $p<.01$). While the correlation between SAT Performance and the Teacher Retention ($r = 0.143$, $p<.01$) and SAT Performance and the School Size ($r = 0.243$, $p<.01$) is statistically significant and positive.

The data were then analyzed using hierarchical regression analysis. In the first model, the predictors were Dropout Rate, Student Attendance and Teacher Retention, while in the second model, the predictor was School Size and the criterion variable was SAT Performance. The results are presented in Table 33.

Table 33. Regression Results: Criterion Variable—SAT Performance (Third Analysis with the 2016–2017 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>$\Delta \text{sig F}$</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.656</td>
<td>.431</td>
<td></td>
<td></td>
<td>-.439**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Dropout Rate</td>
<td>.681</td>
<td>.464</td>
<td>.034</td>
<td>.003</td>
<td>-.431**</td>
<td>.000</td>
</tr>
<tr>
<td>1</td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.288**</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td>.034</td>
<td>.004</td>
<td>-.282**</td>
<td>.000</td>
</tr>
<tr>
<td>1</td>
<td>Teacher Retention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.017</td>
<td>.697</td>
</tr>
<tr>
<td>2</td>
<td>Teacher Retention</td>
<td></td>
<td></td>
<td>.034</td>
<td>.004</td>
<td>-.009</td>
<td>.837</td>
</tr>
</tbody>
</table>

Note: *—Statistically significant on level of .05  
**—Statistically significant on level of .01
Hierarchical regression analysis was used to explore if the School Size is statistically significant predictor of SAT Performance even if variables Dropout Rate, Student Attendance and Teacher Retention are controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of SAT Performance was 43.1% in the first model. The overall proportion of explained variance of SAT Performance was 46.4% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 3.4% of variance when the variables Dropout Rate, Student Attendance and Teacher Retention are controlled. That is a statistically significant R square change (p<.001). These results suggest that School Size is a statistically significant predictor of SAT Performance even if Dropout Rate, Student Attendance and Teacher Retention are controlled.

**Percent SAT Benchmark Achieved**

The results of Pearson’s correlation between the variables are presented in Table 34. The results showed that there are statistically significant correlations between Percent SAT Benchmark Achieved and Dropout Rate, between Percent SAT Benchmark Achieved and Student Attendance, between Percent SAT Benchmark Achieved and Teacher Retention, and between Percent SAT Benchmark Achieved and School Size (p<.01).
Table 34. Correlations between Percent SAT Benchmark Achieved, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included)

<table>
<thead>
<tr>
<th></th>
<th>Percent SAT Benchmark Achieved (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate</td>
<td>-.540**</td>
</tr>
<tr>
<td>Student Attendance</td>
<td>-.650**</td>
</tr>
<tr>
<td>Teacher Retention</td>
<td>.235**</td>
</tr>
<tr>
<td>School Size</td>
<td>.222**</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on level of .05  
**— Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between Percent SAT Benchmark Achieved and the Dropout Rate ($r = -.540$, $p < .01$), between Percent SAT Benchmark Achieved and Student Attendance ($r = -.650$, $p < .01$). Also, Percent SAT Benchmark Achieved is in statistically significant, but positive correlation with Teacher Retention ($r = .235$, $p < .01$) and School Size ($r = .222$, $p < .01$). The data were then analyzed using hierarchical regression analysis. In the first model, predictors were Dropout Rate, Student Attendance and Teacher Retention, while in the second model, the predictor was School Size, and the criterion variable was Percent SAT Benchmark Achieved. The results are presented in Table 35.

Table 35. Regression Results: Criterion Variable—Percent SAT Benchmark Achieved (Third Analysis with the 2016–2017 year included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>sig $F$ change</th>
<th>$\beta$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dropout Rate</td>
<td>.684</td>
<td>.468</td>
<td>.468</td>
<td>.000</td>
<td>-.232**</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.491**</td>
<td>.000</td>
</tr>
</tbody>
</table>
Hierarchical regression analysis was used to explore if School Size is a statistically significant predictor of Percent SAT Benchmark Achieved even if variables Dropout Rate, Student Attendance and Teacher Retention are controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of Percent SAT Benchmark Achieved was 46.8% in the first model. The overall proportion of explained variance of Percent SAT Benchmark Achieved was 49% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 2.2% when the variables Dropout Rate, Student Attendance and Teacher Retention are controlled. That is a statistically significant R square change (p<.01). These results suggest that School Size is a statistically significant predictor of Percent SAT Benchmark Achieved even if Dropout Rate, Student Attendance and Teacher Retention are controlled.
**AP/IB Participation**

The results of Pearson’s correlation between the variables are presented in Table 36. The results showed that there are statistically significant correlations between AP/IB Participation score and Dropout Rate, between AP/IB Participation and Student Attendance, between AP/IB Participation and Teacher Retention and between AP/IB Participation and School Size (all p values are statistically significant on the level of .05).

Table 36. Correlations between AP/IB Participation, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included)

<table>
<thead>
<tr>
<th>AP/IB Participation (R)</th>
<th>Dropout Rate</th>
<th>Student Attendance</th>
<th>Teacher Retention</th>
<th>School Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-.404**</td>
<td>-.468**</td>
<td>.135*</td>
<td>.125*</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on level of .05  
**— Statistically significant on level of .01

The results of the analysis revealed a significant negative correlation between AP/IB Participation and the Dropout Rate (r= -.404, p<.01) and between AP/IB Participation and Student Attendance (r= -.468, p<.01). While the correlation between AP/IB Participation and Teacher Retention (r= .135, p<.05) and between AP/IB Participation and School Size (r= .125, p<.05) is statistically significant but positive. The data were then analyzed using hierarchical regression analysis. In the first model, predictors were Dropout Rate, Student Attendance and Teacher Retention, while in the second model, the predictor was School Size, and the criterion variable was AP/IB Participation. The results are presented in Table 37.
Hierarchical regression analysis was used to explore if School Size is not a statistically significant predictor of AP/IB Participation score if the variables Dropout Rate, Student Attendance and Teacher Retention are controlled by regression. The results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of AP/IB Participation score was 24.4% in the first model. The overall proportion of explained variance of AP/IB Participation score was 25% in the second model and it means that School Size contributes to the explanation of total percentage of variance in the proportion of 0.6% of variance when the variables Dropout Rate, Student Attendance and Teacher Retention are controlled. That is not a statistically significant $R^2$ square change (p<.001). These results suggest that School Size is not a
statistically significant predictor of AP/IB Participation score if Dropout Rate, Student Attendance and Teacher Retention are controlled.

**Percent AP/IB Benchmark Achieved**

The results of Pearson’s correlation between the variables are presented in Table 38. The results showed that there are statistically significant correlations between Percent AP/IB Benchmark Achieved score and Dropout Rate, between Percent AP/IB Benchmark Achieved and Student Attendance, between Percent AP/IB Benchmark Achieved and Teacher Retention and between Percent AP/IB Benchmark Achieved and School Size (p<.01).

Table 38. Correlations between Percent AP/IB Benchmark Achieved, Dropout Rate, Student Attendance, Teacher Retention and School Size (Third analysis with the 2016–2017 year included)

<table>
<thead>
<tr>
<th>Percent AP/IB Benchmark Achieve (R)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout rate</td>
<td>-.371**</td>
</tr>
<tr>
<td>Student attendance</td>
<td>-.499**</td>
</tr>
<tr>
<td>Teacher retention</td>
<td>.164**</td>
</tr>
<tr>
<td>School Size</td>
<td>.186**</td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on level of .05  
**— Statistically significant on level of .01

The results of the analysis revealed a statistically significant negative correlation between Percent AP/IB Benchmark Achieved and the Dropout Rate (r= -.371, p<.01) and between Percent AP/IB Benchmark Achieved and Student Attendance (r= -.499, p<.01), while correlations between Percent AP/IB Benchmark Achieved and Teacher Retention
(r = .164, p<.01) and between Percent AP/IB Benchmark Achieved and School Size (r = .186, p<.01) are positive.

The data were then analyzed using hierarchical regression analysis. In the first model, predictors were Dropout Rate, Student Attendance and Teacher Retention, while in the second model, the predictor was School Size, and the criterion variable was Percent AP/IB Benchmark Achieved. The results are presented in Table 39.

Table 39. Regression Results: Criterion variable—Percent AP/IB Benchmark Achieved (Third Analysis with the 2016–2017 year Included)

<table>
<thead>
<tr>
<th>Model</th>
<th>Criterion Variable</th>
<th>R</th>
<th>R²</th>
<th>R² change</th>
<th>sig F change</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>.511</td>
<td>.261</td>
<td></td>
<td></td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Dropout Rate</td>
<td></td>
<td></td>
<td>-.111</td>
<td>.071</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td>-.420**</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teacher Retention</td>
<td></td>
<td></td>
<td>.061</td>
<td>.227</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>.528</td>
<td>.279</td>
<td>.018</td>
<td>.006</td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Dropout Rate</td>
<td></td>
<td></td>
<td>-.106</td>
<td>.082</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Attendance</td>
<td></td>
<td></td>
<td>-.416**</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teacher Retention</td>
<td></td>
<td></td>
<td>.042</td>
<td>.406</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School Size</td>
<td></td>
<td></td>
<td>.135**</td>
<td>.006</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *— Statistically significant on the level of 0.05

**— Statistically significant on the level of 0.01

Hierarchical regression analysis was used to explore if School Size is statistically significant predictor of Percent AP/IB Benchmark Achieved score even if variables Dropout Rate, Student Attendance and Teacher Retention are controlled by regression. The
results showed that the first regression model is statistically significant (p<.001). The overall proportion of explained variance of Percent AP/IB Benchmark Achieved was 26.1% in the first model. The overall proportion of explained variance of Percent AP/IB Benchmark Achieved was 27.9% in the second model illustrating that School Size contributes to the explanation of total percentage of variance in the proportion of 1.8% when the variables Dropout Rate, Student Attendance and Teacher Retention are controlled. That is statistically significant R square change (p<.01). These results suggest that School Size is a statistically significant predictor of Percent AP/IB Benchmark Achieved even if Dropout Rate, Student Attendance and Teacher Retention are controlled.

*Summary of Third Analysis for Year 2016–2017*

School Size is a statistically significant predictor of SAT Performance, Percent SAT Benchmark Achieved and Percent AP/IB Benchmark Achieved even if the variables Dropout Rate, Student Attendance and Teacher Retention are controlled. School Size is not a statistically significant predictor of SAT or AP/IB Participation if variables Dropout Rate, Student Attendance and Teacher Retention are controlled.

The analysis conducted illustrated that, on average, larger schools with more than 600 students had (on average) higher student performance on the SAT mathematics assessment, greater percentage of students who met or exceeded the SAT College Readiness benchmark, as well as a greater percent of AP/IB students score a 3 or higher on at least one AP exam or a 4 or better on at least one IB exam. This relationship held even when dropout rate, chronic student absenteeism and teacher retention were accounted for.
Summary of Results

This chapter explored the validity of two hypotheses regarding school size and readiness, as measured through various parameters. The first of the two hypotheses is:

1. A statistically significant difference in the participation and performance of New Jersey public school students on the SAT or AP/IB courses and exams will be present as a function of high school size and college readiness.

To validate or invalidate this hypothesis, data from three academic years for New Jersey high schools were analyzed. The statistical tools of ANOVA, regression analysis and Pearson’s correlation coefficient were employed for this purpose. It was seen that School Size had a statistically significant effect on SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved. The only exception to this generic result was the year 2016–2017 where, School Size was shown to influence SAT Participation as well.

The ANOVA also showed that smaller school sizes may be counterproductive to readiness, as SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved were all higher in schools with School Sze over 600 students.

In general, there was agreement among the results obtained for all three years. These results suggest that larger school sizes may improve readiness as it has a positive influence on parameters such as SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved.

The second hypothesis of this study is:
2. A statistically significant relationship of high school size on college readiness will be present as influenced by the school factors of student attendance, teacher retention and dropout rate.

In order to study the effect of school size devoid of influences such as student attendance, teacher retention and dropout rate, hierarchical regression analysis was applied. Over all three years, the influence of school size on readiness parameters were studied by controlling each of the three variables mentioned in the hypothesis (student attendance, teacher retention and dropout rate where available). The results indicate the effect of school size is statistically significant even when these variables are controlled. This further supports that school size can influence readiness.

Analysis of the results obtained in this chapter supports the findings that School Size can have a significant impact on SAT Performance, Percent SAT Benchmark Achieved, AP/IB Participation and Percent AP/IB Benchmark Achieved. In general, school sizes larger than 600 students appears to have a positive influence on these parameters. Since these parameters affect readiness, this study suggests that readiness is better achieved in relatively larger schools with over 600 students, at least for the schools studied in this thesis.
Chapter V

CONCLUSIONS AND RECOMMENDATIONS

Introduction

According to the National Center for Public Policy and Higher Education & The Southern Regional Education Board (2010), there is a disparity between those who are college-eligible, which is defined as having earned a high school diploma, and those that are actually college-ready, meaning capable of succeeding in credit-bearing courses without the need for remediation. Educational leaders, policy makers and researchers are seeking ways to bridge the gap between college-eligible and the college-ready students while working within the confines of budget shortfalls and growing demands to be fiscally efficient (McDonough, 2004). Adjusting school sizes is among the educational reforms being considered in various states to improve public education, including New Jersey. Recommendations stemming from prior research (e.g. Coleman, 1966, Fowler & Walberg, 1991; Greenwald, et al., 1996) promote reducing enrollment in large high schools in order to promote increased student learning (Conley, 2005; Chopin, 2003; Kuo, 2010; Schwartz, Stiefel & Chellman, 2008), but no exploration has been done to see how these reforms would align with students’ academic preparedness for college in the state of New Jersey.

The purpose of this study was to investigate the relationship between high school size in New Jersey and college and career readiness. The data examined were obtained from the three most recent years of the New Jersey School Performance Reports, specifically 2014–2015, 2015–2016, and 2016–2017 school years. College readiness was measured by participation and performance on the SAT (formerly known as the Scholastic Aptitudes Test), enrollment in
Advanced Placement (AP) and International Baccalaureate (IB) classes, as well as performance on AP and IB exams. These academic parameters were employed as they correspond to college readiness. These data, along with previous limited school size studies conducted for New Jersey, provide educators and policy-makers data to make informed decisions regarding school facilities in the areas of construction, consolidation, expansion, and closures.

While non-academic achievements may also factor in, considering those factors were beyond the scope of this work. Additionally, this work also did not account for differences brought about by socioeconomic status, ethnicity, or the degree of urbanization.

**Discussion**

This quantitative, non-experimental, causal-comparative, multi-year study examined the relationship between school size and the college-readiness of New Jersey public high school students. The three most recently available academic years were analyzed for New Jersey public schools, specifically 2014–2015, 2015–2016, and 2016–2017. For the two research questions, college readiness was examined in terms of SAT participation, average SAT performance in mathematics, the percentage of students that scored at or above the SAT benchmark, percentage of students enrolled in AP/IB courses, percentage of students who scored at or above a 3 on at least one AP exam or a 4 or better on at least one IB exam. School size was addressed by grouping schools according to enrollment sizes of \( \leq 600 \), 601–1000, 1001–1500, and >1500 students.

In order to analyze the relationship between the size of New Jersey’s public high schools serving grades nine through twelve and college readiness, two questions were asked:

1. What is the effect of school size on college readiness of New Jersey public schools’ students indicated by student participation and performance on the Scholastic Amplitude
Test (SAT) and Advanced Placement (AP) and/or International Baccalaureate (IB) courses and exams?

2. How is the effect of school size on college readiness influenced by the school factors of student attendance, teacher retention, and dropout rate?

The first research question examined the effect of school size on college readiness of New Jersey public schools students. Analysis of this research question found that there are statistically significant differences between the first group (≤600) and all of the larger groups (601–1000, 1001–1500, and >1500) in the average SAT mathematics performance of students, the percentage of students that met or exceeded the SAT benchmark and the percentage of students that scored a 3 or better on at least one AP exam or a 4 or better on at least one IB exam. In all of these cases, results are lowest in the smallest group. These results suggest that smaller school size (≤600) can negatively affect (average) SAT performance, the percentage of students that reach the SAT Benchmark and the percentage of students that score a minimum of a 3 or 4 respectively on at least one AP or IB exam. From the results, these results suggest that larger school sizes may improve readiness, since it has a positive influence on readiness parameters such as SAT performance, percentage of students that reached the SAT Benchmark, AP/IB enrollment and the percentage of students that met or exceeded the AP/IB benchmark on at least one exam.

The second research question investigated the effect of school size on college readiness influenced by the school factors of student attendance, teacher retention, and dropout rate. In order to study the effect of school size apart from other influences such as student attendance, teacher retention, and dropout rate, hierarchical regression analysis was applied. It was found that school size is a statistically significant predictor of SAT mathematics performance, the
percentage of students that achieved the SAT benchmark, and the percentage of students that score a minimum of a 3 or 4 respectively on at least one AP or IB exam even if variables Dropout Rate, Student Attendance and Teacher Retention were controlled. School Size is not a statistically significant predictor of SAT, or AP/IB participation if the variables Dropout Rate, Student Attendance and Teacher Retention are controlled.

In summary, from the analysis of the results obtained from this study, it was found that school size can have a significant impact on readiness, specifically average SAT performance, the percent of students who (on average) meet the SAT benchmark, AP/IB participation and the percent of students who reach the AP/IB exam benchmark. In general, a school size that is larger than 600 students appears to have a positive influence on these parameters. Since these parameters affect readiness, the finding that readiness in New Jersey public schools is better achieved in relatively larger schools with over 600 students is supported.

**Relationship to Theoretical Framework**

Two theoretical frameworks, school connectedness and economies of scale, provided the foundation for the conceptual framework of this investigation to understand the connection between school size and post-secondary preparedness of New Jersey public high school students. Consistent with the name, the economies of scale theory focus on economic aspects of school size and associated parameters. The school connectedness theory grounds its recommendations on whether or not changes in school size affect the intimacy that is prevalent in a school’s atmosphere. Proponents of the economies of scale theory often use this to support school larger schools and consolidation. Many researchers have argued that the atmosphere of a school is more critical to student achievement than infrastructure. Those in support of the school connectedness theory promote schools of smaller size over larger schools to reduce delinquent behavior in
students (McNeely, 2002; Blum, 2004) while concurrently promoting higher levels of academic success, school persistence, extracurricular participation and better attendance because of how students feel about their school (Cotton, 2001).

In this investigation, the results were consistent with Greeney and Slate (2012), who asserted that economies of scale favor larger sized schools, because large size schools promote efficiency and the development of specialized curriculum.

Links to Literature Review

The results obtained in this study generally favor school with enrollment sizes in excess of 600 students. For virtually every parameter studied, readiness appears to increase as school size increases, however, much of the recent literature argues that smaller school sizes generate better student outcomes, attendance rates and retention rates (Durbin, 2002; Wasley et al., 2000). It can therefore be argued that smaller school sizes would generate better student readiness. Certain studies on college readiness itself produces favorable results for smaller schools. For example, the research by Funk and Bailey (1999) identifies that larger school sizes adversely affected school sizes. The Funk and Bailey study used indirect measures to assess college readiness, much like the study presented here. There is a clear departure between the results of this study and those of Funk and Bailey (1999).

The results obtained, do, however, agree with the findings of Moore (2013), who specifically looked at college readiness. In an extensive, multi-year study, Moore concluded that students across ethnic groups and socioeconomic strata were more likely to be ready for college if they attended larger high schools. Similarly, the study by Comb and Slate (2014) produced nearly identical results and considered only white students. The research of the present study is in line with the results obtained by Moore (2013) and Comb and Slate (2014). However, the
current study does not attempt to provide reasons for these results. In essence, this research cannot offer any justification as to why readiness increases when school size increases.

It should also be noted that as per results, there is no drastic difference in performance once the school size crosses 600 students. Therefore, the relationship between school size and readiness is more stratified than linear. It is possible that factors such as degree of urbanization and multiculturalism may affect these results. For example, New Jersey has a fair number of urbanized school districts, and therefore, these larger school sizes may be catering to more thickly populated communities in general. It has been noted that New Jersey already has a high standard of education among the normal population. (NJBIZ 2011) notes that New Jersey has more people with above high school education and college degrees per square mile than states like New York. This means that the students are more likely to come from better educated homes, with access to guidance if needed. New Jersey also has the fifth highest spending per student compared to all other states in the US (Hess 2018). It is possible that the collective resources available to larger schools allow for a more conducive teaching and learning atmosphere, thereby mitigating many of the adverse effects commonly associated with larger school sizes.

In general, it can be said that the results obtained from this study find parallels with similar studies in existing literature. It seems that much like the cases reported by Moore (2013) and Comb & Slate (2014), the students who are in larger high schools are more likely to be college ready than those form smaller high schools in New Jersey. While investigating the reasons for these results are beyond the scope of this work, this study does suggest that larger school sizes are beneficial to student readiness.
Recommendations for Future Research

The results obtained from this study indicates that larger school sizes are favorable for college readiness. The data analysis performed on data from three academic years clearly establish a link between college readiness and school size. It is seen that a school size above 600 students has a positive impact on parameters such as SAT scores, AP/IB scores and participation, and achievement of benchmarks on AP/IB tests, as well as the SAT. It should however, be noted that this study analyzes academic data without controlling for, or considering, the effect of factors such as socioeconomic status or the ethnicity of students. This aside, the argument that smaller school sizes are always beneficial needs to be questioned based on the results from this study and those by Moore (2013) and Comb and Slate (2014).

As a result of the findings favoring large schools in this study, a recommendation for future research would be to examine specific variables in high schools that might contribute to higher college and career readiness as school size increases. Researchers could engage in mixed method research studies using both quantitative and qualitative research data to examine areas such as the effect of leadership on student readiness. Additional studies are needed to enhance the understanding of college readiness by including case studies via qualitative analysis.

To provide a comprehensive understanding of the relationship between school size and readiness in the public schools of New Jersey, future studies should be conducted regarding school size and readiness in both the elementary schools and middle schools in New Jersey. The understanding of this relationship is important because the possibility exists that readiness indicators are present in each grade (k–12) differently.

Since the 1970's, researchers have correlated family income and higher educational attainment (Jencks 1972; Kelly 1995; Mortimore & Whitty 1997; Bynner & Joshi 2002; Demie,
According to *The Condition of Education 2011* report, the gap between the percentage of high income and low income high school graduates who were enrolled in either 2- or 4-year colleges immediately following high school increased from 23% in 2007 to 29% in 2009 (p. 222). Given that New Jersey has a higher density of high school graduates than New York, this may be one of the factors contributing to the results of the study, since it is conceivable that higher school sizes correspond to more urbanized areas where people with greater educational qualifications are likely to reside (NJBIZ 2011).

There has not yet been sufficient research, for instance, into the advantages that are available to students who have educated family members who are familiar with the system and more likely to motivate and guide them in the direction of college. Separating out the effect of educated family members can, to some extent, clarify the relationship between school size and readiness.

Research has shown that socioeconomic status (SES) is related both directly and indirectly to academic achievement in a multifaceted manner (Brooks-Gunn & Duncan, 1997; Bronfenbrenner & Morris, 1998; Coleman, 1988; Eccles, Lord, & Midgley, 1991; Lerner 199; McLoyd, 1998). Children in poverty are much less likely to go to college, and those who do enroll are less likely to graduate than their more affluent peers (Bumey & Belike, 2008). Additionally, these children are less likely to have assistive resources outside of school that may help them in graduating and being college ready. Poorer families are also in general less likely to financially invest in education and may often choose the most convenient alternatives available.

It is also possible that these students lack positive role models who have attained higher education, thereby making it less likely that they will be personally invested in school. Because this examination did not take into account the impact poverty can have on variables defined in this study, it is recommended future research be conducted that considers socioeconomic status.
(SES) and its relationship with college and career readiness when making decisions regarding school facilities. It may be that readiness is heavily interrelated with both school size and SES. Thus, there may not be an optimal size option that fits all situations. A future study could take the socioeconomic factors into account as well to better understand the unique effect of school size on student readiness. This can be achieved either by choosing students within a school of similar socioeconomic backgrounds, or the effect of socioeconomic parameters.

Another possibility for future research would be to examine the effect of school size on readiness on members of different student subgroups (e.g. ethnicity, English Language Learners, economically disadvantaged, disability, etc.). It is very likely that ethnicity and familiarity with the language will affect the performance of a student. Ethnicity can affect the importance with which a student views education, and since classes are primarily in English, students who are not from English speaking homes suffer a disadvantage. Additionally, factors such as disability can also play a role. It may be beneficial to group students according to these categories and individually assess how these characteristics affect readiness. Only then can the effect of school size alone on readiness be assessed. The results from the present study do not account for this. Given that all schools in New Jersey are considered for this study, it is assumed that any differences brought about by ethnic, and socioeconomic differences are nullified by the large sample of schools. It is however, very possible that such populations have a significant effect on readiness when small school sizes are considered.

This study focused on SAT performance based on average student achievement on the mathematics section of the assessment. It is recommended that additional research be conducted to examine average SAT performance in the reading and writing portion of the assessment as well.
Lastly, this study focused on readiness indicators aligned with academic performance. It is appreciated that some students will opt to enter directly into the workforce rather than pursuing academic post-secondary pursuits; however, the readiness indicators investigated in this study are more directly aligned with college. It is recommended that future research be conducted utilizing measures that align with career readiness indicators such as participation in Structured Learning Experiences (SLE), Career and Technical Education (CTE), and the like.

In general, the future recommendations of this study are as follows:

- There are other factors such as ethnicity, SES, and disability that may influence college readiness so that the effect of school size can be uniquely investigated.
- The method of measuring readiness in the current study is based entirely on academic parameters. There is a need to develop more accurate measure of college readiness to effectively assess the effect of school size on college readiness.
- At present, college readiness is the only quantity being assessed. Career readiness is equally important, and should also be investigated in the context of school size.

**Recommendations for Policy**

Findings from this study call into question the small school movement. In the present study, students who were enrolled in large high schools (i.e. >600 students) consistently demonstrated higher degrees of readiness than students who were enrolled in small sized high schools (i.e. ≤600). Therefore, New Jersey legislators should review data related to school size in high schools. To the extent that findings in this study can be generalized to other grade levels, New Jersey legislators may need to evaluate these findings at the elementary and middle school levels. It is possible that the effects may vary, as children in lower grades are more likely to need
individual attention than those in higher grades (Gershenson, & Langbein, 2015). Additionally, it has been shown that smaller school sizes promote a more conducive learning environment, which may be beneficial to younger children (Lee & Lobe, 2000).

Researchers have continued to promote consolidation of schools and school districts as a method to control costs and increase efficiency (Duncombe & Yinger, 2007; Lewis & Chakroborty, 1996). Large schools also have more teachers who are available to teach courses; therefore, they might have more teachers who are able to teach advanced courses (Schreiber, 2002). The fact that larger schools are able to hire more qualified teachers and keep them, may indeed contribute to the higher readiness demonstrated by larger schools in this study. It is also possible that larger schools have the resources to set up better laboratories, conduct support classes and after school programs. This may in turn help students be better prepared for college, thereby improving college readiness. This information could guide legislators in decisions related to school size and school consolidation, which would create opportunities for students to benefit from the positive effects of larger schools.

School districts must consider the location of current research regarding the relationship between school size and readiness when making decisions regarding school facilities. Educational policy makers should request and conduct further investigations to make decisions regarding educational facilities planning in the United States. They must not automatically believe that smaller schools are more effective than larger schools. Size may have a different effect in different locales. It is recommended this study be extended to other geographic locations, as well as nationally. Depending on per student education spending, demographic variables, urbanization, etc., it is possible that the relationship between school size and outcome may differ in other locations. In the least, this study does challenge the assumption that smaller
school sizes are always beneficial to students. At least for New Jersey, school sizes above 600 produce better SAT results, students in such schools are more likely to attain AP/IB benchmarks, and in general, more likely to be college ready. Therefore, in order to improve readiness, educators and policy makers should assess the effect of school size in greater detail before concluding that smaller schools are always beneficial.

Recommendations for Practice

According to National Center for Public Policy and Higher Education & The Southern Regional Education Board (2010) there is a disparity between those that are college-eligible, defined as having earned a high school diploma, and those that are actually college-ready, meaning capable of succeeding in credit-bearing courses without the need for remediation. In 2007–2008, approximately 36 percent of first year students reported having to take a remedial course. This percentage was higher for African American and Hispanic undergraduate students standing at 45% and 43% respectively compared to 31% of white undergraduate students (The Condition of Education, 2011, p. 70).

In this study, findings were presented that students in large schools (i.e. schools with enrollment sizes of >600 students), at least in the state of New Jersey, performed significantly and consistently better on readiness measures than did students in small size schools (i.e. schools with enrollment sizes ≤600). To the extent that performance on these measures is valued, then large size schools seems to do a better job in preparing students for college. Given the current focus on preparing students for college, this area has practical significance for educational leaders. Administrative personnel in small size schools may need to rethink their practices in preparing their students for higher education. Not a single finding in this study favored the ability of small schools over large schools in preparing students for college. To the extent that the SAT
performance, enrollment in advanced classes (i.e. AP/IB courses), and performance on AP/IB exams are good predictors of success in college, small schools are not the place for students to obtain preparation for college.

During the 1930s there were approximately 260,000 public schools in the United States that served 26 million students. By 2011 the number of public schools in the country dwindled to 98,000 schools with the charge of educating 48 million students (National Center for Education Statistics, 1993; 2014). Proponents of the school consolidation movement advocated for this change suggesting that schools would be more efficient and effective if they were larger. It has also been argued that this increase in school size, while economically enticing, may harm students, and restrict their achievements. Poor performance of students has been linked to increased size of schools and school districts (Berry & West, 2008) which, over time, has led to serious consequences. The failure of students to complete college leads to economic consequences for taxpayers and the society as a whole (Belfield, 2008).

The results from this study provide evidence that students who are enrolled in large high schools have higher instances of readiness than students enrolled in small high schools. Furthermore, the results are similar to other researchers who have reported that students enrolled in large schools have higher achievement compared to students enrolled in small schools (Crenshaw, 2003; Durbin, 2001; Gardner et al, 2000; Rumberger & Palardy, 2005; Slate & Jones, 2006; Zoda, 2009).

It is essential that decision makers such as board members, superintendents, and administrators take the effort to understand how school size effects readiness. Such an understanding in essential to determining budgetary allocations, regulating school enrollment, and subsequently deciding on how large a given school should be. This information would help
guide school officials in decisions related to increased enrollments or budget concerns that are affecting many school districts. School officials could free up resources by consolidating smaller schools or building larger schools to house more students.

It has been demonstrated conclusively that larger school sizes are more economical, and the cost of education per student goes down significantly when schools of larger sizes are established (Bowles & Bosworth, 2002; Stevenson, 2006). Furthermore, by increasing schools size, schools districts could experience extensive economies of scale in teacher salary, supplies, and overall costs (Dodson & Garrett, 2002). This practice could allow administrators to hire more qualified teachers and offer students more advanced classes (Schreiber, 2002).

The studies mentioned above will also support the findings of this thesis. Greater economic freedom given by larger schools can result in better teaching options and more qualified teachers. This can in turn result in better student readiness. In essence, there are a number of studies that challenge the assumption that smaller schools are always beneficial. Practitioners should consider the existing literature and investigate the effect of school size within their communities while managing school size to improve readiness.

Conclusion

In New Jersey, a large percentage of students that graduate from its public schools are inadequately prepared for the academic rigors of college. In fact, a report by the National Center for Higher Education Management Systems (NCHEMS, 2010) states that while 88.6% of ninth graders graduate high school in New Jersey within four years, only 60.8 % of these students enroll in college. The report by NCHEMS (2010) also found that only 25.7 % of the graduates manage to get a college degree. Additionally, of those students enrolling in state colleges and universities, one third of them required remedial classes in order to bridge the gap between high
school and college (NJDOE, 2012; Education Transformation Task Force Initial Report, 2011, p.3). Of the New Jersey SAT participants from the class of 2013 only 46.1% met the SAT College and Career Readiness benchmark (College Board 2014). This benchmark is associated with a 65% probability of obtaining a first-year college grade point average of B- or higher. According to the College Board, similar trends can be observed nationally; with only 42.6% of SAT takers from the same sample being able to meet the college and career readiness benchmark, a figure that has remained relatively unchanged for quite some time (College Board 2014).

This issue of college readiness has serious economic consequences for society. Therefore, it is essential that the education departments try and address the factors that contribute to low readiness. It has been suggested that school size may affect parameters that constitute readiness (Moore 2013). School size is a parameter that is of much concern to government officials, as well as school administrators. On one hand, smaller school sizes have been equated to better student attendance and higher student outcomes. At the same time, larger school sizes are economically more viable, and the cost of education per student decreases. Due to these conflicting reports, it is essential that the effect of school size is thoroughly investigated. This conclusion is based on the literature review presented in this study. A natural step to address this gap was to analyses the effect of school size on readiness in any school district.

An understanding of the factors that constitute readiness, and how they are affected by school characteristics, is therefore of critical importance. In this light, the work presented in this study attempted to understand how school size affected college readiness.

For this purpose, New Jersey school districts were chosen, and data for three school years used in the statistical analysis. Readiness was measured indirectly, using a combination of
academic parameters such as SAT participation, AP/IB participation, and corresponding scores on exams. These metrics were chosen as college admission, did, in real life, depend on these scores. After excluding special schools and a few other exceptions, all schools in New Jersey were considered for the study. The data available for three years were analyzed to see how school size influenced these academic parameters.

The analysis itself involved a correlation and regression analysis to first identify any potential links between school size and any of the chosen parameters. This was then controlled by an ANOVA (F-test) on various school size groups to identify the school sizes at which the correlation existed.

It was seen that, in general, school size did have an effect on most of the parameters studied. The schools were grouped into sets according to their size. This study shows that school sizes higher than 600 were beneficial for readiness. In general, all the parameters responded positively to school sizes above 600.

The next step was to ensure the validity of these results by controlling each of the factors chosen so that the effect of school size on any one given factor can be identified. Hierarchical regression analysis was employed for this purpose, and it was seen that school size does have an impact on most of the parameters contributing to readiness.

While this is not in agreement to studies related to school size in general. Usually, it has been argued that student outcome, teacher retention, and attendance are all better in smaller schools. However, these findings do agree with the results of similar studies on readiness. At this stage, it is safe to assume that, at least in New Jersey, students from schools with a larger number of students are more likely to be college ready than those from smaller schools. The study does not, however, account for cultural, or socioeconomic parameters that could contribute to these
findings. Since such an analysis is beyond the scope of this study, it is recommended that policy makers, administrators, and educators should consider the issue of school size and its effect on readiness in greater detail to ensure intelligent and fruitful spending of education budgets.
Appendix

Assumptions for Regression

The four assumptions of Multiple Regression namely linearity of residuals, normal distribution of residuals, equal variance of residuals (Homoscedasticity) and multi-collinearity were tested for this analysis. The tests are provided below.

SAT Participation

First analysis: 2014–2015 year

Assumption 1: Linearity

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables, which should show a linear pattern for the assumption to be considered satisfied. In the case that the relationship between the variables is not obviously linear or non-linear, the Pearson correlation coefficient was used as a measure of the linear correlation between the two variables. The results showed that the relationship between School Size and SAT Participation do not follow a linear pattern. Pearson correlation coefficient between these variables is not statistically significant (r=.070).

This result suggests that this assumption may be violated.
Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the probability plots (i.e. P-P plots). The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that the assumption of normality was satisfied.

Assumption 3: Homoscedasticity

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.
Assumption 4: Multi-collinearity

There is no multi-collinearity between the independent variables. This assumption is considered to be met if Variance Inflation Factors (VIF) scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, as well. This suggests that the assumption of independence between the independent variables is satisfied.

General Finding:

Three of the four underlying assumptions of regression have been met for the 2014–15 analysis of SAT Participation.

Second analysis: 2015–2016 year

Assumption 1: Linearity

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obvious, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and SAT participation does not follow a linear pattern. Pearson correlation coefficient between
these variables is not statistically significant ($r=0.090$). This result suggests that this assumption may be violated.

![Figure 8. The relationship between the 2015-16 School Size and SAT participation](image)

**Assumption 2: Normality**

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

![Figure 9. Normal P-P plot of 2015-16 SAT Participation Regression Standardized Residual](image)
Assumption 3: Homoscedasticity

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

![Scatterplot](image)

*Figure 10. 2015-16 SAT Participation Homoscedasticity*

Assumption 4: Multi-collinearity

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

Three out of four assumptions of regression have been met for the 2015–16 SAT Participation analysis.
**Third analysis: 2016–2017 year**

*Assumption 1: Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and SAT participation follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.141). This result suggests that this assumption has been met.

![Graph showing the relationship between School Size and SAT participation](image1.png)

*Figure 11. The relationship between the 2016-17 School Size and SAT participation*

*Assumption 2: Normality*

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged almost along a diagonal line. The result indicates that this assumption was satisfied.
Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.
General Finding:

All underlying assumptions of regression have been met.

SAT Performance

First analysis: 2014–2015 year

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and SAT performance follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant ($r=.233$). It has been demonstrated that this assumption has been met.

![Figure 14. The relationship between the 2014-15 School Size and SAT Performance](image-url)
Assumption 2: *Normality*

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

![Normal P-P Plot of Regression Standardized Residual](image)

*Figure 15. Normal P-P plot of 2014-15 SAT Performance Regression Standardized Residual*

Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.
Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.

**Second analysis: 2015–2016 year**

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the
variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and SAT performance follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.240). It has been demonstrated that this assumption has been met.

![Scatter plot of School Size vs SAT Performance](image)

*Figure 17. The relationship between the 2015-16 School Size and SAT Performance*

**Assumption 2: Normality**

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

![P-P plot of Regression Standardized Residual](image)
Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

![Figure 18. Normal P-P plot of 2015-16 SAT Performance Regression Standardized Residual](image)

Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.
Third analysis: 2016–2017 year

Assumption 1: Linearity

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and SAT performance follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant ($r=.243$). It has been shown that this assumption has been met.

![Figure 20. The relationship between the 2016-17 School Size and SAT Performance](image)

Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.
Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00,
too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.

**Percent SAT Benchmark Achieved**

**First analysis: 2014–2015 year**

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and Percent SAT Benchmark Achieved follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.217). It has been demonstrated that this assumption has been met.
Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

Figure 23. The relationship between the 2014–15 School Size and Percent SAT Benchmark Achieved

Appendix Figure 1. Normal P-P plot of 2014-15 Percent SAT Benchmark Achieved Regression Standardized Residual
Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funnelling. This suggests that the assumption of homoscedasticity was satisfied.

![Scatterplot](image)

*Figure 24. 2014–15 Percent SAT Benchmark Achieved Homoscedasticity*

Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.
General Finding:

All underlying assumptions of regression have been met.

Second analysis: 2015–2016 year

Assumption 1: Linearity

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and Percent SAT Benchmark Achieved follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.223). It has been demonstrated that this assumption has been met.

Figure 25. The relationship between the 2015-16 School Size and Percent SAT Benchmark Achieved

Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the
residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

![Figure 26. Normal P-P plot of 2015-16 Percent SAT Benchmark Achieved Regression Standardized Residual](image)

**Assumption 3: Homoscedasticity**

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

![Figure 27. 2015-16 Percent SAT Benchmark Achieved Homoscedasticity](image)
Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**Third analysis: 2016–2017 year**

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and Percent SAT Benchmark Achieved follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.222). It has been demonstrated that this assumption has been met.

*Figure 28. The relationship between the 2016-17 School Size and Percent SAT Benchmark Achieved*
Assumption 2: *Normality*

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

![Normal P-P Plot of Regression Standardized Residual](image)

*Figure 29. Normal P-P plot of 2016-17 Percent SAT Benchmark Achieved Regression Standardized Residual*

Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

![Scatterplot](image)

*Figure 30. 2016-17 Percent SAT Benchmark Achieved Homoscedasticity*
Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.

---

AP/IB Participation

**First analysis: 2014–2015 year**

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. The results showed that the relationship between School Size and AP/IB Participation follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant ($r=0.166$). It has been demonstrated that this assumption has been met.
Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.
Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

![Scatterplot](image)

*Figure 33. 2014-15 AP/IB Participation Homoscedasticity*

Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.
Second analysis: 2015–2016 year

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and AP/IB participation follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant ($r=.150$). It has been demonstrated that this assumption has been met.

![Figure 34. The relationship between the 2015-16 School Size and AP/IB Participation](image)

Assumption 2: *Normality*

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.
Assumption 3: Homoscedasticity

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

Assumption 4: Multi-collinearity

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and tolerance scores were around 1.00.
too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.

**Third analysis: 2016–2017 year**

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and AP/IB Participation do follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.125). It has been demonstrated that this assumption has been met.

*Figure 37. The relationship between the 2016-17 School Size and AP/IB Participation*
Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

Figure 38. Normal P-P plot of 2016-17AP/IB Participation Regression Standardized Residual

Assumption 3: Homoscedasticity

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

Figure 39. 2016-17 AP/IB Participation Homoscedasticity
Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.

**Percent AP/IB Benchmark Achieved**

**First analysis: 2014–2015 year**

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and Percent AP/IB Benchmark Achieved follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.286). It has been demonstrated that this assumption has been met.
Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.
Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funneling. This suggests that the assumption of homoscedasticity was satisfied.

*Figure 42. 2014-15 Percent AP/IB Benchmark Achieved Homoscedasticity*

Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.
Second analysis: 2015–2016 year

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and Percent AP/IB Benchmark Achieved follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant (r=.266). It has been demonstrated that this assumption has been met.

![Scatter plot of School Size vs. Percent AP/IB Benchmark Achieved](image)

*Figure 43. The relationship between the 2015-16 School Size and Percent AP/IB Benchmark Achieved*

Assumption 2: *Normality*

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.
Assumption 3: *Homoscedasticity*

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funnelling. This suggests that the assumption of homoscedasticity was satisfied.

Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00,
too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding**

All underlying assumptions of regression have been met.

**Third analysis: 2016–2017 year**

Assumption 1: *Linearity*

The relationship between the independent and the dependent variables is linear. This assumption can be tested by inspecting the scatter plot between the variables which should show a linear pattern for the assumption to be considered satisfied. In case that relationship between the variables is not obviously linear or non-linear, Pearson correlation coefficient was used as a measure of the linear correlation between two variables. The results showed that the relationship between School Size and Percent AP/IB Benchmark Achieved do follow a little linear pattern. Pearson correlation coefficient between these variables is statistically significant ($r=.186$). It has been demonstrated that this assumption has been met.

![Figure 46. The relationship between the 2016-17 School Size and Percent AP/IB Benchmark Achieved](image)
Assumption 2: Normality

The values of the residuals are normally distributed. This assumption can be tested by inspecting the P-P plots. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. The results showed that the dots are arranged by a diagonal line. This result indicates that this assumption was satisfied.

![Normal P-P plot of 2016-17 Percent AP/IB Benchmark Achieved Regression Standardized Residual](image)

*Figure 47. Normal P-P plot of 2016-17 Percent AP/IB Benchmark Achieved Regression Standardized Residual*

Assumption 3: Homoscedasticity

The variance of the residuals is constant. If the graph looks like a funnel shape, then it is likely that this assumption is violated. The results showed that there are no obvious signs of funnelling. This suggests that the assumption of homoscedasticity was satisfied.

![Scatterplot of 2016-17 Percent AP/IB Benchmark Achieved Homoscedasticity](image)

*Figure 48. 2016-17 Percent AP/IB Benchmark Achieved Homoscedasticity*
Assumption 4: *Multi-collinearity*

There is no multi-collinearity between the independent variables. This assumption is considered to be met if VIF scores are below 10, and the tolerance scores above 0.2. The VIF scores were around 1.00 in all three regression models, and Tolerance scores were around 1.00, too. This suggests that the assumption of independence between the independent variables is satisfied.

**General Finding:**

All underlying assumptions of regression have been met.
References


Blum, R. W., McNeely, C., & Rinehart, P. M. (2002). Improving the Odds: The Untapped Power of Schools to Improve the Health of Teens, Centre for Adolescent Health and Development. University of Minnesota, Minneapolis, MN.


Stevenson, K., Main, S., & Koon, J. (2001). The relationship of school facilities conditions to selected student academic outcomes. Education Oversight Committee. South Carolina (USA).


