School Size, Violence, Achievement and Cost

A Report of the Commission on Business Efficiency of the Public Schools

September 2003

SCHOOL SIZE VIOLENCE, COST AND ACHIEVEMENT

A Report of

The Commission on Business Efficiency Of the Public Schools

Commission's Post Analysis and Executive Summary

Full Report of Contractor

September 15, 2003

School Size, Violence, Cost and Achievement

A Report of the Commission on Business Efficiency of the Public Schools

Table of Contents

School Size, Violence, Cost and Achievement
A Report of the Commission on Business Efficiency of the Public Schools
Commission's Executive Summary

SOURCE AND BACKGROUND

The Commission on Business Efficiency of the Public Schools responds to requests from members of the Legislature as well as from its direct members. Assemblyman Louis Greenwald asked the Commission to consider examining the relationship of school size and violence in order to determine if there exists a causal link between the variables. The Commission discussed this issue and determined that there was a possibility of a significant link between school size and violence. However, the members of the Commission were concerned that an analysis of these two variables alone might lead to conclusions which would a) negatively affect other important public values and b) provide an incomplete picture leading to inappropriate decision making. The two values the Commission believed most likely to be negatively affected by decisions based on an analysis of size and violence alone were student achievement and cost. As a result the Commission decided to include achievement and cost in the examination. Further the Commission thought that if a link exists and it is sufficiently significant, this link might be important on a policy level at this time in New Jersey. Currently, school districts in New Jersey are in the process of building new schools as a result of a recent building bond in excess of $8 Billion. The Commission felt that information regarding school size and how it affects school performance and operation could be valuable to decision makers at both the local and State levels.

In the past examinations of size as it relates to New Jersey education has focused primarily on district size and class size. School size has not received significant attention from policy makers. The studies on district size have had mixed results. Some studies have suggested that district size should be increased to realize benefits from economies of scale. Other studies have suggested that the economies of scale, if they exist, may be offset by diseconomies of performance. Still other studies (including one by the Commission) have suggested that many of the benefits of economies of scale can be achieved through increased cooperation between and among districts and other governmental entities in the form of shared services.

The validity of these studies not withstanding, regionalization of small school districts into larger ones seems to have reached a plateau in New Jersey. If structural

changes toward efficiency are to be made in the near future, it seems unlikely that they will take the form of increased regionalization.

In New Jersey, public elementary and secondary education is a major budget issue. At the state level, it claims more than $8 billion of the state budget (2004 fiscal year projected). At the local level, taxpayers contribute an additional amount in excess of $10 billion annually.

Though funding has dramatically increased, so have recent reports of violence in many districts. Problems of absenteeism and dropouts continue to plague far too many schools. Achievement has remained largely unchanged. While the problems underlying these issues seem, to some, immutable, the Commission believes that it is important that the State continually seeks to identify, articulate and solve such problems. Failure to do so would be irresponsible.

Recent research indicates that at least a part of the solution to these problems lay in the size of individual schools. In some studies small schools appear to be producing lower violence, higher achievement and may contain cost advantages as well.

The basic questions for this study deal with the relationship between and among these variables. Specifically, is there a relationship between and among the independent variable school size and the dependent variables violence; achievement; and cost?

To answer these questions the Commission contracted with Professor Russell Harrison of Rutgers, the State University.

Under the direction of the Commission, Professor Harrison (1) conducted an initial review of the research literature in academic journals, books, and research reports to understand the current thinking regarding school size, violence, achievement and cost; (2) evaluated alternative definitions of school size, violence, achievement and cost; (3) collected, analyzed, and evaluated the data available at the state level on these variables to determine if a sufficient relationship exists to warrant further and more extensive research and (4) prepared the research findings in a form that is useful in the education debate.

This resulting report serves as a preliminary examination to determine if more detailed study is warranted.

POLICY PROBLEM

The problem addressed in this paper is to investigate and identify possible alternative organizational approaches, which may help to improve the efficiency and effectiveness of New Jersey Public Schools. Specifically the issue addressed is to determine if sufficient evidence exists to recommend that the Legislature seek to encourage smaller school size. In this context school size means the size, in pupils, of organizational units providing direct education services to a defined group of children. In common language: the number of pupils who attend an individual school. Here, a school is usually a school building, but may also be a school-within-a-school. A school-within-a-school exists where multiple, separately, administered schools exist within a single school building.

METHODOLOGY

In conducting the research the contractor was directed to determine, at the 95% confidence level, if there exists a relationship between and among the independent variable size and the dependent variables violence, cost and achievement. In research terms, the contractor was asked to seek to prove that any relationships between or among school size, violence, achievement and/or cost are coincidental (the null hypothesis). Failing to prove that at the 95% confidence level, he was to reject this theory in favor of the conclusion that these relationships do indeed exist and to explain the direction of the relationship (positive or negative).

In conducting the research publicly available data relative to each of the variables were used. The statistical analysis was performed by measuring differences in mean values of the dependent variables for different values of the independent variable, analysis of variance for those differences, and multiple regression analysis.

The research regarding violence and achievement was limited to high schools due to the quality of data available regarding achievement and violence. Another reason for this focus is that problems of anomie and alienation have serious consequences in high schools. Student violence and school crime literally become matters of life and death.

Moreover, high school students are more apt to skip school or be absent on their own volition. They are also more likely to get into major problems with the law while playing hooky than elementary school students. Thus both misbehavior in school and absenteeism from school can have serious immediate consequences for high school students.

The combination of poor grades and dropout risks are also serious problems in high schools. In high school, far more so than earlier grades, students performing poorly or missing class are much more likely to leave school. Poor grades, absenteeism, and dropouts push students off the ladder to middle class prospects into a culture of poverty from which escape is difficult. In the culture of poverty they face a morass of problems for themselves and for society as a whole. Areas with more dropouts are especially prone to suffer from other non-school related problems like births to unmarried females, homicides that lead to incarceration in adult prisons for males, deficient care for children, both unborn and born, and elevated risks of infant death. Tax payers may face extra costs for public health care and corrections where dropout rates escalate.

Data on costs included both high schools and all schools.

SAMPLES AND DATA

As mentioned above the samples used in this report for achievement and violence were restricted to high schools. For each analysis a different sample was used to demonstrate that the effects were not dependent on a single sample. Details of the samples are included in the appendices.

The HSPT passing rates for each of the three parts of the test (math, reading and writing) were used as surrogate measures of achievement.

Statistics gathered by the New Jersey Department of Education in 2000 were used to measure violence, which included the most serious school incidents.

The cost measures used spending per pupil from the various school years as reported by New Jersey Department of Education in its State Report Card. District spending was used due to the lack of available data for individual schools. Several

different cost measures were also constructed to measure educational value received per dollars spent.

DISCUSSION OF THE THEORY

What is the relationship of school size with school crime, poor test scores, and inefficiency in educational service delivery? Does a careful review of evidence for a sample of New Jersey schools produce findings sufficient to show that any apparent relationships between the variables is more than coincidence?

Communities face special problems where problems of academic failure, low test scores, student violence, school crime, absenteeism, dropouts, are combined with inflated school budgets. Parents of high school students tend to have a longer earning record and larger savings than parents of elementary children. They are more apt to own or consider home ownership, and are especially sensitive to local tax burdens to fund schools. If schools are both expensive and ineffective, they are apt to vote "with their feet". Parents of high school students are especially prone to flee an inefficient school system, especially where options are close at hand.

This loss of middle class families from the school and the larger community further compounds the problem of academic progress for those left behind, and impedes the realization of vital educational goals. Thus endogenous educational problems produce a downward spiraling cycle of mutually reinforcing educational failures.

Many variables shape educational problems. However, this research was designed to test a theory that school size is a major exogenous variable shaping the endogenous problems that plague many public school systems, including high schools.

If this theory is valid, then large schools and school size should be seen as major explanations for differences in overall inefficiency at the high school level. To the extent relationships of school size with inefficiency problems are highly significant, then public officials in New Jersey should take heed in future debates about educational best practices, optimal architectural design, and rational planning for education governance and administration.

SIGNIFICANT FINDINGS

Following are the significant findings of this preliminary examination as they relate to each of the dependent variables achievement, violence and cost.

Finding I Small schools have significantly higher test scores than large schools.

One task for this project was to estimate relationships of school size with test scores on High School Proficiency Tests (HSPT). The tests measure student success in mastering math, reading, and writing skills respectively.

Passing rates on the three tests were dramatically higher depending on the size of the school. For instance, the passing rate on the math portion of the HSPT was 9.5 percentage points higher, on average, in schools with 500 or fewer pupils than in schools with 1500 or more pupils. The differences in writing and reading were 9.1 and 14.5 percentage points respectively. The results are found in Section 1 of the Full report.

Finding II Small schools have significantly less violence than large schools.

In estimating the relationships of school size with student violence and school crime, data from the New Jersey Department of Education's "*Violence, Vandalism and Substance Abuse in New Jersey Schools – 1999-2000*" was used. The evidence is clear, looking at a sample of high school districts in New Jersey.

The size of district schools is positively correlated with the concentration of student violence and school crime in a given district. This result is analogous to prior research on school segregation. This study shows that school size is also significantly correlated with the concentration of violence and crime in one district versus others. The size of the average school in each district is significantly correlated with violence and overall criminal incidents for districts serving a majority high-school students.

Using a tipping point for school size of 1000 pupils, small schools on average (mean and median) experience between 29 to 40 percent fewer incidents of violence than do all of the schools in the sample. Schools with more than 1000 pupils experience between 58 and 108 percent more incidents of violence. The results are found in Section 2 of the Full report.

Finding III Expenditures per pupil vary with school size and type.

Step 3 of this project was to examine available data to determine (1) if a relationship exists between school size and fiscal cost, and (2) what the nature of that relationship is if it exists.

Note: This part of the analysis uses direct school expenditures only. Costs external to the school district are examined later in the report and discussed in other findings.

In general expenditures on a per pupil basis for smaller high schools were higher than the costs of larger schools. However, the variance in districts of all types (including elementary and middle schools) was far from a simple straight line.

The data related to the following sub findings can be found in *TABLE 3A2:The ratio of fiscal costs in a given year* on page 46 of the full report.

Finding III a. Small high schools with less than 500 pupils have higher expenditures for operation on a per pupil basis than large schools and lower expenditures per pupil than schools in the 500 to 999 range.

High Schools under 500 pupils experienced costs per pupil 1.4 percent higher than the mean for the all high schools in the sample. This represented a difference of $117. These schools had expenditures $726 per pupil higher when compared to high schools with more than 1500 pupils representing a difference of 9.5 percentage points around the mean.

This shift in difference in cost when compared to the difference in achievement may indicate that the most efficient high school size is somewhere near or below 500 pupils. However, this is examined in more detail later in the report.

Finding III b Small high schools with 500 to 1000 pupils have significantly higher expenditures for operation on a per pupil basis than schools with 1,500 or more pupils.

High Schools with 500 to 999 pupils experienced costs per pupil 2.8 percent higher than the mean for the all high schools in the sample. This represented a difference of $233. When compared to high schools with more than 1500 pupils these schools had expenditures 11.0 percent higher representing a difference of $842 per pupil.

Finding III c. Small schools with less than 500 pupils have higher expenditures for operation on a per pupil basis than large schools.

When the focus is shifted to include schools at all levels, the variances are much different. Schools under 500 pupils experienced costs per pupil 3 percent higher than the mean for all schools in the sample or $243 per pupil. On a percentage basis this is a larger gap than for the same population class in high school only comparisons. However, when compared to all schools with more than 1500 pupils the difference shifted from 9.5 percent in the high school comparison to 8.8 percent in the all schools comparison. This 8.8 percent difference represents a $665 per pupil difference.

Finding III d. Schools with enrollments between 500 and 1000 pupils have slightly higher expenditures for operation on a per pupil basis than large schools.

The difference between schools with 500 to 1000 pupils and was only 0.5 percent or roughly $35 per pupil higher than those with 1500 or more pupils. This class of schools had expenditures lower, in this comparison, than both the smallest schools and those schools with enrollments between 1000 and 1500.

The significance of this is the indication that optimal school sizes are likely different for schools of different types. That is an ideal size range for a K-6 school is different that for a high school.

One possible explanation is simply that small schools with 500-1000 students face fewer of the unique challenges of the other even smaller schools serving fewer than 500 students. To house their students and meet their challenges, schools with 500-999 students do not have to spend a lot more than other schools. In fact, they spend a lot less than other schools.

Finding IV Small schools have significantly higher value per dollar spent than large schools.

While the cost of educating a student in varying sizes of school is valuable, it is important to examine the other social values realized by schools in combination with the immediate fiscal cost.

Step 4 of this project was to examine the interrelationships of all four variables under examination in this study simultaneously in order to understand the cost/benefit of changes in schools size. To accomplish this, several approaches were used.

(1) Four separate indices were constructed to show fiscal cost, cost adjusted for expenditures by other governmental units incurred relative to dropouts, cost (through enrollment adjustments) of increasing proficiency test passage rates, and costs adjusted for both dropouts and passage rates.

(2) Construction of "Composite Inefficiency" scores to measure not only fiscal costs but also social and academic costs and to measure than over time.

The approaches use varying enrollment break points to examine the sensitivity of the results to differing groupings of enrollment size. These measures show consistently a higher value achieved per dollar spent for smaller schools.

Parts of Section 3 and Section 4 of the full Report demonstrate these results.

RECOMMENDATIONS

While the Commission finds that there are significant fiscal and social advantages to smaller school size, the Commission also finds that the current research is insufficient, for the most part, to support specific policy recommendations. Additional research should be done before specific school size recommendations can be made. However, the Commission also believes that sufficient proof has been shown to warrant both additional research and serious consideration by school districts embarking on construction projects of the planned capacity of those projects

Action Recommendations

Recommendation One: The research indicates that, in High Schools, a cost/benefit tipping point exists somewhere between 500 and 1,000 students. While further study should be done on this topic, districts considering school sizes significantly higher than 1000 should consider multiple small schools as opposed to large single schools.

Recommendation Two. School districts with existing high school facilities or which are in the process of constructing facilities with enrollments over 1,000 pupils should study the feasibility of creating separate administrative units (known as "*schools within schools"*) within these school buildings.

Research Recommendations

Recommendation Three. Studies should be conducted to identify separate, useful enrollment targets for elementary, middle and high schools. These studies should take into consideration the costs, both direct and indirect of 1) facilities and maintenance, 2) achievement and 3) violence.

Recommendation Four. A study should be conducted to examine the relationship of school size to problems affecting middle school and junior high school students in particular, including failures on GEPA tests, school crime and violence, school climate and performance in high school.

Recommendation Five. A study should be conducted to examine and analyze nationwide surveys to link school size with the costs of construction, maintenance, and transportation

Recommendation Six. A study should be conducted to examine and analyze nationwide surveys to link school size, parental alienation, and lack of involvement by parents in elementary middle and high school levels.

Recommendation Seven. A study should be conducted to examine and analyze nationwide surveys that link school size with the loss of consensus and rapport between teachers and principals

Recommendation Eight. A study should be conducted to examine and analyze nationwide surveys that link school size with physical conflicts and fear as problems facing schools

SUMMARY OF OTHER APPENDICIES

Section 5 of Report 2 summarizes the key variables used in the present research, and section 6 summarizes key concepts used in regression analysis and hypothesis testing.

Section 7 provides background readings on research methods, and section 8 outlines prior research studies relevant to school size outcomes and implementation options.

Section 9 outlines the range of implementations strategies that deserve close attention, and section 10 emphasizes specific research issues that merit and deserve separate follow-up study and analysis.

Report of
Dr. Russell S. Harrison

Linkages Between School Size and Adverse Educational Outcomes in New Jersey – Evidence of Failing Test Scores, School Violence, And Inefficiency Costs

Report to the
Commission on
Business Efficiency of the Public Schools

Members of the Commission

Assemblywoman Arlene Friscia
Chairman
Laurie Fitchett
Vice-Chairman
Senator Diane B. Allen
Senator Shirley Turner
Assemblyman Samuel D. Thompson.
Ms. Tracy DiFrancesco
Mr. Thomas Niland

Dennis Smeltzer
Executive Director

ACKNOWLEDGEMENTS
Special thanks are due to Assemblyman Louis Greenwald who encouraged me and endorsed the study, Assemblywoman Arline M. Friscia, Chair of the Commission on Business Efficiency of the Public Schools and the other Commission Members, who sponsored the study; as well as Dennis Smeltzer, Executive Director of the Commission, who coordinated the study.

An Introduction to the Debate

And a Summary of Empirical Results for New Jersey

By Dr. Russell S. Harrison[1]

In New Jersey leading legislators like Assemblyman Louis Greenwald and members of the Commission on Business Efficiency of the Public Schools are concerned with problems of violence, poor achievement, and apparent inefficiencies that plague too many schools and they children they serve. This report was produced to clarify how small school learning communities can help alleviate some of these problems. More specifically, it was designed to document the extent to which school size is correlated with failing test scores, school violence, and inefficiency costs.

Whatever may have been true for the New Jersey of yesterday, what is the evidence for New Jersey in recent years?

A HISTORICAL PERSPECTIVE

In the first half of the twentieth century certain educators advocated district consolidation and the construction of bigger schools as a key way to improve educational efficiency. Many based their hypotheses on evidence from industrial production studies. It appeared that larger plants had declining marginal costs per "widgets" produced, and therefore displayed "economies of scale". Advocates of big schools assumed that increased size was part of the package of "scientific principles" and "best practices" that equally applied to big factories and big schools. Big schools were required to produce students in the most efficient manner possible, to meet the needs of the new century, the new industrial era, and a new bureaucracy paradigm.[2]

Proponents of the "factory model" school agreed with Elwood P. Cubberley and other urban reformers [3]. He was a former urban school superintendent, and he wanted rural schools built on the big city model. He advocated schools run on the new industrial paradigm to encompass hundreds or even thousands of students, even though many of those students still lived on the farm and roads were dangerous. Early in the century Cubberly wrote:

> Our schools are, in a sense, factories in which the raw products (children) are to be shaped and fashioned into products to meet the various demands of life. The specifications for manufacturing come from the demands of the twentieth century civilization, and it is the business of the school to build its pupils to the specifications laid down. This demands good tools, specialized machinery, continuous

---

[1] As Consultant Dr. Harrison has worked with a wide range of federal, state, and local government agencies, and works closely with leading South Jersey legislators.

At Rutgers University Dr. Harrison holds dual appointments as tenured associate professor both in the Political Science Department and the graduate Department of Public Policy and Administration. Previously he has served as Director of the Rutgers University Forum for Policy Research, and Chair of the Political Science Department (twice). He heads the Political Science Internship program, teaches courses in Research methods and State and Local Government politics and administration, lectures and writes on Government Programs for Children and Youth, including Inequality in Public School Finances and other issues of education reform and community-based service delivery.

[2] R. E. Callahan, Education and the Cult of Efficiency. Chicago: University of Chicago Pres, 1972).

[3] Elwood P. Cubberley, Rural life and education: A study of the rural-school problem as a phase of the rural-life problem [New York: Houghton-Mifflin, 1915, Revised edition 1922; ERIC Document Reproduction Service No. ED 392 559.

measurement of production to see if it is according to specification, the elimination of waste in manufacture, and a large variety in the output.[4]

Proponents of the factory model school wanted not just a large school. They idealized the Max Weber style of bureaucracy characteristic of large factories and other industrial- age institutions. They wanted standardization, a top-down flow of commands, no deviation from written rules and procedures, little improvisation, management but not leadership, minimum influence from the community, maximum power for professional elites over citizens and students. They favored "authoritarian supervisory bureaucratic rules and regulations".[5]

Not just top-level school administrators enforced the new regime. Increasingly union leaders responded to the sense of alienation felt by teachers in such schools. In the large schools, teachers were not personally known to administrators or to each other, much less to parents. Often they exercised only limited influence over major curriculum, hiring, salary, or disciplinary decisions. Thus they asked their professional unions to promote standardized treatment and add "red tape" to protect teachers from authoritarian personnel policies, or simply from being ignored.[6]

In turn organizational behavior research by Peter M. Blau and others confirmed that organizational size and the adoption of bureaucratic rules and regulations were positively correlated, not just in private industry but also in the public sector. Moreover, in the absence of lateral power relationships, "gangplanks" among teachers in different departments, and the breakdown in communications inherent in large-scale organizations, efficiency suffered.

As late as the 1950s and even the 1960s perhaps the bulk of research into the consequences of organizational size and bureaucracy tried to document their superiority, as an alternative to small-scale operations and informal social controls. Prominent among them was James Bryant Conan. He was the former President of Harvard, a chemist, and good friend to fund sources like the Carnegie and Ford Foundations that favored big schools at the time. He tried to document the virtues of size and scale with empirical evidence. For popular support, he played on public fear and envy of a Soviet empire that seemed ahead in math, science, Sputniks, and centralized schooling. In turn major foundations used Conant's research to pressure for larger schools nationwide, including mega-schools in New York City and other big cities.

The reports by James Bryant Conant illustrate the bias of the era. He surveyed small samples of high schools, using very crude indicators collected by different interviewers in different schools. From his small ad hoc sample he found that on average, larger schools had more physical resources (namely, more teachers and more classes and more courses). In turn he assumed that more physical inputs must lead to better quality outputs from the educational process. He assumed that the multiplier effects of inputs like the number of courses are directly correlated with academic success. He concludes that larger schools

---

[4] For a telling commentary on the Cubberly paradigm see Evans Clinchey, Creating New Schools: How Small Schools are Changing American Education, New York City: Teachers College, Columbia University, 2000, pages 7-8. See also Craig Howley, "Ongoing Dilemmas of School Size: A Short Story". ERIC DIGEST, Eric Clearinghouse on Rural Education and Small Schools, October 1996. EDO-RC-96-6, pages 1-2.

[5] *See Evans Clinchy, "Introduction: The Educationally Challenged American School District," in Creating New Schools, op cit., pages 8-9*

[6] *Idem.*

are superior. In particular, he argues that large "comprehensive" high schools are essential to meet the needs of the gifted and talented, like those who would later attend Ivy League schools like Harvard. He systematically ignored issues about what was best for the average student, much less the bottom tier student. The arguments by him, the Ford Foundation, and others convinced many that big schools were best for high school students, whatever their demerits for smaller, younger children.

In the absence of systematic data on test scores, or discipline problems, or school crime, or other academic "outputs", common sense seemed to confirm the expectation that bigger was always better. The public ignored the limited data base on which Conant relied, the limited range of schools he studied, the fact that courses in small schools varied little from the large schools, and the absence of outcome data to justify conclusions about the impact of school size on actual student learning.

However, the last few decades of the 20th century brought major changes. A growing volume of empirical data measured outcomes, not inputs, and not just for a grab bag of schools. Systematic "report card" data were popularized first through nationwide samples, then for states, later by district, and eventually by school. The public and politicians were able to look at empirical outcomes from K-12 education, to see more clearly where students did better and why.

Among the first countries collecting and publishing "report card" data were Commonwealth countries like England and New Zealand. Under welfare state governments they had achieved highly centralized financing combined with centralized testing and centralized standards, run by national officials. They developed extensive data files and record keeping systems that covered not just inputs like spending per student, class size, ethnicity, and income, but also outputs like test scores and absenteeism and suspensions.

New political leaders both of the left and right began to review such data. In turn these leaders were among the first to perceive potential payoffs from a more decentralized system of service delivery for K-12 education, including more site-based decision-making, and alternative service delivery. Support was given to the use of smaller schools under various forms of governance, and an end to ever growing consolidation and centralization. Devolution of administrative control and "the new public management" became popular even before the Reagan era in the United States.

In the United States, cross-national data from the early NAEP and TIMSS tests finally became widely available. These reports showed that the United States was experiencing problems, comparing average U.S. test scores for the nation as a whole versus other comparable countries during the early 1980s. This led to nationwide efforts to combat educational problems for "A Nation At Risk", including national educational goals.

By the late 1980s the NAEP tests began to produce report cards for individual states. So did a wide range of individual states like California. The growing volume of empirical evidence began to erode old complacencies about mega schools, and suggest new priorities for reform.

During the 1970s and 1980s state supreme courts had enthusiastically embraced a policy of judicial activism. In school policy, they had little access to outcome data. Thus in their zeal to produce equality of inputs, they ignored issues of efficiency of outputs.

Dozens of state Supreme Court decisions mandated dramatic increases in state funding for schools. Courts went on to prescribe where, when, and how that money should be spent, including new construction.

However, states with more extensive involvement in the "public school finance reform crusade" often saw state taxes increase far more rapidly than student test scores. Indeed, often the states with the most extensive litigation had the highest ratio of costs per student to test scores. Inefficiency seemed quite common, to the extent that state courts increased centralized funding for schools in states with consolidated districts and/or consolidated schools. In the absence of concern for issues of organizational size, states too often saw an unholy combination of high expenditures per student combined with low test scores and increasing evidence of anomie and alienation within larger schools.

Beginning in the late 1980s, and increasingly during the 1990s, many districts, cities, and states began to consider new principles of architectural design and governance to administer public schools. The "new urbanism" encouraged a new commitment to community-based schools. Principles of "the new public administration" and "reinventing government" encouraged movement away from the older status quo. A concern for site-based decision-making and more responsiveness to what parents wanted for their children brought new appreciation for small schools.

Support for small schools had always been strong in rural and suburban areas. Now support for small schools grew in cities where liberal journalists reported that the largest schools were little more than "Dickensian workhouses breeding violence, dropouts, academic failure and alienation" whereas "schools limited to about 400 usually have fewer behavioral problems, better attendance and graduation rates, and sometimes higher grades and test scores".[7]

Administrative "leaders" and educational entrepreneurs in New York, Boston, Chicago and other big city systems experimented with small schools. Qualitative research and journalistic reports claimed favorable academic and non-academic outcomes from these experiments with smaller schools. Advocates included Deborah Meier in New York [8]. the Coalition of Essential Schools and the "pilot school" movement in Boston [9], and in Chicago the Consortium on Chicago School Research and the Small Schools Work Shop.

---

[7] Susan Chira, "Is Smaller Better? Educations Now Say Yes for High School," New York Times, Wednesday, July 14, 1993, p. A1.

[8] Deborah Meier, The power of their ideas: Lessons for America from a small school in Harlem. Boston: Beacon Press, 1995.

[9] Evans Clinchy, editor, Creating New Schools: How Small Schools are Changing American Education, Columbia University Teachers College, 2000.

PRIOR EMPIRICAL RESEARCH ON TEST SCORES

Using Multiple Regression Analysis of Cross-sectional Quantitative Data
For specific schools and districts

Friedkin and Necochea launched a bold new genre of empirical research in 1988.[10] They grounded their predictions about the effects of size on prior research into generic organizational behavior. They did not limit their ideas to what they had seen on the job as participant observers in a specific school or district. They developed and tested formal hypotheses. They did not simply articulate and illustrate a journalistic thesis or policy preference. They went beyond traditional case study conclusions, based on anecdotal evidence for a specific school or district. Instead they used cross-sectional used data for each district and school in an entire state. For data they looked to California, one of the few states at the time with easily accessible data on test scores, poverty, school size, etc. They used multivariate regression analysis to measure relationships, and clearly spelled out how they measured each variable. They stressed objective evidence, not subjective impressions.

They found that large schools and large districts – and especially poverty districts - have more students with special needs and behavior problems and "culture of poverty" traits. More importantly, they controlled for socio-economic status and measured the independent impact of school size and district size on test scores. They found favorable academic outcomes from smaller districts and from smaller schools, at least at lower grades.

In accord with their "contingency theory", small schools in poverty communities especially helped academic test scores. As large schools proliferated, and average size increased, test scores went down, especially in communities where parents had little education and low occupational status.

A growing number of subsequent studies by Craig Howley and Howard Bickel showed similar results for states besides California.[11]

They have focused on heavily rural and poor states in the West and South. They report that a combination of large schools and extreme poverty, measured variously, are

---

[10] Friedkin and Niccochea, "School system size and performance: A contingency perspective". Educational Evaluation and Policy Analysis, Vol 10, Issue, 3, 237-249.

[11] See the following:

- Craig Howley, 1994 "The Academic effectiveness of small scale schooling (an update)." ERIC Digest. Charlestown WV. ERIC Clearinghouse on Rural Education and Small Schools. ERIC ED 372897, Document Reproduction Service ED 389 503.
- Craig Howley, 1996, "Compounding disadvantage: consolidation and the effects of school and district size on student achievement in West Virginia." Journal of Research in Rural Education, Vol. 12, Issue 1, 25-32.
- Craig Howley, 2000. "Effects of Poverty on Student Achievement Countered by Georgia's Smaller Schools." Washington DC: The Rural School and Community Trust.
- Craig Howley and Robert Bickel, 2000. "Results of a four-state study: Smaller schools reduce harmful impact of poverty on student achievement". Washington DC: Rural School and Community Trust.
- Craig Howley, Marty Strange, and Robert Bickel. 2000. "Research about school size and school performance in Impoverished communities. ERIC Clearinghouse on Rural Education and Small Schools.

negatively correlated with academic test scores – especially in lower grades. Using the same methods as Friedkin and Niccochea, they find similar results.

The need for new research

Looking at the old and new empirical research on test scores and academic outcomes by grade level, a recent study mandated by the state legislature in North Carolina concluded that:

> With respect to achievement, studies at the elementary level have consistently found that smaller schools are associated with higher academic achievement. At the high school level, the findings are more mixed. Some high school studies have found higher achievement among students attending smaller schools, while others have found no achievement advantage for small schools. Others have found that students from medium-sized high schools outperform students from either smaller or larger schools. There is also some evidence indicating that smaller schools are particularly beneficial for students from economically disadvantaged backgrounds. Overall, it would appear that smaller schools are associated with higher achievement in elementary schools, but this conclusion cannot be stated as confidently for high schools.[12]

However, very little research has focused on outcomes in a state like New Jersey, looking at links from school size to academic outcomes for the 1990s. Thus the Harrison report for the New Jersey Commission on Business Efficiency in the Public Schools is critical. It documents a new era for New Jersey, beginning in the 1990s. After years of public school finance reform litigation, variables separate from resources are coming to the fore. Specifically, the correlation of school size and test scores is highly significant – even looking specifically at high school students. Big schools mean lower test scores, including HSPT scores.

Why The "Harrison" Research Methodology Produces Superior Estimates

[By Using Exogenous Institutionalist Prediction Models
Like those Cited In Sections 7 And 8]

One reason for the significant results is that the "Harrison" research methods are more refined than the prior research by Friedkin, Niccochea, Howley, and Bickel. Friedkin and Niccochea concede that one reason that school size appears to help academic outcomes is the linkage of school size to resources. Large schools often have superior resources, in fact, a "munificence" of resources, at least in aggregate. These include a larger budget, more teachers, larger facilities, than for small schools. They often have larger expenditures per student than smaller districts, especially in non-metropolitan areas. To the extent that big budgets facilitate small classes, and both resources help performance, big schools will appear to be superior.

The result, however, is spurious. It is not due to the size of big schools but to the resources their political clout allows them to amass as a base, and budgetary incrementalism that keeps expanding their budgets by a given percent increment even in the midst of problems.

---

[12] State Board of Education, Department of Public Instruction, Office of Instructional and Accountability Services, Division of Accountability Services, Evaluation Section, "School Size and its Relationship to Achievement and Behavior**",** April 2000.

Such an admission would seem to demand a "control" for spending, or perhaps class size, which is a product of spending for teachers. However, prior research fails to control for spending per student or class size when it links school size to test scores. The Harrison research does, and it finds significant relationships linking school size in New Jersey to HSPT test scores for math, science, and reading, "ceteris paribus".

The Harrison research is superior in another way. It measures school size in terms of actual numbers, and with specific tipping points based on actual numbers. It specifically assumes a linear [negative] relationship between school size and test scores. In sharp contrast, prior research by Friedrich, Niccochea, et al. uses a logarithmic index for school size. This assumes a non-linear relationship. Indeed, it assumes that the number of students has declining effects, as schools get larger.

The Harrison research does not. It documents the fact that schools at all size ranges are correlated with declining test scores. The relationship of school size with poor student performance is monotonic over the entire range of schools.

Most importantly, tipping points are not as low as 100, 200, or 300 students, as claimed by some prior researchers. Big schools of 1,000 or more, have especially low scores, controlling for spending and class size, etc.

There is still another reason why the Harrison research is superior to the prior research. They use different indices of socio-economic status for different schools or districts. Moreover, they do not really control for poverty among students, but only the occupation and education of their parents. Further, they do not control for racial concentrations at all. The Harrison research does.

There is yet another defect with the prior research. It does not really measure school size at all. It simply measures the number of students in a given grade. It fails to concede that a school with a narrow grade range may have a lot of students in a given year, but still enroll fewer students overall than other schools with a wider grade range. The Harrison research measures school size in terms of all students within the school, even when it selects out only schools with a majority of high school students.

Prior research also did not explicitly take into account possible effects on academic outcomes due to the introduction of charter schools or special needs schools. It simply lumps all schools or districts together. The Harrison methods exclude charter schools or special needs schools, or explicitly control for the prevalence of special education needs students.

Important results are found in New Jersey using the Harrison methods. A significant linear negative correlation links school size with high school test scores, after introducing statistical controls for spending (expenditures per student), student/teacher (class-size) ratios, racial concentrations within the school, and student poverty (based on students eligible either for free lunch or reduced price lunch subsidies). Even at the high school level, school size profoundly hurts test scores, looking at lagged relationships between school size and future test scores.

PRIOR RESEARCH ON OTHER ENDOGENOUS OUTCOMES: CRIME, VIOLENCE, AND OTHER SCHOOL TRAITS THAT SIMULTANEOUSLY CORRELATE WITH POOR TEST SCORES BOTH AS CAUSE AND EFFECT

Other prior research on school size goes beyond test scores and academic achievement to look at other types of school behavior. The same historical pattern that divides the empirical literature on academic behavior divides the literature on student behavior. The qualitative advocacy research from the first half of the century usually portrayed small schools, and especially small rural schools, in a demeaning manner.

Students in small schools in rural states were poorer than students in the big schools of the urban Northeast. Students in the large schools in the urban, industrial states generally were more prone to consider continuing on after elementary school to higher levels, or after high school to higher levels. Students in the small rural schools were more apt to leave schools early, not graduate from high school, and more often report their desire to be farmers and homemakers, miners or beauticians, or other professions that did not require college degrees.

Researchers from big city universities often treated the advocates of small town schools as boobs and reactionaries, for wanting to hold on to community institutions versus the greater resources available to large comprehensive, consolidated schools in rich cities. Proponents of small schools were seen to represent the unenlightened legacy of the agricultural era, versus the brave new world of the modern large-scale industrial era.

Thus teachers, parents, administrators, and students in small school settings were perceived as inferior to their counterparts in the big schools of the big cities. In response to this logic, not only did consolidation proceed, but also thousands and millions of rural and small town residents migrated to the wealthy industrial cities, which maintained their competitive advantages up through the 1950s.

However, in the last half of the 20th century, the social and psychological benefits of the small schools began to be recognized in new empirical research.[13] Early in the 1960s Roger Barker and Paul Gump found that a much larger proportion of students in small schools take part in after-school activities. In turn, other research found that participation in extracurricular activities helped build self-esteem among students that was correlated with superior academic performance, as well as less desire to dropout or disrupt classroom decorum.

Subsequent research by Valerie Lee and her colleagues shows that the benefits of small schools for students are matched by the benefits of small schools for teachers.[14]

---

[13] Roger Barker and Paul Gump, Big School, Small School: High School Size and Student Behavior, Stanford, California: Stanford University Press, 1964.

[14] Valerie E. Lee and Julia B. Smith, "Effects of High School Restructuring and Size on Early Gains in Achievement and Engagement," Sociology of Education, Volume 68, Issue 4 (October 1995), 241-270.
V. E. Lee, J. B. Smith, R. G. Croninger, 1995, "Another Look at high school restructuring: More evidence that it improves student achievement and more insight into why", Issues in Restructuring Schools, No. 9, Madison Wisconsin, University of Wisconsin Center on Organization and Restructuring Schools.
V. E. Lee and J. B. Smith, 1995, "Collective Responsibility for Learning and its effects on gains in achievement for early secondary school students". Madison Wisconsin, University of Wisconsin, Center on Organization and Restructuring of Schools.

Teachers in small schools are far more apt to report feelings of self-esteem and self-worth, in part due to better student behavior and achievement, and in part because they become part of the informal decision-making process. Site-based decision-making and other aspects of "educational restructuring" become far more real in small schools, even though larger schools and districts more often adopt symbolic "innovations" and "de jure" reforms to deal with problems. Consensus, community, and communitarian virtues help teachers succeed in small schools. In large schools teachers suffer from their absence – and from other key endogenous traits of a "good school climate" or a functional school "culture".

Still more recent research - funded by the U.S. Department of Education, the National Institutes of Health, and the CDC – has linked school size to adolescent health risk behaviors, both in and out of school. This research provides extensive evidence of the social, psychological, and public health benefits of small schools. Students in small schools report much higher levels of "connectedness" and "trust" than students in large schools. In turn the degree of "connectedness" and "trust" in the school is correlated with favorable student behavior, and lower levels of student risk behavior including sexual promiscuity, drug abuse, and delinquent behavior.

In studies of Chicago elementary schools, The Consortium on Chicago School Research found a wide range of favorable school climate traits in elementary schools with fewer than 350 students. These traits included:

- School leadership,
- Parental involvement,
- Teacher collegiality,
- Positive school-community relations,
- Trust among faculty members,
- Fewer incidents of adversarial politics.[15]

Nationwide surveys also confirm Chicago research that smaller schools have less crime and violence. Nationwide, schools with less than 900 students have many fewer incidents of school crime, and especially violent crimes, than larger schools. The schools with more than 900 students have much worse rates of student crime, school violence, and disruptive behavior so severe than police must be called.[16]

However, rarely does this research control for key exogenous variables that also affect crime and violence in schools, besides school size. A great deal of delinquency research and "stress" theories emphasizes the importance of socio-economic variables like race and poverty as determinants of delinquent behavior. A wide range of education policy research stresses variables like class size and expenditures. However, most federal data only aggregate nationwide surveys, and fail to provide cross-sectional breakdowns amenable to regression analysis. They fail to measure the relationship of school size with crime or violence outcomes controlling for race, poverty, class size, or spending. Thus relationships are obscured.

---

[15] See Wested Policy Brief, "Are Small Schools Better? School Size considerations for Safety and Learning", San Francisco California, October 2001.

[16] United States Department of Education, NCES, Digest of Education (Washington DC: various years).

The Need For New Research

In the 1999 legislative session, House Bill 168 (Session Law 1999-237; Section 8.33) directed the State Board of Education (SBE) to study the relationship between school size and the behavior of students in North Carolina, as well as their academic performance. The Evaluation Section's Division of Accountability Services formed a small team composed of in-house staff to study the issue, rather than employ independent outside staff. The assignment was to review and summarize the available research on school size, determine what statewide data were available to address the issue, and provide a preliminary analysis of results.

After reviewing studies linking school size to non-academic outcomes, they concluded that:

> Previous studies of student behavior indicate that smaller schools are associated with more positive outcomes for students. Larger schools are reported to have higher dropout and expulsion rates than smaller schools. Larger schools also have been shown to have more problems with most major behavioral issues including truancy, disorderliness, physical conflicts among students, robbery, vandalism, alcohol use, drug use, sale of drugs on school grounds, tobacco use, trespassing, verbal abuse of teachers, teacher absenteeism, and gangs

However, they did not report whether these results were statistically significant. Indeed, very little research has studied relationships between school size and these problems for specific states, using cross-sectional data.

Next they analyzed data they had obtained for North Carolina. They concluded that

> Analyses of EOG and EOC data examined absolute performance as well as achievement gains as a function of school size. Results indicated that smaller elementary and middle schools tended to demonstrate higher achievement than their larger counterparts, even after controlling for various student background characteristics. These differences were small, however, typically amounting to a 1 to 2 scale score point difference. At the high school level, no achievement differences were found between schools of varying sizes. Analyses of school violence data and dropout rate in relation to school size did not yield any significant associations, with one exception. Rates of violence in middle schools appeared to increase slightly in larger schools after controlling for the poverty level of students in the school. As was true for the achievement analyses, however, this relationship was weak.[17]

In short, again prior research does not make it clear that school size may be associated with problems of anomie and alienation for high school students as well as younger students.

Thus the Harrison report for the New Jersey Commission on Business Efficiency in the Public Schools is critical. It documents a quite different picture for New Jersey. For years reforms have included various zero-tolerance policies, police in schools, and new reporting requirements. A wide range of experimental programs has been launched

---

[17] State Board of Education, Department of Public Instruction, Office of Instructional and Accountability Services, Division of Accountability Services, Evaluation Section, "School Size and its Relationship to Achievement and Behavior**",** April 2000.

to deal with school crime, student violence, and juvenile delinquency. Special funding has been provided for high-risk districts. The state has dramatically intervened in certain districts.

Nevertheless problems persist, especially in certain areas. Where and why?

One explanation is school size. As dependent variables the Harrison research measures the degree to which student crime and school violence becomes isolated and concentrated in one specific locality versus those in the surrounding county.

The results are significant. Namely, the correlations of school size (and district size) with crime and violence are highly significant – even looking specifically at high school students. Big schools mean worse problems of anomie and alienation, based on school self-reports. Where the average size of district schools is large, so is the concentration of crimes and violence in that district – all things else equal.

Why the New Research Design is superior to prior estimates

This new study uses a sophisticated research design that explicitly separates exogenous and endogenous variables. Then it measures the lagged multiplier effects of school size, independently of class size, spending per student, race, and socio-economic status. School size is measured in the past, and crime and violence variables are measured in the future.

In turn, it measures school size separately from district size. Independently of how many schools are housed with a district, the district suffers from a concentration of crime and violence within its schools as a linear function of average school size.

In turn, this is the same pattern found by the author in prior studies linking school size with the isolation and concentration of poverty within specific schools or districts.[18]

Where schools are large, problems are concentrated, including problems of crime and violence among high school students.

[18] Russell Harrison, The Forum Newsletter, Spring 2001.

PRIOR RESEARCH ON INEFFICIENCY AND LOSS OF PRODUCTIVITY

Previous studies of "polycentricity" show that smaller police districts produce a variety of benefits to citizens. Namely, they tend to maximize citizen satisfaction and trust with the providers, and minimize costs relative to what is accomplished. In contrast, Leviathan police districts are less efficient, in that they spend a lot of money, but problems of crime, disorder, fear, and mistrust remain.[19] Community breaks down, consensus declines, and the co-production of services is less effective. When one measures outcomes in terms of multiple indicators, large-scale service delivery units are not more efficient, but often less productive.

Other research on schools shows similar patterns. There is little or no evidence that the size of schools reduces educational costs, or current spending per student, if one takes into account certain possibilities:

- Small schools are mandated to incur costs due to standardized administrative mandates that nominally apply to all schools, but especially escalate costs for small schools. Every school must have a similar minimum level of support staff. These cannot be shared among other small schools. Every school must have certain facilities, which cannot be shared with other governmental bodies or non-profit groups, much less businesses. Thus very small schools are saddled with disproportionate costs due to administrative rigidities. .
- Large schools escalate costs of land and transportation, and reduce the possibility of using less expensive options to new construction of multi-acre stand-alone facilities.
- Large schools contribute to urban sprawl and the loss of potential multi-acre sites for green acre conservation, and reduce the conservation and recycling of older facilities.
- Large schools, or at least large consolidated districts that house consolidated schools, are associated with lower house values, as estimated from "hedonic price indices". District consolidation causes a loss of local control and a rise in political conflict. This hurts the socio-economic resources of a community and reduces its taxable wealth.
- Large schools are correlated with school segregation produced by the loss of middle class families and the concentration and isolation of poverty students in the formerly large schools.
- Large schools produce severe social costs due to their disproportionate levels of crime, conflict, anomie, alienation, absenteeism, and dropouts.

Nationwide, big schools are especially linked to dropouts.[20] In turn the concentration of dropouts produces disproportionate societal costs in terms of arrests, police and court intervention, incarceration, babies born out of wedlock, improper care and maltreatment of children, broken homes, and higher levels of infant mortality rates. All these variables are closely linked among the states and metropolitan areas nationwide.

Large schools are highly inefficient, if one looks not just at money that is spent on students who remain in schools, but take into account those students who are absent or

---

[19] Michael McGinnis, editor, Polycentricity and local public economics (Ann Arbor, University of Michigan Press, 1999. See chapters 1, 5, 7, 16, 17 in particular.

[20] See L. Stefel et al, 1998. "The Effects of Size of student body on school costs and performance in New York City high schools. New York: New York University Institute for Education and Social Policy.

drop out due to deficient learning, which in turn produces a loss of self-esteem, interpersonal conflicts, physical conflicts, and other juvenile health risk syndromes.

The Need for New Research

Unfortunately, prior research rarely looks at the lagged relationships of school size with the compounded problems of educational inefficiency, even less for New Jersey, and even less for high schools in particular.

Fortunately, new research has been undertaken. School inefficiency for New Jersey has been measured by a composite index that measures standardized z-scores for spending per student, (low) test scores on math, science, and reading separately, and (high) scores for dropouts and absenteeism.

According to the "polycentricity" theory, multiple traits should be used to measure efficiency.[21] In turn, inefficiency is maximized where school districts spend a lot of money, to little or no avail, in their pursuit of improved test scores or improved participation in the life of the school by students. Further, inefficiency is especially severe when one measures the compounded problems for high schools where absenteeism and dropouts are more severe than for primary schools.

What happens when one measures the relationship of school size with this composite index of compounded inefficiency?

In New Jersey the linear relationships of school size with inefficiency are highly significant. They persist even after controlling for various combinations of race, poverty, special education students, class size, teacher training, computer resources and Internet access.

Taking into account other explanations for educational inefficiency, school size has a significant independent, autonomous influence.

In high school, big schools mean big problems that contradict national educational goals, and frustrate New Jersey citizens eager for efficiency in the public schools.

[21] Idem.

SUMMARY OF RESEARCH FINDINGS

Nationwide, prior research often shows school size to correlate with a wide range of endogenous variables for students in primary and middle schools. However, the evidence has been mixed for high schools, given the primitive research methods used in prior studies.

In New Jersey the situation is now quite different. School size does make a difference for high school students, using improved methods of measurement and analysis.

The answer is emphatically yes to the following three questions:

(1) Is there a significant relationship linking school size with academic test scores?

(2) Is there a significant relationship linking school size with the concentration of school crime and student violence in a given district?

(3) Is there a significant relationship linking school size with an index of inefficiency that measures the combination of high costs with low test scores, plus unsolved problems of absenteeism and dropouts?

In every case, the “ceteris paribus” relationships are significant at the .05 levels of probability. This is true even for unweighted samples restricted only to schools and high school districts serving grade 9-12 students. Weighted by the number of students in each school or district, the relationships are often significant at the .001 level of probability.

DETAILED PROOFS AND EXPLANATIONS

In the next sections, I provide detailed proofs and explanations for each of these conclusions. Sections where the results seem self-evident serve in effect as Appendixes to the prior text. For other sections where the material is less obvious, more verbal text is provided.

Sections 1 and 2 link school size with test score failures and school violence. They show significant mean differences in problems facing large and small schools, and show that these problems are highly significant when measured "ceteris paribus". The bigger the schools, the bigger the problems. Each section provides a formal analysis of variance to document significant differences in outcomes among different size schools, a graph to visualize that larger schools have larger problems, and a multiple regression analysis to measure relationships with school size controlling for other exogenous predictors like poverty, race, class size, or teacher traits. Looking at schools where the social costs of academic failure and school violence are especially severe, school size maximizes adverse outcomes, controlling for other factors that might obscure the relationships.

In sections 3 and 4 I link school size with different indices of educational "costs". I show that school size is significantly correlated with the more refined indexes of school costs. These indexes (a) measure value added over time, (b) go beyond fiscal costs to include academic costs like academic failure, plus (c) take into account social costs like dropouts and absenteeism. Such indicators produce particularly clear results when applied to a consistent set of schools, like mainstream high schools that consistently report outcome data. Small size does not guarantee low costs, when one examines "other" schools serving mostly ungraded or special needs students subject to special federal and state mandates.

In Section 3, table 3a3 shows that over time a school size of 500-999 students is associated with significant total cost savings per students versus schools housing 1,000-1499 students. The mean savings in total costs of housing students start with $94.95 per student in year one. They rise to $269.69 by year four. The median savings in total costs of housing students start with $217.00 per student in year one. They rise to $422.00 in year four.

The same table also shows savings versus schools of 1,500 or more students. The mean savings in the total costs of housing students start with $296.03 per student in year one. They rise to $337.80 by year four. The median savings in the total costs of housing students start with $122.00 per student in year. They rise to $796.00 per student by year four.

Comparing four different categories of school size, the differences of schools housing 500-999 students versus other size categories are statistically significant at the .001 level of probability for each of the four years analyzed.

Subsequent tables show even more significant cost savings when attention is paid not just to the costs of housing students, but also to the costs of educating students. Even higher levels of significance are achieved when one does not simply take into account the number of schools within each size category, but also takes into account the total number of students enrolled in each school in each size category.

Table 3a4 for example shows that the ratio of what it costs to what children learn grows significantly in larger schools, comparing four size categories, weighting each school by enrollment. Subsequent tables confirm the same pattern.

Part A of Section 3 explains differences in how to measure the costs of housing students versus the costs of educating students. Part B of Section 3 explores in greater detail the relative merits of schools in the size range of 500-999 students. Part C of Section 3 explores in greater detail the relative costs of schools housing 1500 or more students.

This research was not asked to identify the optimal size of schools. Different schools may weight different roles in different ways. However, New Jersey schools that house 500-999 students show major advantages both in their custodial role and in their role of educating students.

Section 4 shows that the results are most emphatic when analysis takes into account the full range of academic and social costs produced by larger schools. These include social costs like dropouts and absenteeism, plus academic costs like failures on HSPT tests of math, reading, and writing. Looking at different indices of "compounded" inefficiency and "residual" inefficiency that adjust for the poverty, racial composition, class size, and other traits of each school, school size is strongly correlated with a wide constellation of inefficiency costs that must be borne by New Jersey tax payers.

Overall the evidence makes clear that the custodial costs of "housing" students are not as systematically related to school size as are the training costs of "educating" students. Educational Policy Makers and the public should insist that future research take into account the total costs of school.

For example, many large schools reduce their "custodial" costs of "housing" students by encouraging absenteeism on any given day, plus dropouts over time, to exclude the marginal student who is hardest to house or educate.

Many other large schools use other strategies as well to control nominal costs. In the short run they crowd more students into a given 1,000 square feet of floor area. This cuts nominal costs. However, by the end of a four year cycle they may have far fewer students per floor area, due to excessive attrition. This makes it harder to achieve a high graduation rate, unless they simply ignore the number of 9th grade students who should have made it to grade 12, but did not.

Thus it is important to measure the effects of school size over time, and not just short-term cost/ benefit ratios. Over time the ratio of costs to benefits grows, as a function of school size, especially if one compares comparable schools that exclude small "other schools" facing inflated costs due to "special need" mandates.

Sections 5 and 6 summarize the methodology used in sections 1-4. They explain data sources, how many schools were analyzed, key indicators used in this research, and the vocabulary common to hypothesis testing and regression analysis – which is generally not very common at all outside the research community.

Sections 7 and 8 outline relevant readings for issues in debate. Many older studies strongly insisted that big schools and big districts have big virtues. Of course, they often reached this conclusion by confusing the resources available within a school to the realization of desired outcomes. Even among the schools studied by Conant and other proponents of big schools, a reanalysis of their purported evidence shows adverse correlations between school size and desired outcomes.

Based on their own evidence:

- School size was negatively correlated with: the proportion of students able to meet basic standards favored by Conant.
- School size was negatively correlated with the proportion of students who participated in programs for the gifted and talented also favored by Conant.
- School size was negatively correlated with a school climate that was safe and secure, and positively correlated with a school climate marked by chaos and confusion.

More recent studies point out growing evidence of better outcomes from the small school learning community. They also clarify research methods and theoretical perspectives to quantify and explain those outcomes.

Section 9 outlines a range of policy options to implement these findings, while Section 10 advocates further research to clarify the case for the small school learning community in New Jersey and beyond. They outline a wide range of issues to be explored in future research. However, based on feedback from Commission members and others, the following issues deserve special consideration in follow-up studies:

- What is the relationship of school size to problems affecting middle school and junior high school students in particular, including failures on GEPA tests, school crime and violence, and a poor school climate overall?
- What is the relationship of school size to problems affecting grammar school students in particular, including low ESPA scores, absenteeism, and limited family involvement in the life of the school?
- What is the relationship of school size with student crime and violence, using unpublished data not yet available to the public?
- In explaining differences in school crime and violence, how superior are "gemienschaft" reform methods based on small school learning communities versus "gesellschaft" methods. The latter authoritarian methods seek to replace informal social controls with formal controls like zero tolerance regulations, automatic reporting of student crimes to police, police in schools, metal detectors, DARE style intervention programs. To what degree is the small school learning community strategy superior? To answer such questions, research should utilize methods and theoretical perspectives like those outlined at the 2003 International Conference on Violence and Family Maltreatment held in San Diego California, sponsored by the Chadwick Center and the San Diego Children's Hospital, and especially the CEU workshop on school violence.
- What are the potential outcomes (including savings in fiscal costs and benefits for social and academic goals) from a balanced shift between class size and school size reduction policies? To what extent would such a shift meet goals including cost savings of several hundred million dollars a year, while improving academic performance, reducing fear among students and teachers from school conflict and crime, plus minimizing dropouts, absenteeism, and violence? To obtain such results, use might be made of the computer simulation methods outlined at the 2002 School Conference on School Crime and Violence sponsored by the Rutgers University Forum for Policy Research and the Medical School of Osteopathic Medicine at Stratford, before a panel headed by Assemblywoman Mary Previte. Multivariate regression analysis

methods like those used in “institutional” research should explore whether small class size policies are increasingly inefficient within New Jersey, compared to small school policies, as predicted by Erik Hanushek and others.

SUMMARY OF DETAILED PROOFS AND EXPLANATIONS

I Four sections summarize the statistical evidence that school size is significantly linked to adverse educational outcomes for New Jersey High Schools, so that the null hypothesis can be and should be rejected for each type of outcome:

- Section 1 links School Size with future Test Score Failures.
- Section 2 links School Size with future School Violence.
- Section 3 shows different ways that School Size links with indicators of housing costs versus educational costs: The Custodial School House Function versus the Educational Value Added Function.
- Section 4 links School Size with "value added" indices that measure educational costs, including indexes of "compounded" inefficiency and "residual" inefficiency – both of which are significantly exacerbated by larger schools.

II Two sections outline and review the Research Methodology to explain how the present results were obtained, and to serve as a guide for future research

- Section 5 explains where to find the evidence.
  - A. Data Sources.
  - B. Criteria for Selection of 100% Comprehensive Samples.
  - C. The Number of Cases in Each Universe of Cases/ Sample Size.
- Section 6 summarizes and explains the statistical data and concepts.
  - A. Key Variables Used In This Research.
  - B. Key Concepts Used In Regression Analysis And Hypothesis Testing.

III. Two sections inventory background readings that clarify what is known about school size outcomes, how they should be measured, and major implementation issues regarding incremental approaches to the small school learning community.

- Section 7 focuses on optimal research methodologies.
- Section 8 points to substantive research on School Size Outcomes and Implementation Options.

IV. Two sections outline the range of Research Priorities and Follow-up Efforts available to the New Jersey Commission on Business Efficiency in the Public Schools, and other advocates of change and improvement in how well public schools operate.

- Section 9 clarifies the range of policy options the Commission should consider for implementing a Small School Learning Community.
- Section 10 emphasizes the need for follow-up studies sponsored by the Commission. New evidence is needed to build a comprehensive needs-assessment, environmental-scanning, and strategic planning process to cut costs and expand favorable educational outcomes for public schools in New Jersey.

SECTION 1 – SCHOOL SIZE AND ACHIEVEMENT

The tables in section 1 provide statistical evidence that school size is significantly linked to the percent of high school students who pass or fail key HSPT tests. School size is negatively linked to the percent of students who pass. This means that school size is positively linked to the percent who fail those tests. The negative relationship between school size in the past and HSPT test scores in the future are consistent enough to reject a null hypothesis that the relationship of school size with test proficiencies is random.

Various tables cover the following topics:

1.1: Looking at Bivariate Relationships, The Differences in High School Proficiency Test Scores between Schools of Different Size are Sufficient to Reject Null Hypotheses for Math, Reading, and Writing

Table 1.1: Students in small high schools in New Jersey performance significantly better than students in large high schools, comparing mean scores on High School Proficiency Tests for high schools above and below 1,500 students

1.2: Looking at simple graphs, one sees a clear picture of major differences in test scores among different size categories of schools, using 500, 1000, and 1,500 students as tipping points

Figure 1.2a:

Net Gaps between average **math** scores for each size category of high schools versus State Mean for all High Schools: Larger Schools have worse **math** scores in the future

Figure 1.2b

Net Gaps between average **reading** scores for each size category of high schools versus State Mean for all High Schools: Larger Schools have worse **reading** scores in the future

Figure 1.2c

Net Gaps between average **writing** scores for each size category of high schools versus State Mean for all High Schools: Larger Schools have worse **writing** scores in the future

1.3: Multiple Regression Coefficients document significant linkages over time between school size and High School Proficiency Test Scores, after controlling for Spending, Class Size, and other School Traits for Students and Teachers

Table 1.3

Multiple regression analysis coefficient show the linkage of school size with proficiency test score results among NJ High Schools is statistically significant, so that the null hypothesis can be rejected, even after imposing various “ceteris paribus” controls, plus measuring “lagged” multiplier effects over time, plus looking at test scores individually (in different equations)

Table 1.1a: Students in small high schools in New Jersey perform significantly better than students in large high schools: A comparison of mean (average) passing rates on High School Proficiency Tests for high schools above and below 1,500 students

% Students Passing HSPT tests in 1999-2000, as a function of lagged school size in 1996-1997

School Size In 96-97	Average % passing In 1999-2000 by subject area	MATH	READING	WRITING
0-1499				
	Mean	93.69	91.87	93.25
	Geometric Mean	93.03	91.00	92.68
N of schools	261			
1500 and above				
	Mean	86.47	82.89	86.77
	Geometric Mean	84.64	80.53	85.16
N of schools	48			
All Schools				
	Mean	92.57	90.48	92.24
	Geometric Mean	91.67	89.29	91.47
N of schools	309			
ANOVA (Analysis of Variance: Impact of school size on lagged test scores				
	F-coefficient (ANOVA)	18.27	22.51	17.16
	Sig Coefficient	**0.00003**	**0.00000**	**0.00004**
Is the statistical significance of the relationship between school size and lagged test scores sufficient to reject the null hypothesis at the .05 and/or .01 level of probabilities?		**yes, yes**	**yes, yes**	**yes, yes**
Measures of the degree that smaller high schools have better test scores than larger high schools, reported as a % (percent) of the mean for all schools [for a tipping point of 1500]		MATH	READING	WRITING
	Mean	7.80	9.93	7.03
	Geometric Mean	9.14	11.72	8.22

Table 1.1b

The Universe of Cases and Measurement Methods for Section 1

(Tables 1.1, 1.2, 1.3)

All data sources were analyzed using SPSS 11 to measure "lagged relationships" over time. Thus school size was measured several years prior to test results, using a "lag" of three years to estimate relationships over time.

High School Proficiency Test HSPT results were taken from NJ DOE "Report Card Tables" for 1999-2000.

Data for school size were taken from U.S. Department of Education, Common Core of Data CCD files, 1996-1997

The Universe of Cases includes 309 schools that meet several criteria. (a) The 1996-1997 US CCD report classified them as "high schools". (b) The same source reported CCD enrollment data (for 1996-1997). This criterion omitted certain charter and alternate schools created after 1996-1997 (c) The NJ DOE "Report Card" files reported HSPT data for 1999-2000.

The "samples" used in Section 1 include 100 percent of the high schools that met all three criteria. However, Table 1.3 includes only 300 schools, since nine schools failed to report complete data for all variables in a multivariate regression analysis. However, the basic strategy is to report results for a comprehensive, exhaustive, 100% sample of the universe of cases defined.

Table 1.1a divides the universe/sample of 309 high schools into two size categories. It compares 261 schools with 0-1499 students, versus 48 schools with 1,500 or more students, based on U.S.DOE CCD enrollment totals reported for 1996-1997.

Figure 1.2a,b,c uses the same sample/universe of 309 high schools. However, it uses four size categories. The results show the same monotonic decrease in the % who pass HSPT tests for larger schools - when one compares schools in four size categories: 0 - 499, 500 – 999, 1000-1499, as well as 1500 and above. The total sample refers to the 309 schools with full data for 1996-1997 and 1999-2000. There were 58, 139, 87, and 48 schools respectively in each size category.

Table 1.3 began with the same potential "universe" of 309 schools. The sample was reduced to 300 schools. Nine schools were omitted since they lacked complete data for all the predictor variables used in the regression equations.

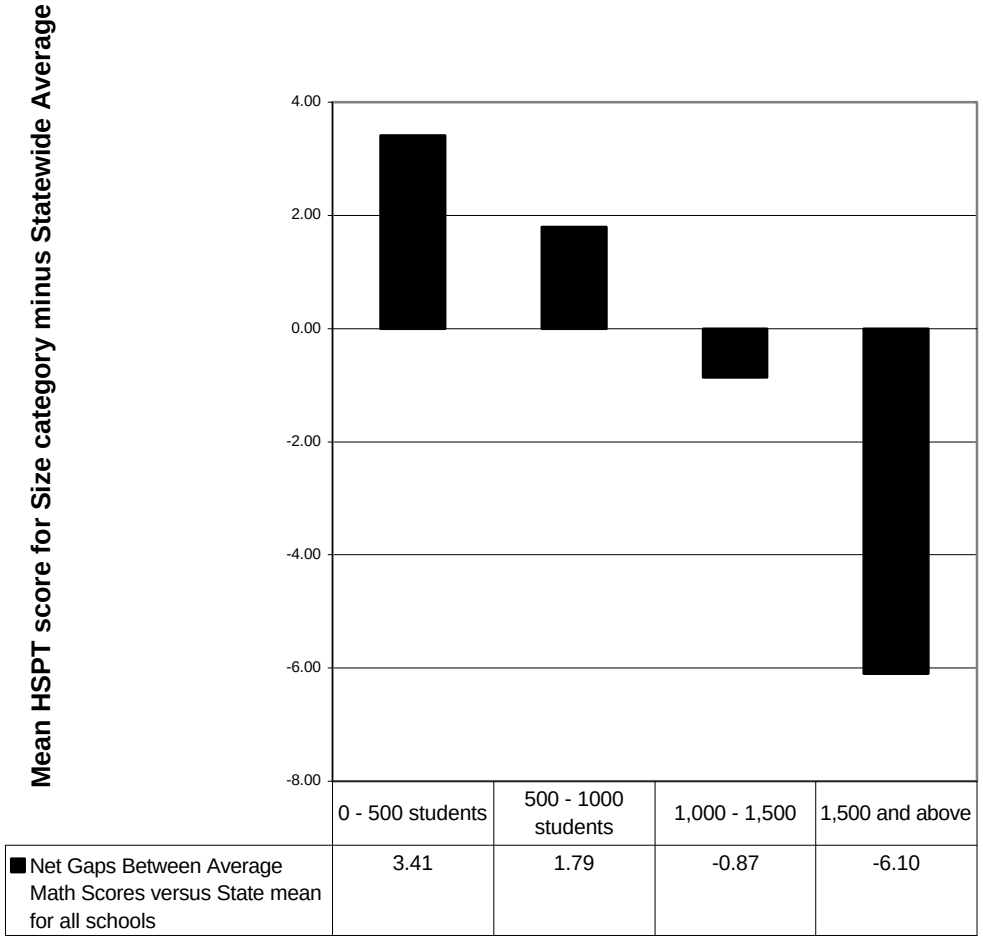
It should be noted that similar results linking school size to the % of students passing the HSPT tests were obtained using slightly different criteria to refine the sample, e.g., only schools with at least 100 students, or only schools with 10 or more students taking the tests, or only schools reported as regular high schools both in 1996-1997 and 1999-2000.

Future research is needed to estimate results for GEPA tests for middle school students, and ESPA scores for elementary students. This research was limited to high school students enrolled in high schools operating in the period 1996-1997 through 1999-2000.

All the data used in this report are publicly available from the
U.S. DOE and the N.J. DOE
to facilitate public review.

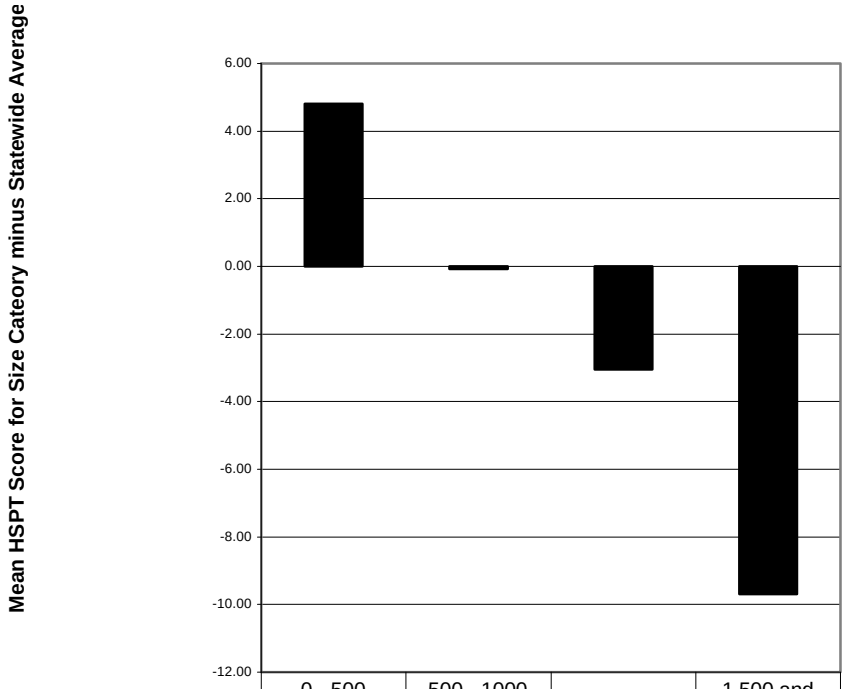
Field name used by NJ Report Card to report HSPT scores for individual schools, supplied by the NJ Department of Education (where y6 = 1999-2000)	math_y6	read_y6	write_y6
SPSS field name	HSPT030	HSPT029	HSPT031

Figure 1.2a:
Net Gaps Between Average % Passing HSPT Math Tests
for each Size Category of High School
versus State Mean for all High Schools in sample:
Larger Schools have worse math scores in the future
(1999-2000 versus 1996-1997)



School Size Categories:
Lagged number of Students 3 years prior to tests

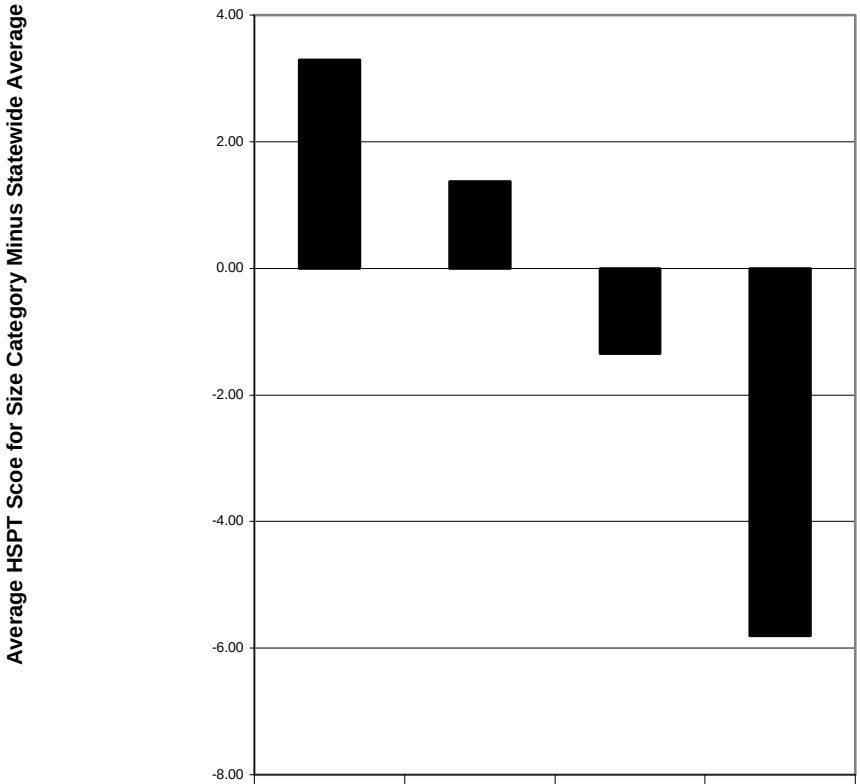
Figure 1.2b:
Net Gaps Between Average % Passing HSPT Reading Tests for
Each Size Category of High Schools
versus State Mean for all High Schools in sample -
Larger schools have worse reading scores in the future
(1999-2000 versus 1996-1997)



	0 - 500 students	500 - 1000 students	1,000 - 1,500	1,500 and above
Net Gaps Between Average Reading Scores versus State mean for all schools	4.81	-0.08	-3.05	-9.68

School Size Category:
Lagged Number of Students 3 years Prior to Tests

Figure 1.2c
Net Gaps Between Average % Passing HSPT Writing Tests for each Size Category
of High Schools versus State Mean for all High Schools in sample -
Larger schools (1996-97) have worse writing scores in the future (1999-00)



	0 - 500 students	500 - 1000 students	1,000 - 1,500	1,500 and above
Net Gaps Between Average Writing Scores for each Size Category of High Schools versus State mean for all High Schools	3.30	1.37	-1.35	-5.80

School Size Category:
Lagged Number of Students 3 years prior to tests

Table 1.3: Multiple Regression Analysis Coefficients Show the Linkage of School Size with Proficiency Test Score results among NJ High Schools is Statistically Significant, so that the null hypothesis can be rejected, even after imposing various "ceteris paribus" controls, plus measuring "lagged" multiplier effects over time, plus looking at test scores individually

Dependent Variable = HSPT (test) scores for 300 NJ High Schools with complete data	Math	Reading	Math	Writing
Total predictors = Number of control variables + school size	8	9	9	9
Equation Type (1 or 2): Both equations include school size plus other predictors that control for spending, federal aid, class size, student/faculty ratios, teacher education (% undergraduate degrees only), mobility (turnover) rates for students. Equation 1 controls for percent black. Equation 2 controls for percent minority, plus ungraded students. Other equations give similar results, using data provided by the U.S. and N.J. Departments of Education. The sample of 300 schools excludes nine high schools lacking full data for all predictor variables.	1	2	2	2

MRA Coefficient	**How derived**	**Math**	**Reading**	**Math**	**Writing**
R-square Coefficient for all predictor variables	proportion of variation in DV explained by all predictors	0.694	0.677	0.625	0.591
F Coefficient for overall equation	ANOVA coefficient	82.411	67.484	53.729	46.491
Sig Coefficient for overall equation	Statistical Significance for entire equation (probability of error in rejecting the null hypothesis)	0.000	0.000	0.000	0.000
Unstandardized Coefficient for School Size	"Ceteris Paribus" Slope (B coefficient)	-0.0039	-0.0027	-0.0028	-0.0022
Average Reduction in % of students tested who pass the HSPT, as a function of each extra 1,000 students in school		-3.865	-2.676	-2.836	-2.242
Average reduction in previous passing rate as a % of the range in scores for all schools in sample		-6.155	-3.890	-4.516	-3.570
Beta	Standardized Regression Coefficient using z scores for all variables (standard deviation units)	-0.178	-0.109	-0.130	-0.112
Average % decrease in test scores over 3 year period, for each increment in school size of one standard unit, measuring test scores in standard units (z scores) as well		-17.769	-10.906	-13.037	-11.167
t coefficient	Ratio of slope to standard error	-4.917	-2.857	-3.171	-2.599
Sig Coefficient for School Size-Test Score Relationship, "all things else equal"	Probability of error in rejecting the null hypothesis that no relationship exists between school size and proficiency test scores, after eliminating effects on relationship due to other control variables or "ceteris paribus" conditions	**0.000**	**0.005**	**0.002**	**0.0098**
Is the statistical significance of the relationship linking school size with HSPT scores sufficient to reject the null hypothesis, either at the .05 and/or .01 levels of probability (i.e., at the 95% and/or 99% confidence levels, for the sample of 300 high schools operating between 1996-1997 and 1999-2000)?		**yes, yes**	**yes, yes**	**yes, yes**	**yes, yes**

SECTION 2 - SCHOOL SIZE AND VIOLENCE

The tables in section 2 provide statistical evidence that school size is significantly linked to test school violence at a level sufficient to reject a null hypothesis about the relationship of school size with school violence. Looking at types of students and districts where the problems of violence are especially serious, dramatic evidence links school size with the concentration of violence in a district.

2.1: Looking at Bivariate Relationships, the Differences in Violence Indices between Districts with Different Size Schools are Sufficient to Reject Null Hypotheses about Size-Violence Relationships

Table 2.1: Linkages Between school size and lagged indices of school violence for 51 New Jersey (regional) high school districts:

- Four different indexes show that the future concentration of violence in high school districts ranges from 86 to 148% higher where schools are larger (above 1000 average enrollment)
- High school districts with larger schools have significantly more violent incidents among students versus other nearby school districts within the county.

2.2: Simple graphs give a clear picture of the extent of differences in violence indices between districts with large and small schools. The percent differences or variances of violence indices from the average for all districts in the sample are compared for large and school schools. High School Districts with large schools have much higher levels of violence relative to the average for all high school districts studied.

Figure 2.2a:

How the Mean Violence index 1 compares to the statewide average – contrasting high school districts with large and small schools (using 1,000 students as a tipping point):
Large Schools in the past are characterized by the geographical concentration of violence over time using index 1

Figure 2.2b

How the Mean Violence index 1 compares to the statewide average – contrasting high school districts with large and small schools (using 1,000 students as a tipping point):
Large Schools in the past are characterized by the geographical concentration of violence over time using index 2

Figure 2.2c:

How the Mean Violence index 1 compares to the statewide average – contrasting high school districts with large and small schools (using 1,000 students as a tipping point):
Large Schools in the past are characterized by the geographical concentration of violence over time using index 3

Figure 2.2d

How the Mean Violence index 1 compares to the statewide average – contrasting high school districts with large and small schools (using 1,000 students as a tipping point):
Large Schools in the past are characterized by the geographical concentration of violence over time using index 4

2.3: Multiple Regression Coefficients document significant linkages over time between school size and High School Violence, after controlling for Spending, Class Size, and other School Traits for Students and Teachers

Table 2.3

Multiple regression analysis coefficient show the linkage of school size with violence among NJ High Schools is statistically significant, so that the null hypothesis can be rejected, even after imposing various “ceteris paribus” controls, plus measuring “lagged” multiplier effects over time

Table 2.1a: Linkages between School Size in 1996-1997 and Lagged Indices of School Violence during 1999-2000 For 51 NJ High School Districts

Four Different Indexes Show that the Future Concentration of Violence in High School Districts Ranges from 86 to 148% higher where schools are larger (above 1000 average enrollment)

High School Districts with Larger Schools have significantly more Violent Incidents Among Students versus Other Nearby School Districts within the County. [School size is based on 1996-1997 enrollments and the degree of school district violence is based on 1999-2000 incidents.]

The Universe/ Sample of cases includes 51 NJ School Districts that serve predominantly High School Students. Over 50% of all students enrolled in grades 9-12 during 1996-1997, while the NJ DOE included the district in its crime and violence reports for 1999-2000. The universe/ sample includes districts located in 15 counties, including all major "regional" high schools and a couple of "service commission" schools. The percent of high school students ranges from 51 to 100 percent.

Using data weighted by enrollment, the relationships are highly significant between enrollment in 1996-1997 and violence indices for 1999-2000. Even with the un-weighted sample of 51 cases, the evidence rejects the Null Hypothesis at the .05 confidence limit, regarding linkages between School Size and the Geographical [spatial] Concentration of Violence within Individual High School Districts.

Some of the key Indicators follow:

Concentration of Violence Indices:	The proportion of total violence within each county that occurs within a specific district (%)	The ratio of Violent Incidents within Each District versus Other Districts in the County {%}
	Comparing Differences In Means for ANOVA	
Average Size for District Schools in 96-97		
	Mean Violence Index 1	**Mean Violence Index 2**
Mean School size of 0-999 (n = 34)	3.56	3.94
Mean School size of 1000 and above (n=17)	7.89	9.54
Total Districts in sample (n=51)	5.01	5.80
ANOVA F coefficient for mean differences in violence index among only those 51 NJ Districts with a Majority High School Level Students	6.198	5.388
Sig Coefficient for these 51 NJ HS Districts	0.016	0.024
Can the null hypothesis be rejected at the .05 level of probability for a sample this small?	YES	YES
	Validity Checks	
	Comparing Violence in Median Districts	
Size Category for High School District		
	Median Violence Index 3	**Median Violence Index 4**
Mean School size of 0-999 (n=34)	1.82	1.86
Mean School size of 1000 and above (n=17)	6.09	6.49
Total Districts in sample (n=51)	3.01	3.11

Table 2.1b

Comparing the Range of Violence Indices between High School Districts with Large versus Small Schools (Using 1,000 as a tipping point)

	Mean Violence Index 1 as a % of Statewide Average	Size Category for High School District	**Mean Violence Index 2 as a % of Statewide Average**
Mean school size of 0-999 (n=34)	-28.83	Mean school size of 0-999: To what extent does the mean violence index vary from the average for all 51 districts in the sample?	-32.20
Mean school size of 1000 and above (n=17)	57.65	Mean school size of 1000 and above	64.39
	Median Violence Index 3 as a % of Statewide Average	Size Category for High School District	**Median Violence Index 4 as a % of Statewide Average**
Mean school size of 0-999 (n=34)	-39.52	Mean school size of 0-999	-40.25
Mean school size of 1000 and above (n=17)	102.07	Mean school size of 1000 and above	108.69

Each Range measures the degree that Districts with larger schools have a worse concentration of violence than Districts with smaller schools, measured as a percent of the State Average for All 51 High School Districts.

Figure 2.2a: The % Difference or Variance in the Mean Violence Index 1 from the Statewide Average for 51 districts-
Comparing HS districts with large and small schools
(using 1,000 students as a tipping point)

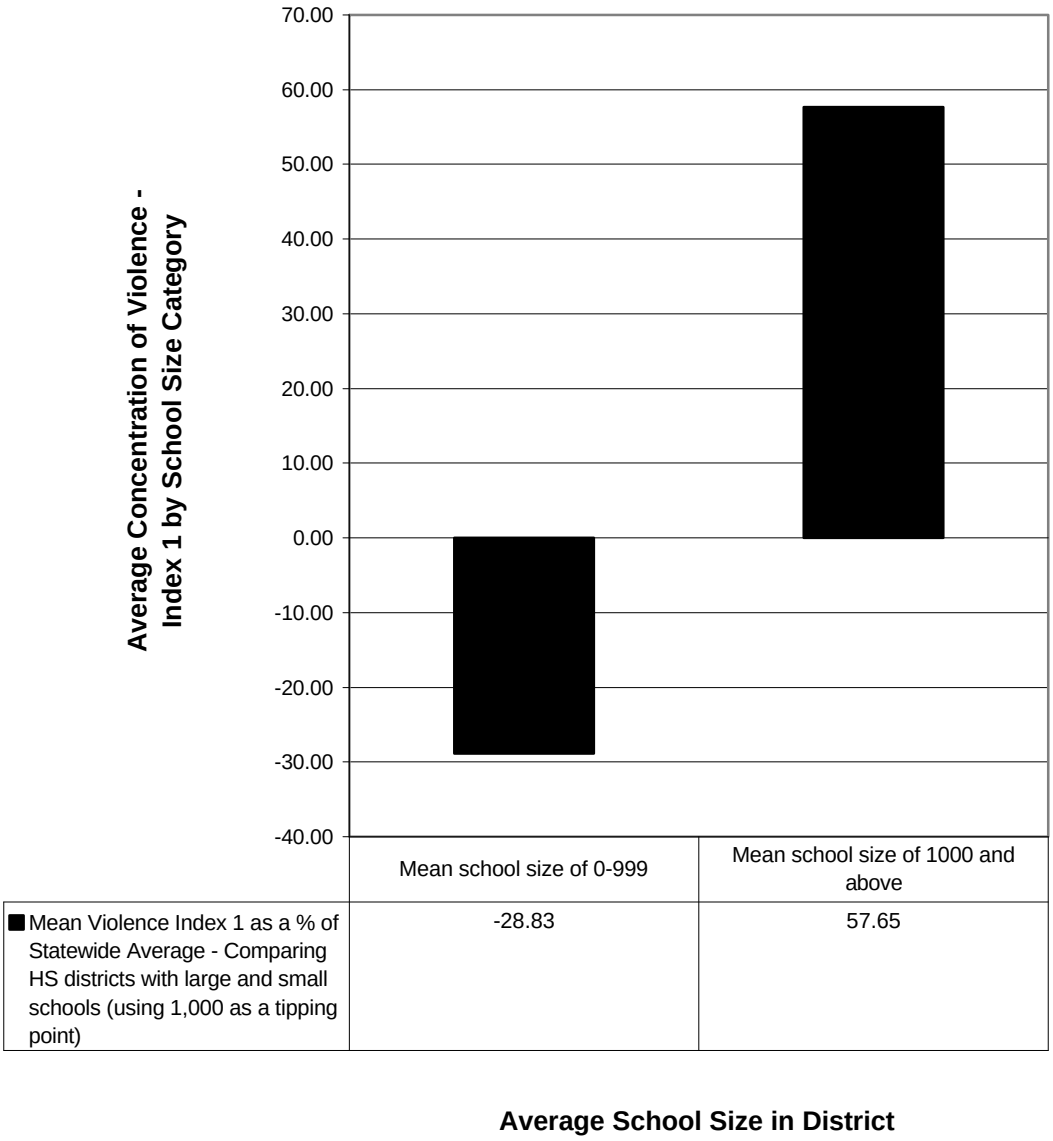


Figure 2.2b: The % Difference or Variance in the
Mean Violence Index 2 from the Statewide Average for 51 districts-
Comparing HS districts with large and small schools
(using 1,000 students as a tipping point)

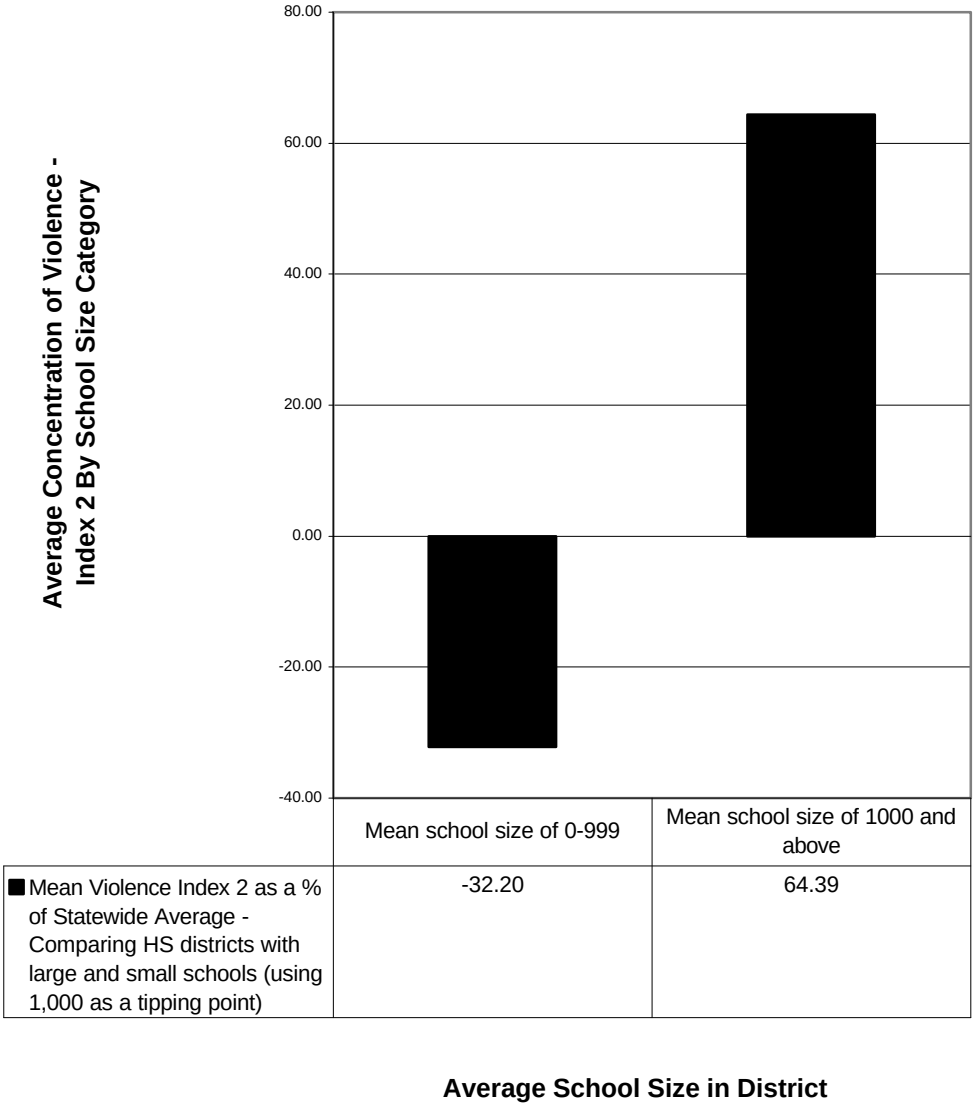


Figure 2.2c: The % Difference or Variance in
the Median Violence Index 3 from Statewide Average for 51 districts-
Comparing HS Districts with Large and Small Schools
[using 1,000 students as a tipping point]

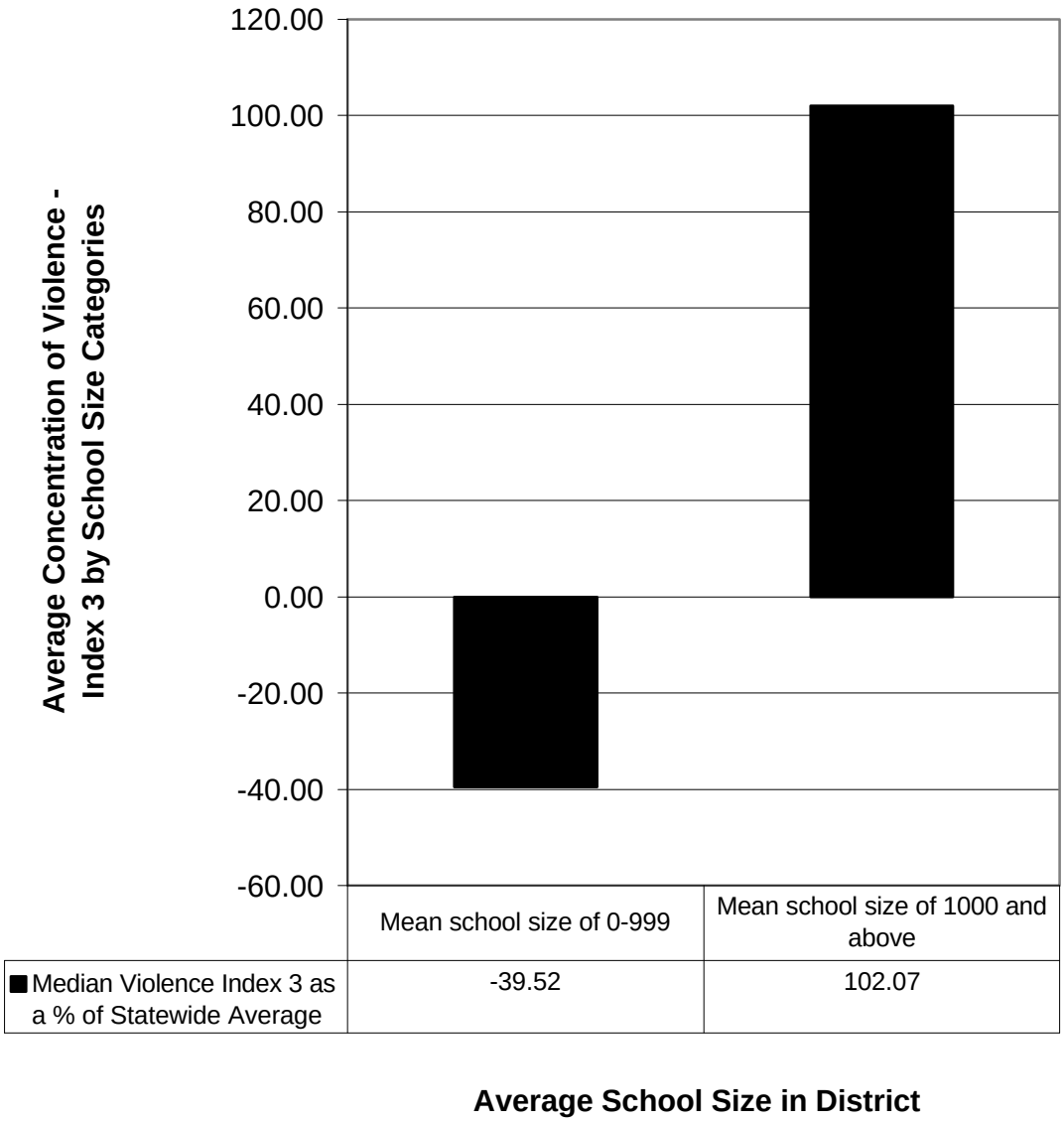


Figure 2.2d
The % of Difference or Variance of the Violence Index
from the Statewide Average for 51 Districts

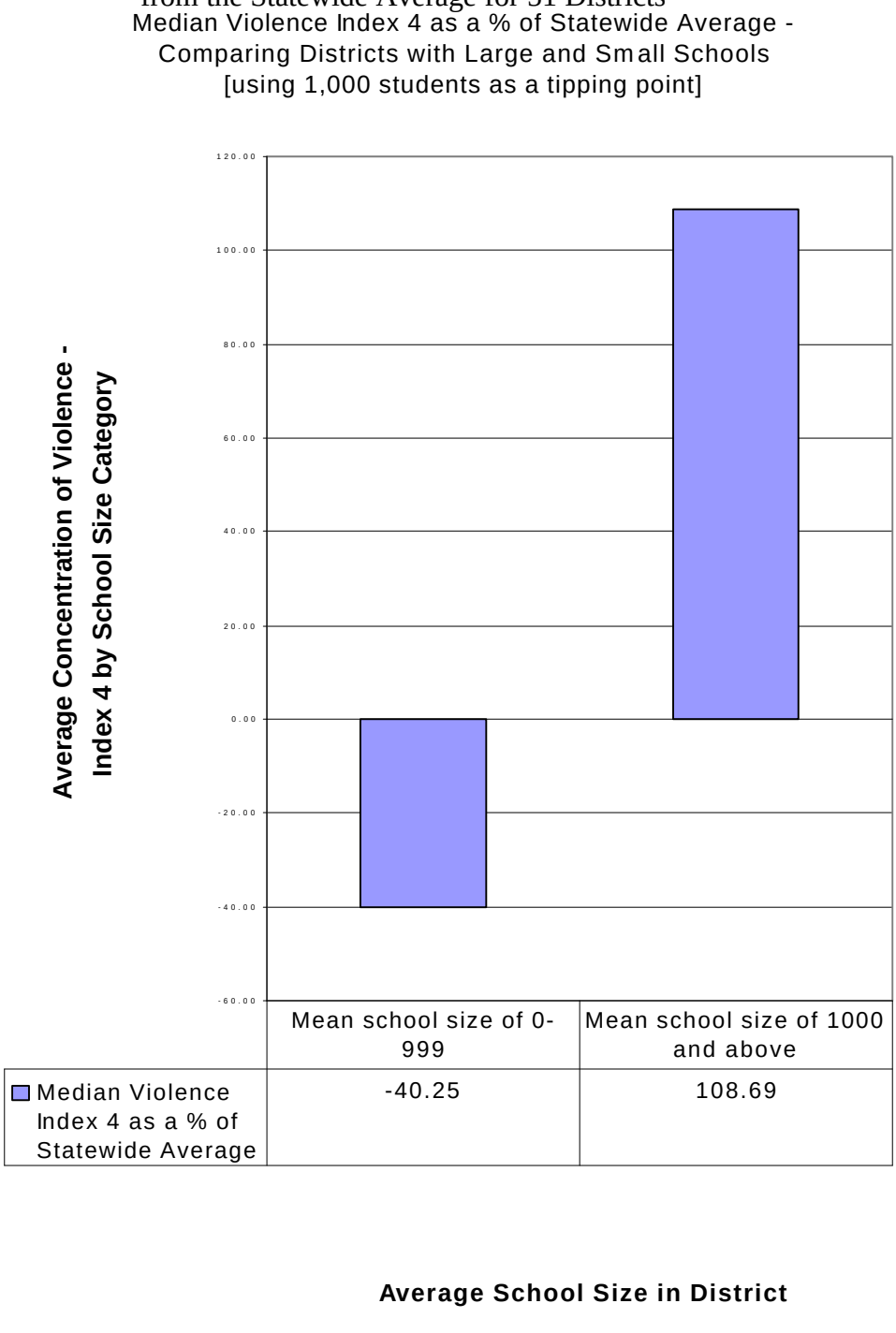


Table 2.3a: Multiple Regression Analysis confirms a statistically significant relationship between School Size **in the past** and the Geographical (Spatial) Concentration of Violence Within A District **in the future,** even after controlling for district size, race/ethnicity, poverty, spending, and class size.

Index 1 measures the % of all violent incidents within county schools that are concentrated within a given district. [SHR_VIO]

Predictor Variables (sorted by statistical significance)	Standardized Regression Coefficient: Beta	t-ratio of slope to standard error	Sig. Coefficient (probability of error in rejecting the null hypothesis)
Lagged School size: Mean of total students per regular school during 1996-97 (from U.S. D.O.E. CCD files)	**0.4288**	**2.4112**	**0.0208**
District Size: 2001 Resident Enrollment for District	0.1678	0.9170	0.3649
Race 2000: Per cent Asian students	-0.1467	-0.7409	0.4633
Race 2000: Per cent white students	0.1709	0.7356	0.4665
Poverty: 2000 Per cent eligible for free lunch or reduced price lunch	0.1300	0.4963	0.6225
Spending: 2001-02 Comparative Cost Per Pupil	0.1509	0.4433	0.6600
Special Needs: 2001 Total Eligible for Special Education % (pct)	0.0730	0.3510	0.7275
Intergovernmental: Local Taxes as proportion of 01-02 Revenue Sources	-0.0294	-0.1169	0.9075
Class size: 2001 Student/ Teacher Ratio: 100 Students per Teacher Ratio Fall 2001 (Certified Staff)	-0.0005	-0.0020	0.9984

Table 2.3b: Multiple Regression Analysis confirms a statistically significant relationship between School Size **in the past** and the Geographical (Spatial) Concentration of Violence Within A District **in the future**, even after controlling for district size, race/ethnicity, poverty, spending, and class size.

Index 2 measures the Ratio of all violent incidents within a given district versus all nearby districts within the county. [RTO_VIO]

Predictor Variables (sorted by statistical significance)	Standardized Regression Coefficient: Beta	t-ratio of slope to standard error	Sig. Coefficient (probability of error in rejecting the null hypothesis)
Lagged School size: Mean of total students per regular school during 1996-97 (from U.S. D.O.E. CCD files)	**0.4892**	**2.7355**	**0.0094**
Race 2000: Per cent white students	0.1671	0.7151	0.4789
Race 2000: Per cent Asian students	-0.1369	-0.6877	0.4958
District Size: 2001 Resident Enrollment for District	0.1042	0.5666	0.5743
Poverty: 2000 Per cent eligible for free lunch or reduced price lunch	0.1294	0.4915	0.6259
Spending: 2001-02 Comparative Cost Per Pupil	0.1134	0.3314	0.7421
Special Needs: 2001 Total Eligible for Special Education % (pct)	0.0600	0.2870	0.7756
Intergovernmental: Local Taxes as proportion of 01-02 Revenue Sources	0.0496	0.1958	0.8458
Class size: 2001 Student/ Teacher Ratio: 100 Students per Teacher Ratio Fall 2001 (Certified Staff)	-0.0123	-0.0536	0.9576

The sample includes only those 51 NJ districts with a majority of high school (grades 9-12) students in 1996-1997, that were included in the survey of crime and violence for 1999-2000. Even for a sample of only 51 cases, and with 8 control variables, the null hypothesis can be rejected at a .05 level of probability regarding the relationship of school size and school violence over time. The same conclusion holds for each index of school violence.

The control variables include district size, as well as class size, two measures of spending, two measures of race, a composite index of student poverty, plus special needs enrollment.

All variables were measured using information provided by the U.S. and N.J. Departments of Education.

SECTION 3 - SCHOOL SIZE AND COST

THE CUSTODIAL/ SCHOOL HOUSE FUNCTION VERSUS THE VALUE ADDED/ EDUCATION FUNCTION

This section shows how School Size links with different indicators of "Costs" in New Jersey. The first set of indicators measure how efficiently or inefficiently schools provide their custodial role, or "The School House Function". These indicators simply measure how much it costs to house a given number of students during a given year. The more sophisticated indicators measure how efficiently or inefficiently schools provide their teaching mission, or "The Educational Value Added Function".

For the latter case of indicators, it seems important to look not just at short run costs, but long run costs. It is important to measure how much it costs to educate students, not just in providing short run floor space, but in improving how well they learn and flourish in the long run. Doing so helps clarify how school size affects outcomes.

To understand the contrast between the custodial costs of housing students and the training costs of educating students, it is important to understand the contrast between the quantity of schooling and the quality of schooling. Both in the United States and other countries, the goals of quality and "value added" are assuming ever greater importance. Reformers place growing attention on the need to measure and enhance the "value added" function of schools.

In the past, educational outcomes were measured simply in terms of how many children attended classes, and the number of years of schooling they completed. Now educational outcomes include how much children learn at any given level of schooling. The public wants schools to educate children to meet high standards of learning, and not just keep them off the streets for a given number of hours, days, and years. Outcomes imply proficiencies, and not just how many students are enrolled.

Of course, many working parents also demand an expanded custodial function for schools. Many want school boards to expand the school day and school year, by starting earlier and ending later. Such changes can greatly expand the costs of the housing function. Thus government must balance demands for an improved quality of schooling with demands for an improved quantity of schooling. Officials need to identify structures than can maximize goals of quality and quantity in a cost efficient manner.

In any event, expanding demands placed on local school boards and state officials can alter both the housing function and the education function, and make the task of maximizing efficiency even more important.

This initial look at school costs in New Jersey does not necessarily produce a simple answer to where costs are greatest, for those who fail to see the need to differentiate the different functions provided by schools The present research does reveal an important result for those interested in more subtle nuances.

Namely, for New Jersey, the relationship of school size is more consistently correlated with the quality of education versus the quantity of schooling. This is especially true when one looks at more sophisticated indices of quality or value added over time. It is much harder to predict which size schools will have the lowest costs for housing children as part of their custodial role. It is much easier to predict and prove which size schools do the best job of educating children.

Certain types of cost indicators particularly blur the task of understanding causes for custodial costs. These crude indices simply divide aggregate spending by naïve quantity indices. They simply add up nominal enrollments and projected class rosters at the beginning of a school year. Such indices ignore how many children attend class over time, and actually graduate with their cohort. They miss an important point. Namely, school size affects patterns of dropouts and attendance.

Larger schools produce adverse conditions that exaggerate dropouts and absenteeism. Big schools produce a complex set of social, academic, and fiscal costs that plague students and parents, and those concerned with the costs of educating students. However, by eliminating marginal students over time, they reduce their nominal costs of housing students. Larger schools also tend to house a larger number of students per 1,000 square feet. Again, this is one of the ways they reduce their nominal costs of housing students. By holding down the costs of housing students, they make it harder to achieve their responsibility to educate students.

The next two sections clarify differences in the housing and educating roles of schools. Namely, Section 4 will explore educational quality issues or value added issues, to show how large schools reduce benefit/ cost ratios. Section 3 will focus more closely on the quantity issue, or the custodial costs of housing students. It will outline different ways to measure costs, and how different cost indices vary as a function of school size in New Jersey.

Part A explains and illustrates differences between indices that measure the costs of housing students versus the costs of educating students. It shows that the costs of educating students are consistently higher in larger schools. Larger schools spend significantly more compared to what students learn. Size is closely linked to the ratio of benefits learning to fiscal costs.

In contrast, less sophisticated indices for housing costs do not follow a consistent pattern in regard to school size, especially in terms of short-term costs. In particular, costs are often quite high in very small schools required to must provide specialized services and facilities for ungraded students in “other” schools.

On the other hand, certain charter schools spend relatively little compared to other schools in their county or municipality, since they are only funded at about 90 per cent of other schools, and often lack permanent facilities. As more charter schools are created, their expansion may reduce the apparent costs per pupil in small schools, since charter schools tend to be very small.

In short, because the mission of schools varies, so do their costs of housing students. Thus school size does not follow a consistent pattern with the costs of “housing” students, at least at first glance. However, one finding is important. Namely, New Jersey schools with 500-999 students may have extremely favorable cost ratios for housing students.

Part B focuses more extensively on cost differences between schools with 500-999 students versus other size schools. Part B explains why many small schools have very high costs. Among other duties, they provide specialized facilities and specialized staff for their specialized student bodies. Thus very small schools often have very high costs because of the extra services they provide. High costs per se do not mean inefficiency, if the schools produce socially desirable outcomes. On the other hand, very large schools

often have high inefficiency ratios, since they produce social and academic problems that minimize how well they teach their students versus what they cost.

What about the remaining in-between schools? In New Jersey the average school that houses 500-999 students may enjoy significantly lower costs than do other size schools.

Part C focuses on four different indicators that can be used to compare housing costs and education costs. It shows that for all these indices, schools of 1,500 or more students may generate inflated costs. The super-sized schools are connected with higher costs for housing students, as well as higher costs for educating students, especially after taking into account how many students attend each school, rather than simply comparing schools one by one.

SECTION 3A:
THE CUSTODIAL/ SCHOOL HOUSE FUNCTION VERSUS THE EDUCATIONAL/ VALUE ADDED FUNCTION COMPARING TWO TYPES OF COST/BENEFIT RATIOS AS A FUNCTION OF SCHOOL SIZE:

To improve the validity and reliability of policy analysis, it is useful to build on databases where the public has the opportunity to inspect the facts they report. In effect, the underlying databases are subject to public review. In the present research project for the Commission, "transparency" and "open access" were key criteria used to guide all analyses. All underlying data must be publicly accessible for critical review.

This limited the research. Namely, neither the U.S. nor N.J. Departments of Education report fiscal information for all individual schools. The NJ DOE only reports expenditure and revenue information for **districts**, not schools. Thus it is not possible to use publicly accessible information that directly estimate fiscal costs for each school in New Jersey. Consequently, there is only limited data available to measure the effects of school size solely on fiscal costs per school, since the data are rather crude.

Thus Section 4 pays attention to the possibility that bigger schools produce social and academic costs in addition to fiscal costs. In fact, adding up six different types of costs for different size schools, an important discovery was made. Big schools are associated with much higher costs in aggregate, counting lower proficiencies in math, reading, and writing as academic costs, dropouts and absenteeism as social costs, plus district-wide spending as a fiscal cost.

To be more specific, these aggregate social, academic, and fiscal costs emerge over time, comparing past enrollments to future agglomerations of costs. This clearly indicates that school size is correlated with compounded inefficiency, and indeed significantly so.

Section 4 also adds a quick look at a new indicator of "residual inefficiency". This indicator measures how well high school students perform on reading tests, relative to district spending and the socio-economic status of students. Namely, it sees how far above or below they perform compared to expectations, looking at a subject area dear to the governor's heart.

These "residual" performance levels are instructive, since they show what happens as a function of school size over time. Namely, one sees that the "residual" percent of students who pass HSPT tests on reading is lower in larger schools. To repeat, these results emerge comparing past enrollments to academic benefits several years in the future, relative to fiscal costs. Over time, students in large schools do worse at learning how to read, compared to what is spent on them in school, and depending on the resources available to them in their home or community.

Some advocates of big schools, however, do not care about long-term effects from school size. They are only interested in the ratio of costs per students in any given year. They want to know what it costs to 'board" or "house" a given number of students in any given year. They want to know if "big box" architecture is a cheaper way to provide space for a given number of students in a given year. Their criterion is the ratio of total spending, or total comparative costs, to total pupils on class rosters. They are little concerned with whether students attend classes regularly, or even drop out over time, or

can pass even the most basic of proficiency tests. They are preoccupied with the custodial role of schools. They want to know the "bottom line".

Using a simple criterion that compares total costs during each school year to total pupil enrollment each Fall, they conclude that big districts are cheaper. Consequently, they assume that big schools are cheaper, since big districts typically have big schools. Taking the next leap of faith, they conclude that big districts and big schools are more efficient, since their buildings house more students at lower cost.

Such conclusions ignore several emerging principles in modern educational outcome evaluation research. Namely, there is a difference between short-term and long-term costs. What may seem in the short run may prove quite expensive in the long run.

Secondly, looking at how much it costs to house a student for a given year ignores the issue of how much it costs to help that student learn during the time they are housed in a given school. There is a difference between cost-benefit ratios when one looks at the quantity of schooling a student receives in a given year, versus the quality of learning they obtain over several years.

Third, one must take into account the possibility that education research should look at lagged relationships just like public health research. The architecture and organization of schools – like smoking – does not produce symptoms that necessarily show up in one day, one week, or one year. They only show up over time. Thus like smoking research, one must look at long-term costs, and not just perceived short-term benefits. What is true for public health research is also true for educational outcome research. Puffing away for one year may not hurt much. Puffing away for many decades becomes literally a matter of life and death. So does compulsory attendance in over-sized schools.

This supplemental report will apply these basic principles to educational cost/benefit analysis. It will report what happens from extrapolating fiscal information for districts to schools, and then looking at different fiscal cost/ academic benefit ratios.

The resulting evidence documents certain major conclusions about cost/benefit ratios for New Jersey schools. Namely, the following conclusions seem valid:

- Big schools may reduce the short-term costs of **housing** students.
- Big schools emphatically increase the long-term costs of **educating** students.
- Big schools may reduce the short-term costs required to provide a certain gross **quantity** of **schooling**, as measured by the number of students enrolled at the beginning of a year.
- Big schools much more dramatically increase the long-term costs required to provide a certain **quality** of **learning**. Namely big schools increase the long-term costs required to help students meet acceptable (passing) levels of performance on basic academic proficiencies, comparing school size in the past with performance levels five or more years in the future. This is especially true if one takes into account the large number of marginal students who drop out of big schools over time, and thus obscure the true costs of obtaining a certain quality of academic achievement per student originally enrolled.

These findings make use of recent conceptual breakthroughs in outcomes-based education research. Erik Hanushek, Ludger Woessman, and other institutionalists have applied these innovations in cross-national research plus cross-state research. These

methodological refinements have not yet been applied widely in studying intra-state educational outcomes.

(1) It is absolutely essential to distinguish between the short term and long term determinants of educational outcomes. Quite a few educational outcomes are endogenous in the short run. It is only by looking at long term "lagged" relationships that one can untangle "causal" relationships. [Metaphorically speaking, what is cheap in the short run may be worthless in the long run, if the product or service fails to produce any value. What is true for plumbing or electrical firms is also true for schools. A big company may not always be better, even if they offer a lower price for a unit of service. What is important is quality, and what happens over time.]

(2) There is a big difference between what is required to maximize the short-term quantity of schooling in any one year versus the long-term quality of what students learn over time.
   a. It seems easy to maximize short-term quantity: For example, the more money that is spent in any one year, the more the number of students enrolled in that year. This is almost tautological, in that most aid formulas distribute educational funds based on reported enrollments. Thus it is not so much that money increases enrollments, but enrollments increase money, at least at the local level. In the short run, spending and the quantity of schooling are closely linked.
   b. The equation is more subtle for long term quality: Unlike the quantity of schooling, the long-term relationships of spending with the quality of schooling are much weaker. Increasingly it is not how much money is spent, but how well, that determines the quality of spending. Thus nations that spend the most per student often have extremely low relative levels of achievement for the average student. This is especially true when one compares the ratio of what the average student learns in the future compared to what was spent per student in the past. It is also true when one takes into account differences in class size versus school size. The United States, for example, ranks extremely low in class size, compared to other comparable nations. However, it ranks extremely high in school size, except for a few nations like Korea that are attuned to Confucian values. The United States spends a lot of money per student. Unfortunately, compared to what is spent, the American student at any given level of schooling displays inferior "proficiencies", compared to many other comparable nations. Small classes cannot generally compensate for large schools.

(3) Among the nations, the quality of schooling is the increasingly important determinant of economic growth, development, and overall prosperity, not the quantity of schooling. Thus increasingly how much money is spent on education is not as important as how well it is spent, to increase the quality of learning per unit of spending.

(4) Among the states, it is important to compare the tradeoffs of school size and class size. Generally, states with larger schools have larger classes. However, nationwide, if you cut school size by the same percent that you increase class size, a state with the basic parameters of New Jersey would save over $500,000,000 a year. However, not only fiscal costs but social costs would be

reduced. Such a policy would reduce the number of assaults on students and teachers by over 10,000 over a decade, plus reduce hundreds of dropouts, plus increase average test scores for thousands of students.

(5) Proof of these arguments is reserved to a follow-up study. In this report, I simply want to clarify certain simple facts for New Jersey. Namely, the relationship of school size with outcomes varies depending on whether the outcome measures the short-term costs of housing students, versus the long-term costs of educating students.

To clarify these distinctions, perhaps the following tables will help.

Table 3A1 contrasts the costs of educating a student versus the costs of housing a student, and how to measure each function.Table 3A1: The Costs of Housing Students versus the Costs of Educating Students

	Where big schools appear superior	Where small schools appear superior
Unit Cost basis	Custodial Costs of **housing** students	Training Costs of **educating** students
Short-term versus long-term time perspective	Short-term impacts	Long-term impacts
Value: quantity of schooling, versus quality of education	**Quantity** of **schooling**, as measured by aggregate student enrollment at the beginning of a year	**Quality** of **education**, as measured by the per cent of high school students who can pass proficiency tests
Cost/ benefit ratio	Index of short-term **housing** cost/benefit ratio: The ratio of expenditures over the course of a year versus the number of students enrolled at the beginning of the same year. In short, spending per student in a given year.	Index of long-term **education** cost/benefit ratio: The ratio of expenditures in the past versus the percent of high school students who pass proficiency tests in the future, looking at the future

The next two tables explore the degree to which school size is correlated with the custodial costs of housing students – at least in New Jersey.

To start, Table 3A2 looks only at short-term costs for a narrow range of functions. That is, it matches up observed expenditures in 1996-1997 with enrollment totals in that same year. It also looks only at certain "comparative" costs per pupil, which ignores the total educational costs faced by many schools. Table 3A2 shows that the cost of housing students appears as a negative function of school size, if you look only at a limited range of fiscal categories, and you ignore delayed effects that extend over time.

TABLE 3A2:
The ratio of fiscal costs in a given year
Divided by total enrollment at the beginning of the year

HOUSING COSTS AS A FUNCTION OF SCHOOL SIZE FOR HIGH SCHOOLS AND ALL SCHOOLS
One Year Housing costs = **comparative** cost expenditures divided by the pupils on class rosters, measuring both with district totals for 1996-1997, then weighting results by individual schools in district

The ratio of expenditures to student enrollment is an index of "housing costs" during any one school year.

Here 1996 - 1997 data are used to measure both spending and enrollments.

Comparative Cost per Pupil [CCTOT_Y2] is taken from NJ DOE State Report Card.

The enrollment size in 1996-1997 is taken from U.S. DOE CCD file

Enrollment in 1996-1997		Secondary school only in SSD	Secondary school only in USD	All secondary schools in any type of district except Charter, Vocational, Alternative/ Special districts	all schools of all types	per cent difference of index from mean for all schools in sample
0-499	Mean	**$9,943.60**	**$8,154.89**	**$8,356.89**	**$8,214.26**	3.05
	N	5	28	46	**1,382**	
500-999	Mean	**$10,696.03**	**$7,877.16**	**$8,472.70**	**$7,583.68**	-4.87
	N	30	112	142	**726**	
1000-1499	Mean	**$9,458.41**	**$7,710.46**	**$8,137.73**	**$7,762.63**	-2.62
	N	22	68	90	**155**	
1500 +	Mean	**$8,158.00**	**$7,454.94**	**$7,630.71**	**$7,549.22**	-5.30
	N	12	36	48	**51**	
All	Mean	**$9,805.51**	**$7,800.28**	**$8,239.91**	**$7,971.51**	
	N	**69**	**244**	326	**2,314**	

Range in Housing Cost index from smallest to largest schools -8.34

Table 3A3 offers a more sophisticated view of custodial costs. First, it takes into account the total costs that may be required for different types of students. Second, it takes into account the possibility that cost functions may change over time. Doing so, it shows that one type of school seems to display a particularly favorable pattern of custodial costs over time. Namely, schools that house 500-999 students seems to have a particularly favorable ratio of costs to enrollment over time, especially compared to larger schools. The cost advantage of the schools with 500-999 students in 1996-1997 is lower than larger schools not only in the short run, but in the long run. Indeed the cost advantage of schools with 500-999 students versus larger schools seems to grow over time.

Overall, mean average differences in "total costs per students" differ significantly among different size schools in New Jersey.

TABLE 3A3

mean average differences in "total costs per students"

School year =		SY 1997	SY 1998	SY 1999	SY 2000
School size enrollment categories in 1996-1997					
0-499	Mean	$9,477	$9,880	$10,172	$10,259
	Median	$8,937	$9,287	$9,517	$9,677
	N	1382	1393	1406	1416
500-999	Mean	$8,800	$9,319	$9,578	$9,770
	Median	$8,720	$9,053	$9,307	$9,462
	N	726	726	726	726
1000-1499	Mean	$9,096	$9,605	$9,945	$10,108
	Median	$8,842	$9,569	$9,915	$10,258
	N	155	155	155	155
1500 & above	Mean	$8,895	$9,507	$9,787	$10,039
	Median	$8,937	$9,430	$9,672	$9,884
	N	51	51	51	51
All schools with data	Mean	$9,226	$9,679	$9,964	$10,093
	Median	$8,876	$9,238	$9,509	$9,657
	N	2314	2325	2338	2348

500-999 schools versus:		SY 1997	SY 1998	SY 1999	SY 2000
1000-1499 students	mean	$94.85	$187.51	$209.42	$269.69
1500 + students	mean	$296.03	$285.70	$366.81	$337.80
500-999 schools versus:					
1000-1499 students	median	$217.00	$377.00	$365.00	$422.00
1500 + students	median	$122.00	$516.00	$608.00	$796.00

ANOVA	F	12.15	7.52	7.63	5.67
	Sig	0.001	0.000	0.000	0.000
Reject Null hypothesis at .10, .05, and .001?		yes	yes	yes	yes
REPORT CARD FIELD		TOTCOSTY_2	TOTCOSTY_3	TOTCOSTY_4	TOTCOSTY_5

Table 3A3 shows that over time a school size of 500-999 students is associated with significant total cost savings per students versus schools housing 1,000-1499 students. The mean savings in total costs of housing students range from $94.95 in year one to $269.69 by year four. The median savings in total costs of housing students range fom $217.00 in year one to $422.00 in year four.

The same table also shows savings versus schools of 1,500 or more students. The mean savings in the total costs of housing students range from $296.03 in year one to $337.80 by year four. The median savings in the total costs of housing students range from $122.00 in year one to $796.00 by year four. Comparing four different categories of school size, the differences of schools housing 500-999 students versus other size categories are statistically significant at the .001 level of probability for each of the four years analyzed.

Many other tables show even more significant cost savings when attention is paid not just to the costs of housing students, but to the costs of educating students, and also take into account the total number of students enrolled in each school in each size category. Table 3A4 for example shows that the ratio of what it costs to what children learn grows significantly in larger schools, comparing four size categories.

Section 3B explores in greater detail the relative merits of schools in the size range of 500-999 students, while Section 3C explores in greater detail the relative costs of schools housing 1500 or more students.

Section 4 shows that the results are most emphatic when analysis takes into account the full range of academic and social costs produced by larger schools. These include social costs like dropouts and absenteeism, plus academic costs like failures on HSPT tests of math, reading, and writing. Looking at different indices of “compounded” inefficiency and “residual” inefficiency that adjust for the poverty, racial composition, class size, and other traits of each school, school size is strongly correlated with a wide constellation of inefficiency costs that must be borne by New Jersey tax payers.

Overall the evidence makes clear that the custodial costs of “housing” students are not as systematically related to school size as are the training costs of “educating” students. Educational Policy Makers and the public should insist that future research take into account various ways that large schools reduce their “custodial” costs of “housing” students by encouraging absenteeism on any given day, plus dropouts over time, to exclude the marginal student who is hardest to house or educate.

Future research should explore the more subtle ways that large schools cut costs. For example, in the short run many crowd more students into a given 1,000 square feet of floor area. This cuts nominal costs. However, by the end of a four year cycle they may have far fewer students per floor area, due to excessive attrition. This increases the costs that must be borne by other agencies who deal with truants and dropouts, including police, juvenile courts, welfare, and alternative schools.

Thus it is important to measure the effects of school size over time, and not just short-term cost/ benefit ratios. Over time the ratio of costs to benefits grows, as a function of school size, especially if one compares comparable schools that exclude small “other schools” facing inflated costs due to “special need” mandates.

Tables 3A4 and 3A5 move from the costs of measuring the costs of housing students to the costs of educating students. It shows that in New Jersey, school size is linked to training costs for educating high school students in particular. By looking only at comparable schools that provide HSPT tests, and excluding "other" schools, one sees more clearly the links from school size to the costs of educating students.

Schools of 1,000 are more have significantly higher cost ratios for educating students. In fact, the differences in cost/benefit ratios for educating students differ significantly among the four key categories of school size utilized in this report. This is true even for a cost index based on comparative costs versus total costs per students.

TABLE 3A4:

SCHOOL SIZE IN THE PAST IS LINKED TO HIGHER COSTS OF LEARNING AMONG NEW JERSEY HIGH SCHOOLS IN THE FUTURE
A proof using unweighted data for individual schools serving mostly high school students

Comparing costs required for a one percent average increase in passing rates for math (HSPT) proficiency tests - among schools with a majority of grade 9-12 students

RATIO OF PER PUPIL SPENDING VERSUS PER CENT PASSING MATH HSPT TEST, MEASURING BOTH INDICES DURING 1999-2000,
but computing their average values for school size several years prior during 1996-1997

School Size	Mean	N	Per cent difference of index from mean for all schools in sample
0-499	95.28	27	-3.42
500-999	96.35	138	-2.33
1000-1499	99.83	87	1.20
1500 and above	105.00	48	6.44
Total schools	98.65	300	

Per cent Increase in the cost of learning index, comparing the range from smallest to largest high schools = **9.86**

TABLE 3A5

Analysis of Variance for differences in Cost of Education Indexes
Comparing small and large High Schools
Using Data Weighted by Enrollments in each school
The Cost of Education Index =
Ratio of spending CCPP to % passing HSPT exam [READ], using data from 1999-2000

School Size for 1999-2000	Mean Cost of Education Index for 1999-2000	N (weighted by students in each school in 1999-2000)	Std. Deviation
0 to 999 students in 2000	99.06	128,336	23.65
1000 or more students in 2000	102.69	218,418	35.19
Total	101.35	346,754	31.46

ANOVA Table
Cost of Education Index as a function of school size in 1999-2000

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups (combined)	1064139	1	1064139	**1078.34**	**0.0000**
Within Groups	342184981	346752	987		
Total	343249120	346753			

School Size for 1996-1997	Mean Cost of Education Index for 1999-2000	N of cases (weighted by students in each school in during 1996-1997)	Standard Deviation
0-499	95.57	10,956	16.76
500-999	97.41	104,342	25.10
1000-1499	99.12	106,063	30.83
1500 +	106.38	92,846	40.23
Total	100.57	314,207	32.14

Cost of Education Index as a function of school size in 1996-1997

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups (combined)	4680089	3	1560030	**1532.39**	**0.0000**
Within Groups	319870189	314203	1018		
Total	324550277	314206			

Summary of Section 3A

Such tables document several emerging themes for New Jersey

Larger schools may have, or appear to have, lower costs for **housing** students, especially ignoring lost-term cots. However, larger schools have significantly higher costs for **educating** students. These cost are especially clear if one looks at longer-term relationships between school size and cost/benefit ratios.

In terms of short-term costs of housing students, the largest schools may appear to have cost advantages over the smallest schools.

However, the relationship varies depending on the level of student and the type of district. For all schools, the difference in the short-term costs of housing students may be less than ten percent, as of 1996-1997. However, the relationship of school size with costs is obscured.

Looking at long-term costs, various tables show a favorable picture for smaller schools, even though many smaller schools are “other” schools.

For custodial housing costs, the schools that house 500-999 students seem to have a very favorable competitive advantage versus larger schools, especially over time.

For the costs of educating students, the pattern is even more more consistent. now The costs of educating students are lower in all schools of less than 1,000. In contrast, the costs of educating students are higher in schools housing above 1,000 students. This can be seen clearly looking at high school data.

Among schools serving a majority of high school students, the long-term costs of educating students is about ten percent less in the smallest schools versus the largest schools, looking at schools where most students are in regular grades 9-12. Using un-weighted data, the biggest schools cost more than the smallest schools.

Table 3A5 shows the results of taking enrollments into account. It uses cost data that is weighted by the enrollment in each school. Now school size is significantly correlated with the education cost index, an index that measures the relative costs of educating students to pass basic HSPT exams. Larger schools have higher costs for educating students to achieve the same results as smaller schools. It costs more to raise the passing rate by one per cent.

The relationship of school size in 1996-1997 to the index of educational costs for 1999-2000 is statistically significant. That is, there are statistically significant differences among the mean average for this cost index comparing all four key categories of school size. However, this index is looking at value added, quality, or education outcomes, for math in particular.

In the next section I look more closely at differences in other cost indexes for schools housing 500-999 students in particular.

SECTION 3B

Linkages From School Size To The Costs Of "Housing" Students - Schools Housing 500-999 Students Have Significantly Lower Total Costs Per Pupil

Advocates of big schools sometimes complain that very small schools, with fewer than 500 students, often report very high costs per student, at least on average. This leads to a frequent conclusion that small schools in general cost a lot, and perhaps are inefficient. However, such a conclusion is too simplistic for many reasons.

As this Section emphasizes, other small schools – namely those that house between 500 and 999 students - may spend very little.

More importantly, it is important to recognize the special burdens and unique academic challenges faced by many small schools housing fewer than 500 students. These unique burdens inflate the costs faced by the very small schools, when one computes average spending per school.

First, the very small schools provide training for a much larger relative share of "ungraded" students. Such students are often certified special needs students. Such students receive and require extra monies mandated by federal and state law. They require a high ratio of staff to students. Parents and staff often ask for special equipment and more easily accessible buildings and classrooms. Such obligations inflate costs, which are hard to amortize for small schools serving specialized student bodies and facing rapidly evolving legal mandates.

Perhaps such problems should be documented. Namely, small schools housing fewer than 500 students have a significantly higher mean average percent of ungraded students, at least in New Jersey. Relative to other schools, they housed 11.55% more ungraded students during 1996-1997. The absolute difference was statistically significant at the .037 level of probability, with an F value of 4.372, for 2,119 schools surveyed during 1996-1997. It is true that many larger schools house a large absolute number of ungraded students. However, very small schools on average house a larger relative concentration of such students. This share of special students increases the costs per student.

The fact that small schools that house fewer than 500 students face extra burdens can be documented in another way. They are disproportionately required to operate as "other schools," whether their students are classified as ungraded or not. Small schools with fewer than 500 pupils are much less likely to serve as traditional elementary and secondary schools, compared to schools of 500 or more pupils. In New Jersey small schools disproportionately serve students in special education, alternate schools, charter schools, and vocational schools, which comprise and define the "other" schools.

Among regular schools, 42.34 percent house 500 or more students. Among "other" schools, only 3.66 percent house 500 or more students. Small schools, with less than 500 students, are many more times likely to operate as "other schools" serving very specialized student bodies. The differences in roles are statistically significant.

Why is this important? The "other" schools must deal with vastly inflated costs, which usually demand far higher spending levels. The data is clear, looking at 1996-97 and 1999-2000 as base years.

On average, regular schools spent respectively $8,885.06 and $9,793.84 during 1996-97 and 1999-2000. On average, the "other" schools spent respectively $15,876.00 and

$14,570.51 during the 1997 and 2000 school years. Thus the "other" schools spent respectively 78.68 per cent more during 1996-1997, and 48.77 percent more than the regular schools during 1999-2000. (This latter change partially reflected the growth of charter schools, which spend less on average than even regular schools).

On average, "special education" schools spent 175 to 185 per cent more than the state average per student, during the base years. On average, "vocational" schools spent from 57% to 33% more than the state average during those years. On average, "alternate" schools spent from 5 to 7% more. Among the "other" schools, only charter schools spent less than the state average, since they were only funded at 90%, and were often brand new facilities.

However, even though they do not necessarily spend a lot, charter schools often face special problems, like other small schools. In many cities, charter schools overwhelmingly serve minority student bodies. Statewide, charter school districts enroll a significantly larger share of minority (African-American and Hispanic) students than do other districts. The charter schools face major start-up problems not faced by older schools. Charter schools have to hire, pay rent for facilities, scramble to buy new equipment, and face extra paper work challenges. Thus the charter school life cycle explains extra problems faced by some small schools. These normally would produce extra costs, except for funding lids placed on charter schools.

Overall, "other" schools in New Jersey tend to be very small, and small specialized schools face major fiscal burdens. They serve students formally classed as special education students placed in ungraded classrooms. They serve special education students who are mainstreamed. They serve other students who are placed in "alternate" settings, or receive special "vocational" training, or are otherwise different.

Overall, small schools face much different academic and social burdens than many larger schools. These burdens help explain why they appear to spend so much, at least in the short run.

However, the fact that some small schools spend a lot on average does not necessarily mean that such schools cost the state or even local taxpayers a lot of money, relative to the total educational budget for the state and district. The reason is that many of the schools with the most unique burdens are often extremely small. If one weights for the number of students involved in each school, then smaller schools in general will be seen not to cost very much, per student, relative to the state average for all schools.

Their impact is quite different from the very large schools. Namely, schools with 1,500 or more students spend more than smaller schools, if one takes into account the number of students enrolled in each school. Small schools that spend a lot have few students. Big schools that spend a lot have large enrollments. Weighting school expenditures by enrollment, schools with 1,500 students or more in 1996-1997 spent $265.49 more per student on average than other schools collectively during 1999-2000. Thus large schools during 1996-1997 were spending significantly more by 1999-2000, at the .05 significance level.

The inflated expenditures of the biggest schools are even more noticeable if one takes into account their dropout patterns. If one adjusts expenditures by dropout patterns, then schools with 1,500 or more students spend dramatically more than other schools.

However, when one compares enrollments for individual schools, and simply compares schools without taking into account their differential dropouts, an interesting pattern emerges for schools with 500-999 students. This size category displays a favorable pattern for total costs per pupil, based on state financial records. Namely, the average schools in this enrollment category spend less than all other schools collectively, which include both the very small schools (with less than 500 students) and larger schools (with more than 1000 students). Schools with 500-999 students spend less than smaller and larger schools, and thus less than the state average.

One reason is simply that small schools with 500-1000 students face fewer of the unique challenges of the other even smaller schools serving fewer than 500 students. To house their students and meet their challenges, schools with 500-999 students do not have to spend a lot more than other schools. In fact, they spend a lot less than other schools.

The following table compares average spending for schools housing from 500 to 999 students, versus all other schools, based on fiscal data for two different base years.

		Total costs per student during 1996-1997	Total costs per student during 1999-2000
School with 500-999 students during 1996-1997	Mean	$8799.82	$9769.74
	N	726	726
School with larger (or smaller) student bodies during 1996-1997	Mean	$9421.50	$10237.54
	N	1588	1622
How much less was spent in schools with 500-999 students than in other schools?		-$621.68	-$467.79
Totals for schools of all sizes	Mean	$9226.45	$10092.89
	N	2314	2348

The table shows that during 1996-1997, schools with 500-999 students spend $621.68 less per student.

During 1999-2000, several years later, the schools with 500-999 students during 1996-1997 still spent $467.79 less per student.

[Of course, it should be noted that the two sets of school are not identical for 1996-1997 versus 1999-200. The latter base year includes fiscal data for a new set of charter schools. Over time other changes occurred as well (since over time some schools close while others open)].

For both years the differences in spending were statistically significant at the .05 level of probability. The following ANOVA (analysis of variance) tables compare variation in mean spending (on total costs per pupil) to document that schools housing 500-999 students differ significantly from other size schools.

ANOVA Table for 1996-1997 spending relative to school size in 1996-1997

		Sum of Squares	Df	Mean Square	F	Sig.
1996-1997 total costs per student	Between Groups (combined)	192557665.2	1	1.93E+08	30.805	0.00
	Within Groups	14452174838	2312	6250941		
	Total	14644732504	2313			

ANOVA Table for 1999-2000 spending relative to school size in 1996-1997

		Sum of Squares	Df	Mean Square	F	Sig.
1999-2000 total costs per pupil	Between Groups (combined)	109747629	1	1.1E+08	16.229	0.00
	Within Groups	15864700528	2346	6762447		
	Total	15974448157	2347			

The following tables use multivariate regression analysis to confirm the pattern of relatively low costs for New Jersey schools with 500 – 999 students. The first table models 1996-1997 total costs per student as a function not only of school size, but also the percent poor and percent minority students in each school. The same pattern emerges as from a bivariate regression analysis. Schools with 500-999 students during 1996-1997 spent significantly less than other schools.

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	8601.916	44.647		192.666	0.00
Schools with 500-999 students for 96-97 (big500)	-225.644	59.054	-0.081	-3.821	0.00
% free lunch eligible for 97-97 (pctpoor)	-6.263	2.16	-0.126	-2.899	0.00
percent minority – (poverty and minority from US DOE CCD for 1997-97) pctmin)	14.961	1.788	0.364	8.366	0.00

The next multivariate regression table confirms this pattern of relatively low costs for New Jersey schools with 500 – 999 students. It models 1999-2000 total costs per student as a function both of school size, plus the percent poor and percent minority students in each school. The same pattern emerges as from a bivariate analysis. Schools with 500-999 students during 1996-1997 spent significantly than other schools, this time looking several years in the future.

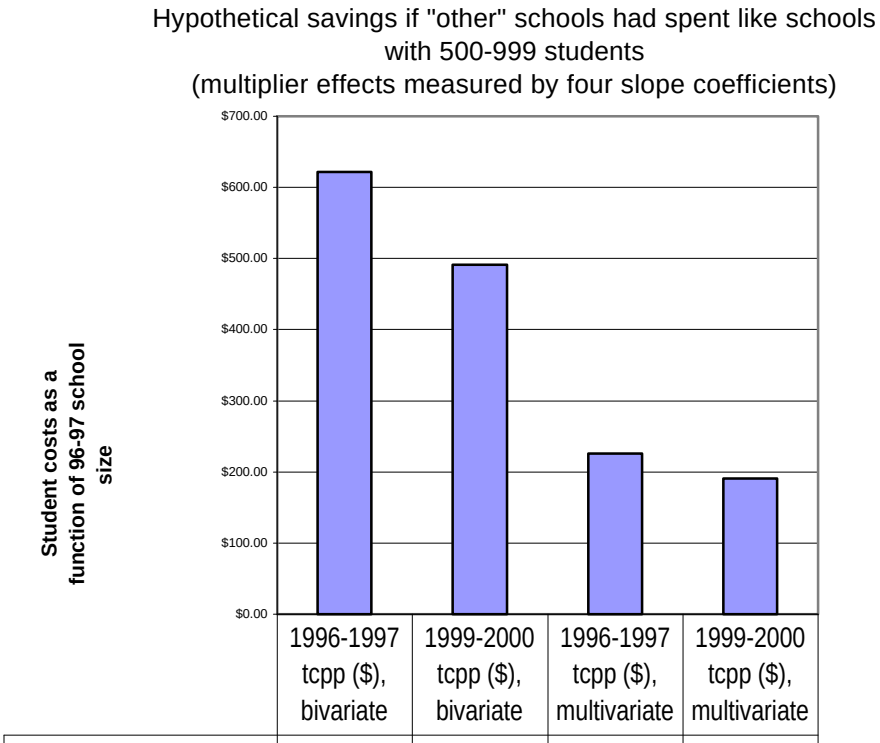
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	9154.038	42.891		213.425	0.00
Schools with 500-999 students for 1996-97 (big500)	-191.16	56.732	-0.065	-3.37	0.00
% free lunch eligible for 1996-1997 (pctpoor)	5.649	2.075	0.107	2.722	0.01
percent minority - from US DOE CCD for 1996-97 - (pctmin)	16.841	1.718	0.388	9.802	0.00

Summary of 3B

How do NJ schools with 500 – 999 students compare to other schools? The following table summarizes four slope coefficients that estimate multiplier effects. The slopes summarize how much would have been saved per student in the other schools if they had spent like schools in the 500-999 enrollment category. The bivariate coefficients ignore the fact that school size may affect future patterns of race and poverty, and ignore all other control variables as well. The partial slopes reflect the results of controlling for poverty and race in each school during 1996-1997. Both bivariate and multivariate coefficients estimate responses in total costs per pupil to school size during 1996-1997, for lagged and unlagged spending.

The cost savings from the enrollment size target ranges from about $200 to $600 per student. For a given state with 1,000,000 public school students, such numbers could add up to major savings for taxpayers.

Of course, better schools might also encourage certain parents to reduce their out of pocket spending in favor of public schools. Many students in private schools might transfer to public schools, if the problems that beset many larger public schools could be bypassed or minimized. Thus a shift to smaller public schools, versus the compulsion to expand schools housing 1000, 1500, or even more students, might have a range of effects.


Hypothetical savings if "other" schools had spent like schools with 500-999 students
(multiplier effects measured by four slope coefficients)
Student costs as a function of 96-97 school size
$700.00
$600.00
$500.00
$400.00
$300.00
$200.00
$100.00
$0.00
1996-1997 tcpp ($), bivariate
1999-2000 tcpp ($), bivariate
1996-1997 tcpp ($), multivariate
1999-2000 tcpp ($), multivariate
Hypothetical savings if "other" schools had spent like schools with 500-999 students (multiplier effects measured by 4 slope coefficients)
$621.68
$491.36
$225.64
$191.16

Conclusions from 3B

This analysis reviews how much schools spend to fund total costs per pupil, and whether there is any specific school size category that seems to minimize costs.

All the indicators reported here achieve statistically significant linkages with a specific school size category. The results enable one to reject a hypothesis of random results at the .05 level of probability. Namely, schools that enroll between 500 and 999 students spend significantly less than all other schools for the two different base years.

Such schools seem to lie in a lucky latitude between the Scylla and Charybdis faced by other schools. Schools that are even smaller often serve specialized student bodies with special needs. Federal and state regulations inflate costs. Such costs are not easily amortized over their specialized student bodies. On the other hand, many educators justify such costs, since special students often require more personal settings for successful outcomes relative to their individualized goals.

At the other extreme are certain very large schools. They face inflated costs because of disproportionate problems of crime, violence, dropouts, and absenteeism. Schools that lack a strong climate of connectedness and trust generate such problems. Such problems especially burden very large schools, including schools in the 1000 above category, and perhaps especially schools in the 1500 and above size categories.

However, between Scylla and Charybdis are schools that house 500 to 999 students. The evidence indicates that they meet their obligations at a very reasonable cost, at least compared to other New Jersey schools. Such evidence should be taken into account when deciding enrollment targets for schools to follow that seek to minimize fiscal costs, social costs, and academic costs.

Further research should explore in greater detail whether separate analyses of elementary and secondary schools will document similar patterns of evidence. Future research should be funded to confirm that high schools that house between 500 and 999 students have an extremely favorable cost structure, especially when one takes into account their ability to retain entering students through to graduation.

This report does not measure value added, or which size school produces the best academic and social benefits compared to how much it spends.

This analysis thus ignores how well the school performs. It just looks at how much the district spends relative to each school and each student to fund its housing function.

The task here is to report how much it costs to house the average pupil. The specific task is to identify a specific size category of schools that seems to produce an extremely favorable cost function. This report focuses on indicators that measure total spending per pupil, or what it costs to house a student who is still enrolled in the school. Future research is needed to take into account what it costs per student, when one takes into account how many students drop out over time for each school.

I also leave to other reports the task of evaluating how much it costs to educate the average pupil, and how best to model education costs as a function of school size. To understand cost functions, it is important not only to look at what it costs to house students, including those who are prone to absenteeism and dropouts. It is also important to look at how much they learn while in school, as shown by test results. However, a discussion of various ways to measure those cost indicators is left to other reports.

Here the focus is on very simple cost indicators. They rely on district spending that is allocated to each school in the state, to estimate per student expenditures, and more specifically total costs per pupil, as a function of school size. No attempt was made, for example, to exclude transportation costs, much less specific functions provided by "other" schools.

Prior to further research, one can make an important policy conclusion. School size is linked to many different cost indicators, and the public deserves to be informed of these patterns.

SECTION 3C

A CLOSER LOOK AT FOUR SCHOOL COST INDICES FOR VERY BIG SCHOOLS OF 1,500 OR MORE STUDENTS

Linking School Size to Four Indices that Measure The Costs of Housing Students, And more importantly the costs of Educating Students

To measure the true costs of educating students, the public must distinguish the costs of housing students versus the costs of educating students. They must distinguish the short-term (nominal) costs of housing students versus the long-term and indirect costs of educating students. To measure costs, the public should take into account the costs exported to other agencies by schools that encourage dropouts.

The public should realize that some schools export long-term costs by pushing out marginal students, students who fail to thrive, students who fail to learn. By getting rid of these marginal students, an individual school can lower its nominal rate of spending, - even though societal costs are escalated.

The public should recognize the extra costs produced by schools that generate disproportionate dropouts, both official and unofficial. Such schools produce extra costs for outside agencies like local police stations, probations, courts, welfare offices, AFDC/TANF, child protective services, juvenile lockup facilities, alternative schools, "juvenile resource centers", mental health agencies. Such costs should be taken into account.

In terms of cost accounting, it is nearly irrelevant how schools push out students. Some emphasize active short-term efforts, some emphasize long-term neglect. In either case, student dropouts become the responsibility of other agencies that must house or help the rejects, or ignore their failure. The costs of neglect should be recognized by adjusting short-term rates of nominal spending to take into account long-term rates. External costs should be added to internal costs. Costs should reflect dropouts.

The costs of how well a school houses students should take into account what happens to those students and student problems they export to other agencies. Schools should be charged for their failures to retain students, and especially their *de facto* dropouts, even if they fail to report them as de *jure* dropouts. The costs to society should take into account what happens to each student cohort between grades 9 and 12, and all those who fail to reach grade 12.

This report shows that school size is closely linked to real costs, especially when the public looks at the extra costs produced by the largest schools of 1,500 or more students.

Such costs become particularly clear given two accounting improvements:

- The public or an appropriate state agency adjusts the total costs of <u>housing</u> students to include the costs faced by outside agencies like local juvenile facilities and alternative schools who must house dropouts from dysfunctional schools.
- The public or an appropriate state agency further adjusts costs by taking into account the goal of <u>educating</u> students, which means helping them learn how to pass basic high school proficiency tests - as opposed to simply housing them for a few years.

Overall, this report shows the results of using four different types of indices to measure costs.

Indexes 1 and 2 provide two different ways to measure the costs of housing students, or how much it costs per student to keep their name listed on the class roster. The first index is the traditional naïve index. The latter is much better.

1. Index 1 simply measures unadjusted expenditures per student, and ignores how many students drop out over time.
2. Index 2 adjusts expenditures per student to take into account dropouts, both *de jure* and *de facto*. This index takes into account extra costs imposed on other agencies to deal with official and unofficial dropouts. Such dropouts disproportionately move into the care of juvenile courts, Jamesburg, the welfare system, public health facilities, and other institutions that must deal with educational rejects from dysfunctional schools. Index 2 takes into account the pattern of dropouts, by using a standard index of dropout rates that compares grade 9 to grade 12 students. Those who disappear between grades 9 and 12 are counted as de facto dropouts. In turn, index 2 multiplies Index 1 by the reciprocal of the dropout index. This helps project what the district and other agencies would be paying, if they all paid the same amount to house each student per year. Index 2 charges schools for their failures, though not the significantly higher costs that dropouts at Jamesburg and county lockups and welfare agencies actually require. At present, Index 2 is reported only for high schools. In the future, similar indices should be constructed for other levels of schooling, in addition to high schools.

Indexes 3 and 4 parallel indexes 1 and 2. They provide two alternative ways to estimate the costs of educating students, or how much it costs per student to increase the passing rate by one percent. Drawing on Indexes 1 and 2 respectively, indexes 3 and 4 provide estimates using unadjusted and adjusted expenditure data.

3. Index 3 measures the ratio of Unadjusted Expenditures per student to the percent of students who pass basic proficiency tests. In effect, it measures the costs per student of increasing the passing rate by one per cent.
4. Index 4 measures the ratio of Adjusted expenditures per student to proficiency passing rates, after taking into account the costs for other agencies for dealing with the dropouts and transfers caused by school pathologies. It provides the best estimate for measuring the true total costs per student, though it is the hardest to obtain complete information to compute the index.

To understand the full costs of housing students, the public should take into account the number of students who leave after each year of school, and never reach their senior year.

In doing so, it is important to look at patterns of change over time. A big school in one year may not be a big school 2, 4, or 10 years later, and vice versa. To measure school size, one should look at school size in the past, and then evaluate its effects over time. It is misleading to measure school size in the present, before size has a chance to impact the evolution of a school climate.

Big schools lose students year after year, so they have far fewer students who reach their senior year than began their careers in grade 9. Big schools retain far fewer students to the end of a four-year high school education than they enrolled at the beginning. The adjusted costs of housing students should take into account these failures.

To measure the costs of educating students, the public should also find out if the remaining students actually learn anything while in school. Big school students often become experts in how to survive highly escalated rates of school crime and violence. However, the issue is how much they learn about reading, writing, and arithmetic.

Previous costs studies have been simplistic and naïve. Previous studies have only looked at unadjusted costs. They ignore how many students have been kicked out, pushed away, or simply run away from the school into the care of other agencies. Worse, previous studies generally ignore whether the students who remain housed within a school over the four-year high school cycle actually learn anything or not.

This is the first study to systematically compare these four indices of school costs.

This study will test a prediction that a clearer pattern emerges when one looks at the more sophisticated indexes to account for costs. The public will see more clearly that the very largest schools do not cost less, but more. Big schools can cut nominal costs by crowding a lot of ninth grade students into a limited amount of floor area. However, by the twelfth grade large numbers will drop out. Of those who remain, large numbers fail to pass basic proficiency tests. They have failed to thrive, and have failed to learn.

In assessing true school costs, the public and the state should move beyond nominal costs, and look at the real costs of education. If so, the adverse effects of big box schools become clear. Big box schools may not cost a lot to house students short term, because they house more students per 1,000 square feet, at least during the first months that students are exposed to the school. In the long run the big school also appear to cost less, because they export the costs of the students they fail, who become the ward of other agencies. Big schools no longer have to pay to house these students, and especially marginal students. Thus their nominal costs in the future are low, versus smaller schools that better retain all students.

The nominal costs of big schools are low for another reason. They do not teach their students very much, nor even control their behavior. Big schools do not pay the costs of police, probations, judges, and others who must intervene to deal with school problems, but are financed from non-school budgets.

The public should measure costs not only from students who are lost from class rosters. Costs extend to those students who are not lost from the school but simply fail to thrive there. Schools also lose students who lose their innate potential to succeed, when schools fail to teach the students who remain. Society and the student both lose when students fail to master basic academic proficiencies, so they can not pass even simple tests.

By looking at true costs, the inefficiency of big schools becomes clear. They fail to retain students in their classrooms over time. Even among those they retain, they fail to educate those students to read, write, or do simple arithmetic. When one looks at sins of omission as well as sins of commission, the true costs of big schools emerge.

Five different tables in this section (Tables 31C 1- 5) illustrate the linkages of school size with the four different types of indices. In these tables each index has a specific meaning.

Index 1 measures the unadjusted costs of housing students in the short-run, ignoring dropouts.

This index is computed for all schools. However, it should at least be weighted by the number of students in each school, for a very important reason. Very small schools frequently seem to cost the state a great deal, even though the serve very few students. Often these schools that seem to cost the most are very small "special needs" schools serving "high risk" students. Even if cost indexes are not adjusted for dropouts over time, cost indexes should take into account the number of students served by each school. Thus Index 1 and all the other indexes are weighted by student enrollments.

Index 2 measures adjusted costs, based on retentions.

Index 2 is adjusted for how many students each school retains over time, and especially between grades 9 and 12. It takes into account the costs that should be borne by schools that lose lots of students between grades 9 and 12. Since index 2 is based on retention and loss patterns among grades 9 and 12, it only includes schools serving such students. Thus the number of students covered is less than for Index 1.

Index 3 and 4 adjust for actual learning.

Index 3 and 4 move on to take into account how much students learn.

Since Indexes 3 and 4 use HSPT tests to measure learning, they are by necessity limited almost exclusively to high school students. Thus they are based on data for fewer students and schools than is Index 1. In particular, Index 4 is limited, because it only includes schools with grade 9 and 12 students, and schools that report HSPT tests, which some special schools do not.

However, even regular schools may also serve other grades. Some schools with HSPT tests and students in grades 9 and 12 also have other students. They may not be comparable to schools limited almost exclusively to students in grades 9 through 12. Thus Indices 3 and 4 can be applied more precisely.

Tables 3C3 - 5 are refined even beyond Tables 3C1-2.

Tables 3C3-5 move on to look at more comparable schools, namely high schools with 90% of more high school students. These tables exclude schools serving large numbers of ungraded special needs students. These tables also exclude schools with lots of pre-high school students, who are often funded at different levels.

In summary, Tables 3C3-5 look at high schools weighted in terms of how many students they actually serve, that have 90% of more high school students in that initial cohort, and that report test scores to allow one to evaluate how well students learn over time.

A Preview

All the Tables show the same pattern. The more refined the estimates of costs, the more significant is the impact of school size. Very large schools produce very large costs. However, in terms of educating students, school size has a basic monotonic relationship with how much it costs to teach students to master basic high school proficiencies. School size is significantly correlated over time with how much students learn in their academic careers, or rather, how little.

Taking into account how many students stay in school over time, and how much they learn, big schools cost more over time. Certain small schools serving certain types of high-risk students may cost a lot. However, looking at all the students in each school, big schools generally cost more, and usually significantly more.

Table 3C1 shows that schools of 1,500 and above cost more both to house and educate students, taking into account the number of students enrolled in each school. The costs are very similar if you ignore dropouts, but if you pay attention to dropouts, the cost differences are staggering. The big schools cost 17 percent more to house students, and 36 per cent more to educate students, on average – after adjusting for dropouts and how much students actually learn who remain in school.

TABLE 3C1

Mean Averages for four cost indexes during 1999-2000, classified as a function of prior school size during 1996-1997

The Degree to which Large High Schools face increased costs both for housing and educating students

Measuring the link from school size to future costs during the time period it normally take for a first year student cohort to graduate from high school [the period from grade 9 to grade 12]

		0-1499 students in 1996-1997	1500 and above student in 1996-1997	All schools in sample during 1996-1997	**% Cost increase in largest schools over 1,500**
Index 1	**Index 1**				
Costs of Housing student	(Unadjusted for dropouts)	Dollars spent (on average) to "house" pupil			
Total Comparative Cost per Pupil CCTOT_Y5 99-00 or ccps9900	"Comparative" spending per pupil	$8,437.43	$8,449.76	$8,438.46	0.15
Index 2	**Index 2**				
Costs of Housing student	(Adjusted for dropouts)	Dollars spent (on average) to "house" pupil			
ADJ_CC00	"Comparative spending" per pupil	$11,045.63	$12,935.55	$11,604.78	17.11
Index 3	**Index 3**				
Costs of Educating student	(Unadjusted for dropouts)	Dollars per pupil (on average) required to increase HSPT by 1 %			
rr_math = ccps9900/ hspt030 (math)	Math	$98.14	$106.38	$100.57	8.41
rr_read = ccps9900/ hspt029 (read)	Reading	$101.00	$112.49	$104.40	11.38
rr_write = ccps9900/ hspt031 (writing)	Writing	$98.38	$104.38	$100.15	6.10
Average for math, reading, writing	All three	$99.17	$107.75	$101.71	8.63
Index 4	**Index 4**				
Costs of Educating student	(Adjusted for dropouts)	Dollars per pupil (on average) required to increase HSPT by 1 %			
RR_MATH2 (uses adj_cc00)	Math	124.99	169.58	138.20	35.68
RR_READ2	Reading	129.17	181.37	144.63	40.41
RR_WRIT2	Writing	124.85	165.26	136.82	32.37
Average for math, reading, writing	All three	126.34	172.07	139.88	36.15

Table 3C2 shows that the differences in costs for Big versus Small schools are not random. In fact, the differences are highly significant statistically. Moreover, in terms of the number of students involved, the differences are certainly worthy of consideration and appropriate reaction in the highest circles of government.

TABLE 3C2

The Statistical Significance of Greater Costs in large versus small schools, using 1,500 as a tipping point

Mean Averages for four cost indexes during 1999-2000, classified as a function of weighted school size during 1996-1997

The Degree to which Large Schools of 1,500 or more students lead to increased costs - both for housing and educating students - especially for high schools

	Index 1	**F ratio**	**Sig. Level**	**Df = N - 1**	Each indexes measures a different N of students during 1996-1997 (for schools with data for 1996-1997 through 1999-2000)
Costs of Housing student	(unadjusted for dropouts)				Index 1 is not limited to high schools. It includes all schools with "comparative costs per pupil" in 1999-2000 and enrollment data in 1996-1997. This excludes new schools after 1997, and schools that closed. Here it is computed for 1,166,232 students.
	"comparative" spending per pupil	8.89	0.00288	1,166,231	
	Index 2	**F**	**Sig.**	**df**	Index 2 adjusts for potential students lost between grades 9 and 12 (ie, de facto dropouts). This reduces sample size since normally only high schools offer grades 9 though 12. Here Index 2 is computed for 308,012 students.
Costs of Housing student	(adjusted for dropouts)				
	"comparative spending" per pupil	13183.45	0.00000	308,011	
	Index 3	**F**	**Sig.**	**df**	Index 3 does not adjust for de facto dropouts. However, it does adjust for HSPT passing rates. This reduces the potential sample size since mostly high schools report HSPT tests. Note that Index 3 may include more students than either index 2 or 4, which require adjustment data for grade 9 and 12 students.
Costs of Educating student	(unadjusted for dropouts)				
	Math	4368.63	0.00000	314,206	
	Reading	6492.04	0.00000	314,206	
	Writing	2438.37	0.00000	314,206	
	Index 4	**F**	**Sig.**	**df**	Index 4 adjusts for both HSPT test scores and de facto dropouts. This twice reduces the sample size since normally only regular high schools report data on all these topics.
Costs of Educating student	(adjusted for dropouts)				
	Math	17363.35	0.00000	307,696	
	Reading	19497.57	0.00000	307,696	
	Writing	16155.60	0.00000	307,696	

The next tables further explore differences in costs, using a more refined sample of high schools.

Table 3C3 evaluates costs using index 3, but only for high schools with 90% or more regular high school students enrolled in grades 9-12.

As before:

- Index 3 compares what it costs per student to increase by one percent the students able to pass various HSPT proficiency tests.
- Index 3 does not adjust expenditures for students who have dropped out or been pushed out of the school.
- The expenditures and test scores are based on data reported for the 1999-2000 school year. They measure the costs of educating each student during 1999-2000.
- This index is compared to the original size of each school during 1996-1997, while each school is weighted by student enrollment during 1996-1997 to estimate per student patterns.
- Overall, the results show lagged effects from school size over time, at least for a specific index of costs relative to HSPT proficiencies.

Table 3C3: The Mean average costs of educating high school students by school size, for four categories of school size

		The marginal unadjusted costs of educating students to learn Math Proficiencies	The marginal unadjusted costs of educating students to learn Reading Proficiencies	The marginal unadjusted costs of educating students to learn Writing Proficiencies
School size in 1996-1997	N (weight) = enrollment in each school in 1996-1997	rr_math = ccps9900/ hspt030.	rr_read = ccps9900/ hspt029.	rr_write = ccps9900/ hspt031
0-499	10,956	95.5685	96.3959	96.2349
500-999	104,342	97.4087	100.4964	98.2459
1000-4999	106,063	99.1170	101.9698	98.7276
1500 & above	92,846	106.3848	112.4922	104.3811
Total	314,207	100.5736	104.3954	100.1513

Table 3C3 shows that the costs of educating students is higher in the larger size schools, using Index 3. This contrast emerges for every subject matter, for every possible comparison of size categories. School size is not simply important comparing schools larger or smaller than 1,500 students.

Table 3C4 evaluates the degree to which the results for Index 3 are statistically significant. This table shows that for every subject area analyzed, the mean cost of educating students is significantly higher. The costs are not just higher on average, but significantly higher, in the larger schools.

TABLE 3C4: ANOVA Table for Index 3 as a function of school size in the past

SPSS variables	ANOVA Comparisons	Sum of Squares	Df = N – 1 Students	Mean Square	F	Sig.
The costs of educating high school students to master high school level math proficiencies						
rr_math = ccps9900/ hspt030	Between Groups	4680089.	3	1560030	1532	**.000**
	Within Groups	319870188	314203	1018		
	Total	324550277	314206			
The costs of educating high school students to master high school level reading proficiencies						
rr_read = ccps9900/ hspt029	Between Groups	8998120	3	2999373	2256	**.000**
	Within Groups	417788146	314203	1330		
	Total	426786265	314206			
The costs of educating high school students to master high school level writing proficiencies						
rr_write = ccps9900/ hspt031	Between Groups	2422971	3	807657	836	**.000**
	Within Groups	303765997	314203	967		
	Total	306188968	314206			

The next figure “graphs” the results for the math index. The Figure shows that over time bigger schools generate a higher mean average cost of educating students to learn math. Though Figure E summarizes the pattern for math, similar results apply to reading and writing. The costs to educate students escalate for larger schools. Big schools are no bargain.

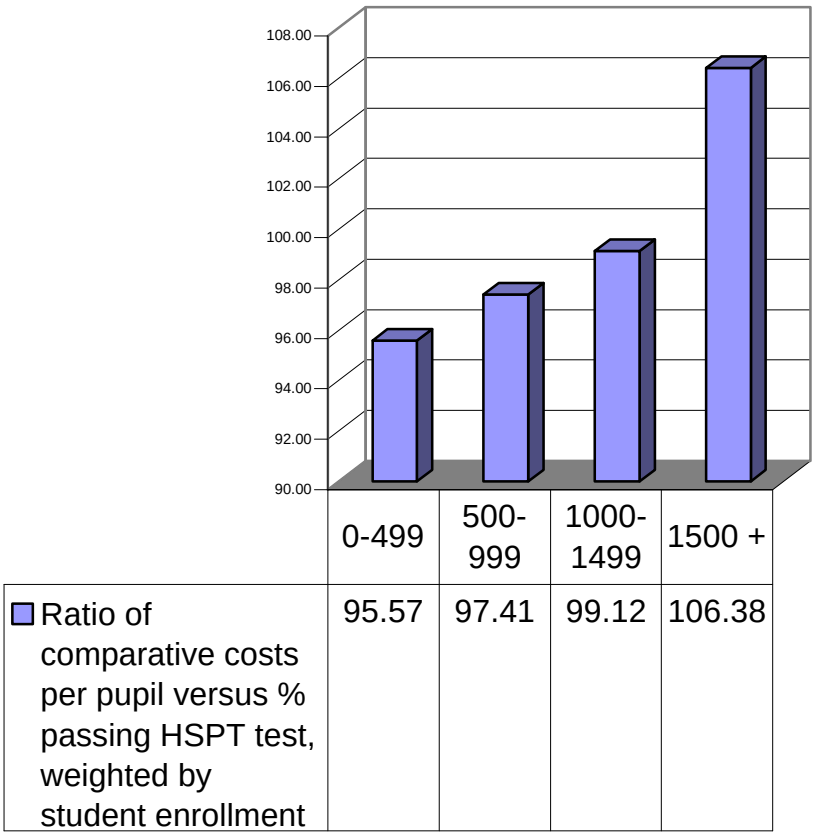
Figure 3C5, like prior tables, compares what happens during the period from 1996-1997 through 1999-2000. This covers a period it takes a successful grade 9 class to reach grade 12 status. Future research should take a look at other cohorts to demonstrate similar results.

Future research should report in much greater detail the inefficiencies produced by big schools. They should explore even more sophisticated indexes of “compounded inefficiency” that take into account social problems facing students and teachers like dropouts and absenteeism, as well as failing test scores compounded with high expenditures.

This is the task of the next section.

Figure 3C5:
A Picture of Index 3 Education Costs by School Size
Schools that were larger during 1996-1997
Face higher costs for educating students
During 1999-2000

Ratio of comparative costs per pupil versus the % passing Math HSPT test during 1999-2000, classified by student enrollment during 1996-1997



Index 3 for math, by school size
[2000 cost ratios versus 1997
weighted school size

x

SECTION 4: - "Compounded" Inefficiency and "Residual" Inefficiency

The tables in section 4 provide statistical evidence for New Jersey that school size is significantly linked to the costs of educating students. It looks first at indices of "compounded inefficiency", and then at indices of "residual inefficiency."

The results show that the relationships of school size with inefficiency outcomes are strong and consistent. The evidence easily rejects the null hypothesis – that the relationship of school size with the cost of educating students is random.

School size is significantly correlated with an index of "compounded inefficiency" that includes six different components academic, social, and fiscal costs. It measures not only three sets of academic failures, but also dropouts and absenteeism as social failures by schools, as well as the costs of housing students in each school.

The first three sets of tables look respectively at differences in average levels of "compounded Inefficiency" These tables document a wide range of significant relationships.

The fourth set of tables show the results of using an alternative index of "residual inefficiency". It shows that as school size increases, net (residual) value added decreases. Reading is a key subject dear to the governor's heart. Where schools are bigger, schools show a decreasing ability to add value added to the task of helping children learn to read, relative to what one would expect knowing their race, poverty, level of spending within the school, class size.

Many prior studies suggest that school size will be linked to inefficiency costs and declining value added. The hypothetical evidence is borne out in reality. Rather than discuss the results in detail, here is a quick outline:

4.1: Looking at Bivariate Relationships, the Differences in Inefficiency between Schools of Different Size are Sufficient to Reject Null Hypotheses regarding Size-Inefficiency Relationships

For example, the differences in inefficiency between regular high schools of different sizes are statistically significant at the .05 level of probability.

Table 4.1: Larger schools have much higher inefficiency problems overall than do smaller schools, comparing mean Compounded Inefficiency scores for High Schools

- Schools with 1,000 or more students have dramatically worse problems of inefficiency, as shown by student inability to master basic academic proficiencies, plus symptoms of anomie and alienation like dropouts and absenteeism, even though the total costs per student may be high
- Regular high schools suffer from a much more dramatic increment in inefficiency scores as a function of school size than do Vocational-Technical schools.

4.2: A simple graph provides a clear picture of major differences in overall inefficiency between different size categories of schools, using 1000 students as a tipping point

Figure 4.2: In NJ Overall Inefficiency is far greater in larger schools with 1,000 or more students, as measured by the combination of high total costs per pupil, high dropout rates, high absenteeism, and low student proficiencies in reading, math, and writing

4.3: Multiple Regression Coefficients that document significant linkages over time between school size and overall inefficiency, after controlling for class size, federal aid, ungraded students, poverty, mobility, minority, student computer ratios, and faculty training

Table 4.3 Regression analysis shows that school size has statistically significant relationship with higher levels of educational inefficiency among New Jersey high schools, "all things else equal", so that the null hypothesis can be rejected at the .05 and .01 levels of probability

Table 4.1a: Larger schools have much higher inefficiency problems overall than do smaller schools, comparing mean Compounded Inefficiency scores for High Schools

TYPE OF SCHOOL	SCHOOL SIZE	Mean for Index of "compounded inefficiency" index	Inefficiency Index for different size schools as a % of average for this type of school of any size	Relative per cent greater inefficiency in large high schools (above 1000) versus small high schools	Number of schools with data for HSPT test scores, plus dropouts, attendance, and total costs per students
Both regular and vocational high schools	0 – 999 students	-0.092	-13.806		189
Both regular and vocational high schools	1,000 or more students	1.685	252.548		141
Both regular and vocational high schools	Any Size enrollment	0.667	x	**266.35**	330
High school (regular)	0 - 999 students	-0.311	-53.221		168
High school (regular)	1,000 or more students	1.665	285.188		139
High school (regular)	Any Size enrollment	0.584		**338.41**	307
Vocational-Technical with HS students	0 - 999 students	1.657	93.203		21
Vocational-Technical with HS students	1,000 or more students	3.046	171.370		2
Vocational-Technical with HS students	Any Size enrollment	1.778	x	**78.17**	23

Table 4.1b
Methodology for Table 4.1a

Going beyond Section 1, Section 4 expands the universe/ sample of cases to include vocational-technical schools that were not listed as high schools in both the 1996-1997 and 1999-2000 CCD surveys.
The universe of cases for Section 4 includes all schools with relevant high school "cost" data for 1999-2000 and enrollment data for 1996-1997:
It includes schools serving high school level students even though not classified as a "mainstream" or "regular" high school for both 1996-97 and 1999-2000. Thus it includes certain vocational-technical schools serving high school students, and providing HSPT tests for those students.
Table 4.1 and Figure 4.2 includes 330 high schools that include 307 regular schools and 23 vocational technical schools. Of these 189 enrolled less than 1,000 students in 1996-1997, and 141 enrolled 1,000 or more students.
The task was to measure linkages from school size in the past (1996-1997) with compounded inefficiency in the future (1999-2000).
The compounded inefficiency index takes into account total costs per student as well as dropouts, poor attendance, and poor test scores on reading, math, and writing.
The compounded inefficiency index is based on the sum of six z scores.
(1-3) % of students who fail to pass HSPT examinations on math, reading, writing,
(4) poor retention rates (high dropout rates),
(5) poor attendance rates,
(6) paralleled by high total costs per student.

For Table 4.3 some of these schools lack predictors used in multiple regression analysis. Thus the sample size in Table 4.3 is smaller than the sample for Table 4.1.
For the schools analyzed:

- Schools with 1,000 or more students have dramatically worse records of inefficiency, as shown by student inability to master basic academic proficiencies, plus symptoms of anomie and alienation like dropouts and absenteeism, even though the total costs per student may be high.
- Regular high schools suffer from a much more dramatic increment in inefficiency scores as a function of school size than do Vocational-Technical schools. However, Voc-Tech schools are much fewer in number than regular schools, and they may not report dropouts, absenteeism, and proficiency test failures in the same manner as comprehensive high schools.

Figure 4.2a: In NJ Overall Inefficiency is far greater in large schools with 1,000 or more students

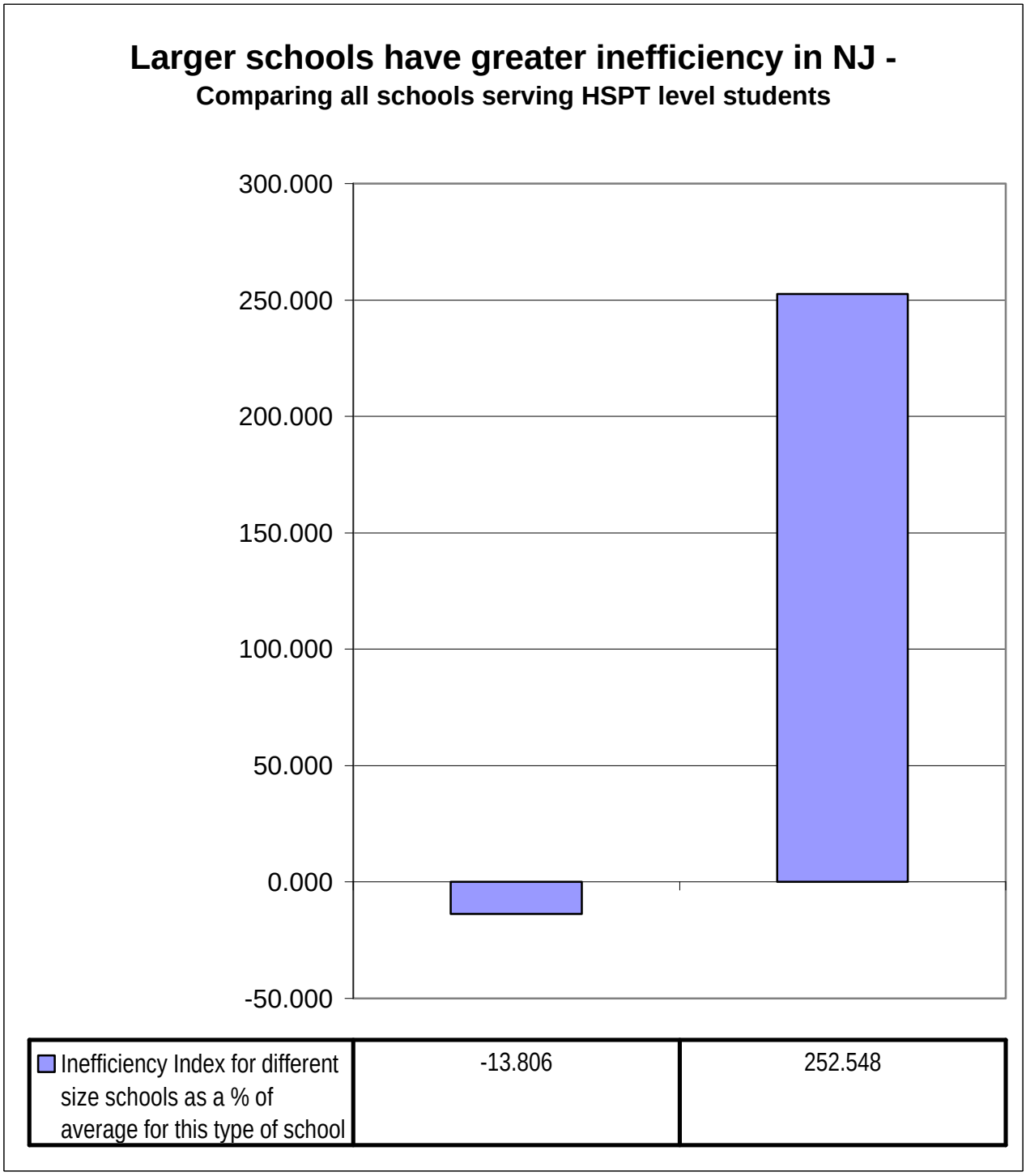


Figure 4.2 continued::
In figure 4.2 the schools include both “regular” high schools and vocational-technical high schools. The total of 330 schools includes 307 “regular” high schools and 23 “vocational-technical” schools.
The Inefficiency Index = sum of z scores for 6 "cost" indicators with the following coefficients:
+ total costs per pupil
+ dropout rates
- attendance rates
- HSPT reading test
- HSPT math test
- HSPT writing test
Note that each z score is computed separately for all schools in state with data. Thus N varies for the individual components.
However, the composite index is limited to schools serving high school level students taking HSPT tests.

TABLE 4.3 - Regression analysis shows that School size has a statistically significant relationship with higher levels of educational inefficiency among New Jersey High Schools, "all things else equal"

Results of Multiple regression Analysis	Unstandardized Coefficients B = slope	Unstandardized Coefficients Std. Error of estimate [about slope]	Standardized Coefficients Beta	Standardized Coefficients t-ratio	Sig. Coefficient Measure of "statistical significance"	Is coefficient significant at .05 level of probability? At the .01 level?
Constant: [Hypothetical value of DV if all IV were set to zero]	-5.2451	1.1231		-4.6702	0.000	
Independent Variables (predictors)						
1996-97 % faculty with BA/BS degrees only	-0.0055	0.0127	-0.0173	-0.4356	0.663	no, no
1997-98 Student Computer Ratios	-0.0124	0.0144	-0.0302	-0.8571	0.392	no, no
% minority in school for 1996-97	0.0282	0.0103	0.1894	2.7399	0.007	yes, yes
Mobility rate for 1996-97	0.1505	0.0235	0.3086	6.3926	0.000	yes, yes
% free lunch eligible (with NA=0) for 1996-97	0.0429	0.0216	0.1613	1.9905	0.047	yes, no
% ungraded students [with missing = 0] for 1996-97	0.0309	0.0423	0.0287	0.7309	0.465	no, no
% federal revenues for 1999-00	0.7273	0.1908	0.2355	3.8117	0.000	yes, yes
Class size - average for 1996-97	0.0185	0.0497	0.0133	0.3729	0.710	no, no
School size = total student enrollment for 1996-1997 school year	0.0010	0.0003	0.1121	**2.9295**	**0.004**	**yes, yes**

The Independent Variables (predictors) are listed in the order they appear on the SPSS Regression "Enter" command. To ensure conservative values, School Size was listed last on the enter command.

Nevertheless School Size is positively and significantly correlated with higher Compounded Inefficiency Scores, comparing all New Jersey High Schools in this sample.

SECTION 4.4 -

The need for even more compelling evidence

Future research should develop a new type of statistical evidence to prove that school size is significantly linked to efficiency outcomes, especially for at risk students.

It is predicted that a new type of coefficient will clarify even better how and where and when to reject a null hypothesis about the relationship of school size and efficiency outcomes.

The new research should measure partial relationships between school size and the efficiency of the educational production function, and obtain “residuals” for reading test scores and other outcomes. These “residuals” would identify schools that perform better or worse than expectations, based on their total comparative costs per pupil, class size, teachers with BA or BS degrees, mobility rates, as well as the socio-economic status of students.

First I outline how to measure this new index of efficiency, and the need to focus on poverty and minority districts.

Figure 4.4 summarizes the expected results of measuring this new type of efficiency coefficient as a function of school size and poverty students.

Future research should be commissioned to implement this methodology for all levels of schooling, and for all types of outcomes, including efficiency scores on math and writing as well as reading skills, plus efficiency in dealing with problems of absenteeism and dropouts.

A New Way to Measure Efficiency Coefficients

Inefficiency can be measured by residual test scores that are lower than the level to be expected from the amount of money spent on students, class size, teacher training, and social and economic determinants of achievement. Inefficiency means low mean averages for residuals. Efficiency means high mean averages for residuals. Efficiency means schools do better than expected from the resources available to them, including how much money is spent on each student..

New research should be undertaken to document that among poverty schools in New Jersey, school size is especially conducive to inefficiency. Larger schools have more inefficiency. Smaller schools have more efficiency. That is, they have residual test scores far higher than can be explained by resources like money, class size, and the socio-economic status of their students.

Among "poverty" schools, school size is significantly correlated with "residual" test scores that vary from the level to be predicted from the resources present in each school. In poverty schools, size hurts efficiency.

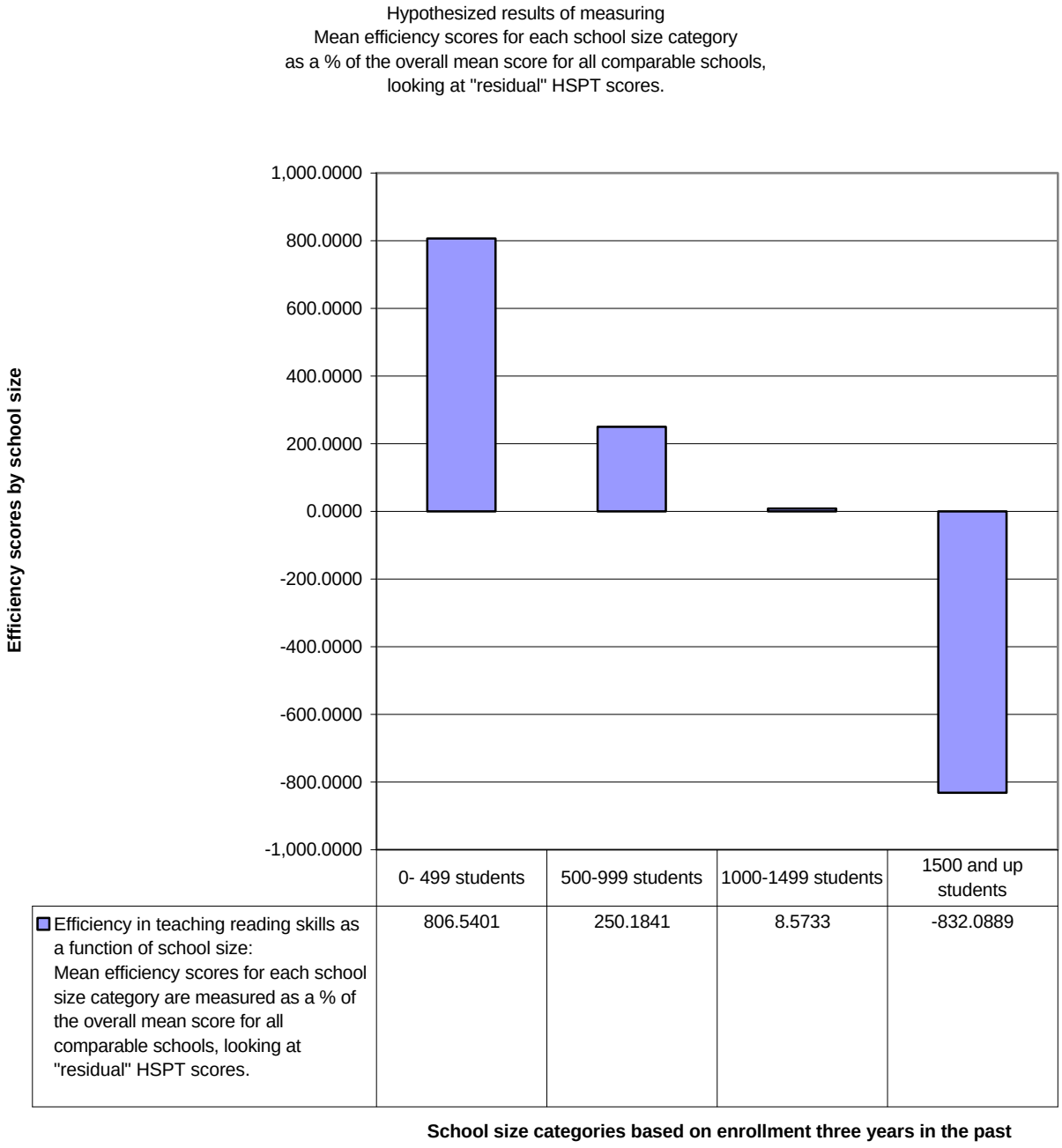
The “residuals” should be computed using lagged variables. For example, predictors could use data for school years three years in the past. Consequently, the results would show the effects of school size on efficiency outcomes three years in the future.

Research should then focus on districts and schools with significant poverty concentrations and/or major poverty concentrations, to show what happens to efficiency outcomes where schools are over-sized, using this new index of efficiency.

Figure 4.4 shows the results. It produces major implications:

- The Commission of Business Efficiency in the Public Schools should fund follow-up research to confirm that school size can indeed explain differences in efficiency outcomes that range up to 800% improvements for students in smaller schools, versus an 800% deterioration in efficiency outcomes for larger schools, relative to where the school should be.
- The Commission on Business Efficiency in the Public Schools should fund a follow-up study to document that school size significantly and specifically thwarts the promise of a “thorough and efficient” education for poverty and minority students, contrary to explicit guarantees in the New Jersey constitution.
- The Legislature, the Executive, and the Courts must confront a growing problem that does not revolve around money per se, but defective organizational structures for the administration and governance of primary and secondary education, and perhaps beyond.

Table 4.4:


Hypothesized results of measuring
Mean efficiency scores for each school size category
as a % of the overall mean score for all comparable schools,
looking at "residual" HSPT scores.
Efficiency scores by school size
1,000.0000
800.0000
600.0000
400.0000
200.0000
0.0000
-200.0000
-400.0000
-600.0000
-800.0000
-1,000.0000
0- 499 students
500-999 students
1000-1499 students
1500 and up students
Efficiency in teaching reading skills as a function of school size:
Mean efficiency scores for each school size category are measured as a % of the overall mean score for all comparable schools, looking at "residual" HSPT scores.
806.5401
250.1841
8.5733
-832.0889
School size categories based on enrollment three years in the past

SECTION 5 - Where to Find the Evidence

This Section has three parts.

- Section 5A explains the importance of high schools which define the universe of interest for this initial report.
- Section 5Bsummarizes major data sources.
- Section 5C outlines criteria for selection of 100% Comprehensive Samples.
- Section 5D summarizes the number of cases used to link school size with test scores, violence, and compounded inefficiency.

SECTION 5A
SELECTING THE SAMPLE,
WHAT THE SAMPLE SHOWS,
AND WHAT FUTURE SAMPLES SHOULD EXPLORE

What is the relationship of school size with achievement test scores, school violence, and inefficiency in educating students? Is there evidence for New Jersey schools that would enable one to reject a null hypothesis for each relationship?

For this initial needs assessment, a decision was made to focus on high schools. One reason is that problems of anomie and alienation have serious consequences in high schools. Student violence and school crime literally become matters of life and death. Moreover, high school students are more apt to skip school or be absent on their own volition. They are also likely to get into major problems with the law while playing hooky, more so than grammar school students staying home from an inner ear infection. Thus both misbehavior in school and absenteeism from school can have serious immediate consequences for high school students.

The combination of poor grades and dropout risks are also serious problems in high schools. In high school, far more so than earlier grades, students performing poorly or missing class are much more likely to leave school. Poor grades, absenteeism, and dropouts push students off the ladder to middle class prospects into a culture of poverty from which escape is difficult. In the culture of poverty they face a morass of problems for themselves and for society as a whole. Areas with more dropouts are especially prone to suffer from problems like births to unmarried females, homicides that lead to incarceration in adult prisons for males, deficient care for children, both unborn and born, and elevated risks of infant death. Tax payers face extra costs for public health care and corrections where dropout rates escalate.

Communities face special problems where problems of academic failure, low test scores, student violence, school crime, absenteeism, dropouts, are combined with inflated school budgets. Parents of high school students tend to have a longer earning record and larger savings than parents of elementary children. They are more apt to own or consider home ownership, and are especially sensitive to local tax burdens to fund schools. If schools are both expensive and ineffective, they are apt to vote “with their feet”. Parents of high school students are especially prone to flee an inefficient school system, especially where options are close at hand.

This loss of middle class families from the school and the larger community further compounds the problem of academic progress for those left behind, and impedes the realization of vital educational goals.

Many variables shape educational problems. However, this research was designed to test a theory that school size is a major exogenous variable shaping endogenous problems that plague public school systems, including high schools.

If this theory is valid, then large schools and school size should be seen as major explanations for problems of overall inefficiency at the high school level. To the extent relationships of school size with such problems are highly significant, then public officials in New Jersey should take heed in future debates about educational best practices, optimal architectural design, and rational planning for education governance and administration.

Based on the evidence for New Jersey high schools, school size is a major force shaping educational outcomes that concern state legislators like Assemblyman Louis Greenwald and members of the Commission on Business Efficiency of the public Schools.

Section 1 of this project estimates relationships of school size with test scores on high school proficiency tests. The tests measure student success in mastering math, science, and writing skills respectively.

The first set of tables shows that large schools have significantly lower test scores. Small schools have significantly higher test scores.

A graph visualizes some of the differences among schools of different size.

The last set of tables shows that the negative relationship of school size with test scores persists for MRA coefficients. The coefficients are all statistically significant, controlling for poverty, race, class size, expenditures, and various school resources.

The null hypothesis can be emphatically rejected for New Jersey high schools.

Section 2 of this project estimates relationships of school size with student violence. The evidence is clear, looking at a sample of high school districts in New Jersey.

The size of district schools is positively correlated with the concentration of student violence and school crime in a given district. This result is analogous to prior research on school segregation. The author has previously shown that school size is significantly correlated with the concentration of poverty children over time, comparing one school versus another. This new research shows that school size is also significantly correlated with the concentration of violence and crime in one district versus others. The size of the average school in each district is significantly correlated with violence and overall criminal incidents for districts serving a majority high-school students.

The first set of tables measures mean differences in violence, that is, bivariate relationships. The ANOVA coefficients document statistically significant relationships.

A subsequent figure visualizes differences in violence as a function of school size.

The last set of tables show that results remain significant analyzing regression coefficients that measure “ceteris paribus” relationships.

The null hypothesis can be emphatically rejected for this sample of New Jersey high school districts.

Sections 3 and 4 of this report correlate school size with different indices of school costs.

Section 3 compares the costs of housing students versus the costs of educating students. Schools that house 500-999 students seem to have a favorable spending pattern, when one looks at <u>total</u> custodial costs per student, and especially over time.

Section 4 focuses on composite indicators that measure not only fiscal costs but also social and academic costs. They include standardized scores for fiscal costs as measured by total costs per student. They also include social costs as measured by high rates of dropouts and absenteeism. In addition, they measure academic costs including poor performance on math, science, and writing tests. The relationships with school size were measured using lagged coefficients.

The first table shows that big schools have much higher inefficiency scores, both for regular high schools and vocational high schools. Looking at regular high schools, the differences in inefficiency score are significant.

A subsequent figure visualizes those differences.

The third set of tables shows that the same results hold for multivariate regression analysis, which measures relationships “ceteris paribus”. The null hypothesis can be emphatically rejected for this sample.

The last table illustrates a prototype measure of “residual” inefficiency. It measures the gaps between where students should be performing on reading tests, and where they actually perform. The expected level is a function of the poverty and race of students, plus resources like spending.

In small schools, students perform above expectations. In large schools, students perform worse than they should.

Overall, the present research protocol produces highly significant results. However, follow-up efforts are desirable to answer remaining questions.

Do similar findings apply to all schools at all levels, statewide? Are the effects of school size equally adverse in middle schools, in grammar schools, in alternative schools?

What is the correlation of school size with the loss of middle class students or families from districts? To what extent is school size correlated with changes in demographics that independently harm educational progress?

Do similar findings apply to schools in urban, suburban, and rural areas respectively? Are big schools especially harmful in center city districts?

Which tipping points significantly escalate problems facing public schools? To what extent do schools of some 500-999 students surpass the achievement of schools in the 1000-1499 and 1500 and above enrollment categories?

To what extent does school size escalate the adverse effects of poverty on test scores, in accord with the Howley-Bickel theory of educational inequality? Does New Jersey follow the same pattern as other states in the South and West? Are the effects of school size especially adverse in poor communities?

How far do the harmful effects of school size extend over time? Does school size have maximum effects in the very short term, like one year, perhaps an interim term like 2-3 years, or even a longer term? Does school size set into motion certain internal dynamics that corrupts the school culture for long periods of time, or at least the time period required for a given student cohort to move through the various high school grades?

What would be the aggregate costs savings of comparable trade offs in school size versus options like class size? How many hundreds of million dollars would be saved over time by statewide options such as a one to one tradeoff in school and class size, like a reduction in school size of 1-10% versus an increase in school size of 1-10%? Would the fiscal savings be matched by savings in social costs from less school crime, less violence, less absenteeism, fewer dropouts? Would the fiscal savings be matched by

savings in academic costs like fewer student failures in mastering basic skills, and less need for remedial classes?

To what extent would a reduction in student enrollment per floor area surpass a reduction in student enrollment per teacher as a means to improve school operations with minimal fiscal costs and maximum social and academic benefits?

To what extent are the alleged cost savings of big schools achieved by encouraging dropouts and absenteeism by marginal students, and minimal learning by students who stay in school?

What are key psychological traits that help explain the adverse effects of large schools? To what extent is school size associated with the loss of connectedness, trust, and social capital in the school community, with subsequent major implications for adolescent health risks in a public health perspective?

Other countries like New Zealand and England have tried major reforms to overcome the adverse effects of impersonal, oversized, factory-model schools. One option is the proliferation of focus or academy schools to maximize school choice within a public school setting. Which types of focus or academic schools or patterns of choice are most correlated with significantly elevated levels of student proficiencies, controlling for student poverty, race, class size, spending?

Section 5B: Sources of Data Used to Produce Tables

Data Source	Publication/ Publisher	Section 1	Section 2	Section 3	URL Address
1	U.S. Department of Education, National Center for Educational Statistics, Common Core of Data survey, 1996-1997	(a) for all of Section 1	(b) for all of Section 2. [c] used to define predominantly HS districts	Table 3.3 (a) enrollment (e,f) race, ungraded	http://nces.ed.gov/ccd/
2	U.S. Department of Education, National Center for Educational Statistics, Common Core of Data survey, 1999-2000	x	x	Section 3	http://nces.ed.gov/ccd/
3	New Jersey Department of Education, Violence, Vandalism and Substance Abuse in New Jersey Schools - 1999-2000	x	All of Section 2.	Composite Inefficiency Index	http://www.state.nj.us/njded/schools/vandv/9900/append_d.htm;http://www.state.nj.us/njded/schools/vandv/9900/
4	New Jersey Department of Education, New Jersey Vital Education Statistics	x	Table 2.3	Table 3.3 (district data)	www.stte.nj.us/njded/data/vitaled/ S.Y. district information for 2000-2001 and 01-02.The district data for 2001-2002 used in Table 2.3 were taken from Vital Statistics sources.
5	Evalsoft, for the New Jersey Department of Education, School Report Card System	x	x	x	http://nj.evalsoft.com/njDOE/data_maps4632.asp;http://nj.evalsoft.com/njDOE/files/Tables_to_Sections_to_ReportCards.xls web sites provide direct access to data, plus "road maps" to explain both school and district data
5	School data: grade 11 statewide assessment results from SC_tst11	All of Section 1	x	Composite Inefficiency Index	read_yx = per cent students who pass HSPT 99-00 (read_y6)
5	School data: grade 11 statewide assessment results from SC_tst11	All of Section 1	x	Composite Inefficiency Index	math_yx = per cent students who pass HSPT 99-00 (math_y6)
5	School data: grade 11 statewide assessment results from SC_tst11	All of Section 1	x	Composite Inefficiency Index	write_yx = per cent students who pass HSPT 99-00 (write_y6)
5	School data: grade 11 statewide assessment results from SC_tst11	x	x	Composite Inefficiency Index	attendance rate att_yx where x = 1 to 7 (99-00)
5	School data: grade 11 statewide assessment results from SC_tst11	x	x	Composite Inefficiency Index	dropout rate drop_yx where x = 1 to 7 (99-00)
5					
5	School data: grade 11 statewide assessment results from SC_tst11	Table 1.3	x	x	mobility rate mob_yx where x = 1 to 7 (96-97 for lagged)
5	School data: grade 11 statewide assessment results from SC_tst11	x	x	Table 3.3	class size clsz_yx where x = 1 to 7 (96-97 for lagged)
5	School data: grade 11 statewide assessment results from SC_tst11	Table 1.3	x	x	student-faculty ratio stfa_yx where x = 1 to 7 (96-97 for lagged)
5	School data: grade 11 statewide assessment results from SC_tst11	Table 1.3	x	Table 3.3	% faculty with BA/BS ba_yx where x = 1 to 7 (96-97 for lagged)

5	School data: grade 11 statewide assessment results from SC_tst11	x	x	Table 3.3	student computer ratio stcomp_yx where x = 1 to 7 (96-97 for lagged)
5	District fiscal data for 1999-2000	Table 1.3	x	x	expenditures: total or comparative costs per student in 2000 = tcps or ccps
5	District fiscal data for 1999-2000	Table 1.3	x	x	federal aid, state aid, local revenues in 2000

1 The U.S. Department of Education provided the Common Core of Data CD for the 1996-1997 school year. I used this source to measure (a) school enrollment to match up with "lagged indices" of test scores, violence, dropouts, absenteeism, and costs for 1999-2000. (b) Mean average school size for each district during 1996-1997, total district enrollment divided by the total number of schools, for 1996-1997 regular schools (c) the proportion of students in grades 9-12 to total enrollment (totstu) - the index used to select out the 50+ districts with majority high school enrollment (d) alternate indexes of student/ teacher ratios [tch_rto] and expenditures per student [expps] (e) racial composition (% by race, % minority) (f) % ungraded students

2 The U.S. Department of Education provided Common Core of Data for districts during 1999-2000. District data used include percent Asian students, percent white students, and percent students eligible for free lunch or reduced price lunch.

3 Violence includes simple assault, aggravated assault, fight, gang fight, robbery extortion, sex offense, threat. It excludes weapons, vandalism, and substance abuse.

Section 5C:

Description of Samples used in Various Tables -Criteria for selection

.

- In this research the samples used for each table focus on high school students, to refute claims that only elementary or middle school students are affected by size variables. It should be noted that certain types of behavioral risk problems associated with school size have particularly serious consequences for high school students. In New Jersey, school size is significantly correlated with a wide range of serious consequences including poor test scores, violence, and a pattern of inefficiency which produces problems like dropouts, absenteeism poor test scores on math, reading, and writing – in spite of high levels of expenditures per student.
- Unless otherwise stipulated, every sample includes all schools or districts in the state with available data for all the variables of interest in the table. Every table includes school size as an independent variable, and one or more dependent variables. In each section the first "table" compares average scores for the dependent variable, after classifying schools or districts by the size of the individual school, or the average school in a district. The second "figure" provides differences in mean averages using a graphic format. In each section the third table reports regression analysis results. These results "control for" and "take into account" various background variables that also affect school outcomes. These equations subtract out the effects of various variables that measure race, ethnicity, income, poverty, fiscal resources, class size, computer accessibility, teacher training, etc. The control variables are listed in the individual table, and also in a summary of variables used for all tables.
- Each sample uses data easily available for inspection and review by the public. The URL addresses are provided where all data can be obtained. Schools or districts lacking data are excluded from the analysis. The goal was to focus on variables easily available in "report cards" either from the federal or state governments. The intention is to encourage members of the public to undertake their own analyses.
- Each sample is a comprehensive or exhaustive sample, subject to the stated criteria for each table. The sample includes 100 per cent of the defined universe of cases. The selection process is completely objective. The members of each sample are not dependent on a "draw", or arbitrary "matching" or subjective "selection". Thus they are far superior to quota samples or convenience samples used in certain other research. There is no selection bias possible, since every "sample" includes cases that define the "universe" of interest.
- Each table (or sample) is restricted to schools or districts with complete information for all variables. For comparisons of mean averages, the sample generally includes all schools or districts, since there is very little missing information, except for certain special needs, vocational, or charter schools. For the regression analyses (Table 1.3, 2.3, 3.3) the sample may be smaller, since missing data for one or more of the "control variables" may eliminate the school or district from the analysis.
- In short, the sample size depends only on the availability of publicly available, "transparent" data, for the schools or districts indicated. It is therefore a 100% sample of relevant cases with complete information on all data items of interest from reliable state and federal sources.
- Sections 1 and 3 both analyze over 300 high schools. The section 1 high schools are listed as high schools in both the 1996-1997 and 1999-2000 CCD surveys. The section 2 high schools include vocational-technical schools.
- The sample of school districts analyzed in Section 2 includes 51 districts with a majority of high school students. It features *regional* high school districts with a majority of students in grades 9-12 in 1996-1997. Grouped by county, they range from Greater Egg Harbor Regional and Mainland Regional in Atlantic County to High Point Regional, Kittatinny Regional, Lenape Valley Regional, and Wallkill Valley Regional in Sussex County. The other schools are found in Bergen, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hunterdon, Monmouth, Morris, Ocean, Passaic, and Somerset Counties.

- Section 2 only analyzes High School districts. However, if one looks at all 2,348 schools statewide with relevant data, a significant positive correlation will be found that links school size with the % of violent incidents affecting each school, the implications of which will be spelled out in future research.

Section 5D:
The Number of Cases in Each Table

Section 1 Tables for Schools' Test scores

Table 1.1, also figure 1.2

332 schools reported HSPT passing rates for math, reading, and writing in 1999-2000, and also had data available on enrollments for 1996-1997.

The number of schools in each category of school size (enrollment) in 1996-1997 were:	Number of schools
0-500	58
500-1000	139
1000-1500	87
1,500 and above	48
Total	309

The sample was further refined to focus on regular high schools.

Using ANOVA, the differences in test scores among different size categories was highly significant for all three proficiencies tested. Thus the null hypothesis is rejected for each subject area tested. School size in the past is closely linked to poor test scores in the future.

Table 1.3

The regression equation includes 300 schools, since several schools lacked complete data on one or more control variables. The 300 schools analyzed have complete data for all variables, including the "control" variables.

These control variables take into account and subtract out confounding influences due to spending, federal aid, class size, student/faculty ratios, teacher education (% teachers with only undergraduate degrees), student mobility rates, and % un-graded students.

All things else equal, the relationship of school size with each set of test scores is statistically significant at the .05 level of probability.

Section 2 Tables for Districts' Concentration of Violence

Table 2.1

The ANOVA sample includes 51 school districts with a majority of students in grades 9-12. These are defined as the High school districts of interest for this analysis. It measures the concentration of violence in each district, relative to the average (mean) size of schools in that district three years previously. The analysis of variance compares districts above and below 1000 students enrolled in the mean average school.

51 "high school" districts classified by the average school size in each district during 1996-1997	Number of districts
0-999 students	34
1000 and above students	17
Total	51

Also figure 2.2 Table 2.1b, and Figure 2.2, standardize the violence indices. Each district is analyzed to report the degree that the differences or variances for that district fall above or below the state average for all comparable districts, expressed as a percent of the state average. Some districts are above, and some are below, that baseline average.

The concentration of violence in each district, and the degree to which the violence index is above or below the state average, varies significantly between districts with different sized schools. The size of schools in the past is closely linked to the concentration of violence within a district in the future.

The differences are statistically significant, and the null hypothesis must be rejected.

Table 2.3 (a,b,c,d) The regression equation includes 48 districts, since 3 districts were lacking complete data. The remaining districts report complete data for all variables.

The control variables include overall district size (versus school size), per cent Asian students, per cent Non-Hispanic "white" students, per cent eligible for free lunch or reduced price lunch (an index of household poverty), comparative cost per pupil, % students eligible for special education, local taxes as a proportion of revenue sources (versus federal or state aid), the student/ teacher ratio (certified staff only).

All things else equal, the relationship of school size with district violence is statistically significant at the .05 level of probability. School size in the past is closely linked to the concentration of violence within a district in the future.

It should be noted that if one looks at all 2,348 schools statewide with relevant data for 1996-97 and 1999-2000, a significant positive correlation will be found that links school size with the % of violent incidents affecting each school in the future. The implications of this pattern and the need for public access to such data should be spelled out in future research.

Section 4 Tables for Schools' Compounded Inefficiency

Table 4.1

In New Jersey over 300 schools enroll a majority of high school students. They include not only "regular" high schools but also "vocational-technical" high schools.

However, not all these schools report full data for dropouts, attendance, test scores, and total costs per student that define the overall composite index of "compounded inefficiency".

For these tables, 330 "regular" and vocational-technical high schools reported full data for all variables, which could be used for ANOVA tables.

School Size category	Number of Schools
Both regular and vocational high schools	
0-999	189
1000 and above	141
total	330
Regular high schools only	
0-999	168
1000 and above	139
total	307
Vocational-technical schools	
0-999	21
1000 and above	2
total	23

Figure 4.2

Figure 3.2 standardizes the compounded inefficiency indexes, to report differences or variances for each school, to see how far the school is above or below the state average for all comparable schools.

These differences or variances are measured as a % of the statewide average. However, they can be above or below that average, since the index measures relative differences or variances.
The differences in "compounded inefficiency" between different size schools are statistically significant at the .05 probability level (based on ANOVA results available from the author), and the null hypothesis must be rejected.

Both regular and vocational high schools classified by enrollments in 1996-1997

School Size category	Number of Schools
0-999 students	189
1000 and above students	141
Total schools in sample	330

Table 4.3

The regression equation includes fewer schools, since a few schools lack complete data. The schools analyzed have complete data for all variables.

The control variables include per cent faculty with only BA/BAS degrees, student/computer ratios, per cent minority in school, mobility rates, per cent free lunch eligible, per cent un-graded students, per cent federal revenues, class size, which are entered as predictors along with school size.

"All things else equal", the relationship of school size with compounded inefficiency is statistically significant at the .05 level of probability.

In fact, the level of probability is only .004 for a relationship this strong, given the size of the obtained sample. School size in the past is closely linked to the degree of inefficiency faced by high schools in the future, when one looks at the combination of poor outcomes and high spending. Using other indexes of inefficiency should produce similar conclusions.

SECTION 6

Summary of key variables and concepts

Section 6 summarizes the key variables used in this research, and the key concepts used in regression analysis and hypothesis testing for these variables.

- Section 6A outlines the variables used to explain differences in test scores in section 1.
- Section 6B outlines the variables used to explain the geographical (spatial) concentration of violence within a district in section 2.
- Section 6C outlines the variables used to explain differences in "compounded inefficiency" among high schools in section 3.
- Section 6D outlines the key concepts used in regression analysis and hypothesis testing.

6A: Variables used to explain Differences in Test Scores in Section 1	
96-97 Total Comparative Cost per Pupil [state index CCTOTY2]	Ccps9697 also dfin0066
99-00 Percent of Revenues from Federal [state index FED_Y5]	Fed9900 also dfin0027
96-97 Class size [state index CLSZ_Y3]	ScFct029
96-97 Mobility rate [state index MOB_Y3]	ScFct035
96-97 Student/Faculty Ratio 96-97 [state index STFA_Y3]	ScFct041
96-97 % faculty with BA/BS [state index BA_Y3]	ScFct072
96-97 Per cent African-American students	pctblack
96-97 sum of students for 1996-1997 from NCES CCD	totstu
Dependent Variables	
Reading: % pass High school proficiency test in 1999-2000 [State index READ_Y6]	HSPT029
Math: % pass High school proficiency test 1999-2000 [State index MATH_Y6]	HSPT030
Writing: % pass High school proficiency test 1999-2000 [State index WRITE_Y6]	HSPT031

6B: Variables used to explain the Geographical (Spatial) Concentration of Violence Within A District in Section 2

	SPSS index
Lagged School size: Mean of total students per regular school during 1996-97 (from U.S. D.O.E. CCD files)	meanstu1
District Size: 2001 Resident Enrollment for District	ENROLL17
Race 2000: Per cent Asian students	RACE0021
Race 2000: Per cent white students	RACE0018
Poverty: 2000 Per cent eligible for free lunch or reduced price lunch	RACE0019
Spending: 2001-02 Comparative Cost Per Pupil	VITALS04
Special Needs: 2001 Total Eligible for Special Education % (pct)	ENROLL56
Intergovernmental: Local Taxes as proportion of 01-02 Revenue Sources	VITALS06
Class size: 2001 Student/ Teacher Ratio: 100 Students per Teacher Ratio Fall 2001 (Certified Staff)	VITALS11

The dependent variables measure the degree to which violent incidents within county schools are concentrated within a given district

The proportion of total violence within each county that occurs within a specific district (%)	Index 1 uses the mean and Index 3 uses the median to measure averages for a group of districts
The ratio of Violent Incidents within Each District versus Other Districts in the County {%}	Index 2 uses the mean and index 4 uses the median to measure average s for a group of districts

All variables were measured using information provided by the U.S. and N.J. Departments of Education.

6C: Variables used to explain differences in compounded inefficiency among NJ high schools in Section 3

The independent variables measure school size, class size, and other independent variables. Both expenditures and revenue sources are fiscal variables. The dependent variables measure test scores, absenteeism, dropouts, as well as spending.

	SPSS name	Source for each Variable
1996-97 % faculty with BA/BS	ScFct072	[from state file BA_Y3]
1997-98 Student Computer Ratios	ScFct110	[from State file stcomp_y4]
% minority in school for 1996-97	pctmin	[from U.S. DOE CCD file for 96-97]
Mobility rate for 1996-97	ScFct035	[from State file MOB_Y3]
% free lunch eligible (with NA=0) for 1996-97	pctpoor	[from U.S. DOE CCD file for 96-97]
% ungraded students [with missing = 0] for 1996-97	pctungrd	[from U.S. DOE CCD file for 96-97]
% federal revenues for 1999-00	fed9900	[from state file FED_Y5] - not lagged
Class size - average for 1996-97	ScFct029	[from state file CLSZ_Y3]
School size = total enrollment/ sum of students for 1996-1997	totstu	[from U.S. DOE CCD file for 96-97]
Total cost per pupil in 1999-2000	TCPS0001	[State index TOTCOSTY6]
Dropout Rate for 1999-2000	scfct026	[State index DROP_Y6]
Attendance Rate 1999-00	scfct020	[State index ATT_Y6]
Reading: % pass High school proficiency test in 1999-2000	HSPT029	[State index READ_Y6]
Math: % pass High school proficiency test 1999-2000	HSPT030	[State index MATH_Y6]
Writing: % pass High school proficiency test 1999-2000	HSPT031	[State index WRITE_Y6]

In Section 3 each dependent variable is a composite index of compounded inefficiency. It measures the degree to which each school suffers from low test-scores, low attendance-rates, and high dropouts, in spite of high levels of spending per pupil.
Standardized z scores were computed for all NJ schools with available data, separately for each variable. Then z scores for only those schools with complete information for all variables were utilized to produce a composite index. In the composite index all six variables are equally weighted, with + signs for fiscal burdens and dropout rates and negative signs for steady attendance and favorable test scores.
All "cost" variables are based on official results for each school made public through NJ DOE "report card" files.

SECTION 6D: Key Concepts

This section outlines the key concepts used in regression analysis and tests of null hypotheses.

It is based on notes from classes by Dr. Russell S. Harrison in Quantitative Methods in Social Science Research, Political Methodology, Evaluation Research, Research Methods in Public Policy and Administration, and Education Policy.

ANOVA versus MRA

Concept (abbreviation) or acronym	Common symbols	What the concept measures	Meanings
Bivariate and Multivariate Relationships		Bivariate relationships measure the relationship between one independent and one dependent variable. Multivariate relationships take into account other possible independent variables. This research tests the relationships of school size with various outcomes by measuring both bivariate and multivariate relationships. The goal is to see if a null hypothesis of no systematic relationships can be systematically rejected.	In this research ANOVA is used to compare means and evaluate the statistical significance of bivariate relationships linking school size to various outcomes. MRA [multiple regression analysis] is used to measure multivariate relationships (including slopes that "control" for spending, class size, socio-economic traits of students, and other "control" variables), and evaluate the statistical significance of relationships.

Unstandarized Coefficients produced by SPSS MRA procedure [multiple regression analysis]			
Slope	"b" in statistics texts, or "m" in physics B in SPSS	For multiple regression analysis, the slope measures the linear relationship between an independent variable and a dependent variable, "taking into account" or "controlling for" the other independent variables in the equation. The independent variables are predictors. For this analysis, school size was typically measured several years prior to each outcome, to emphasize that it was an "exogenous" predictor being used to explain variation in a given "endogenous" dependent variable. For a multiple regression equation, each slope measures the relationship between an independent variable and the *residuals* in a dependent variable not explained by the other predictor variables.	The slope answers questions like these: If I increase the independent variable by one unit, by how many units will I increase or decrease the dependent variable? The slope is an unstandardized coefficient. Therefore the value of the slope changes depending on how you measure each variable. Moreover, t he values for the slope can range from -infinity to + infinity. Further, you can easily deduce probable effects by changing the independent variable by a given multiple, such as 10 or 100 units. The slope measures the "elasticity" or "productivity" of a relationship.
Intercept [slope intercept]	"a" in statistics texts, or "b" in physics Intercept in SPSS	Calculates the point at which a line will intercept the y-axis by using a best-fit regression line plotted through the known x values and y values. It is used primarily as a means to compute predicted values for a dependent variable.	What is the value of the dependent variable if the value of each independent variable is zero? The answer can have any positive or negative value, which may or may not exist in a given universe of observed cases.
Standard error of slope	Std Err in SPSS	Returns the standard error of the predicted y-value for each X in a regression equation. Though unstandardized, it is used to produce the standardized t ratio.	The standard error is determined by the average difference between the predicted and observed values of the dependent variables, weighted by extreme differences between the predicted and observed values. The answer is always a positive value, since it is equivalent to the standard deviation of deviations about the regression equation.

Standardized MRA coefficients

Beta	"*B*" in statistics texts Beta in SPSS	Returns the value of a slope assuming that all variables are measured in z-scores or at least standard deviation units.	The Beta answers questions like these: If I increase the independent variable by one standardized unit, by how many units will I increase the dependent variable? It is a standardized coefficient that typically ranges in value from –1 to +1. Any more extreme scores often indicate a multi-co linearity problem.
t-coefficient or t-ratio	"t" in SPSS	Measures the ratio of a slope to its standard error, which indicates the relative importance of a variable assuming standardized measurement procedures	This coefficient is commonly used to measure the statistical significance of a relationship. Significant relationships have a large t-ratio and a large sample size. Thus the same relationship for a smaller sample may not produce the same "significance" level. Different types of t-coefficients are used in regression analysis, ANOVA or comparison of means, etc.
R-squared coefficient, which typically equals the square of the R coefficient	R**2 In SPSS	The square of the R coefficient for a multiple regression equation Sometimes called the coefficient of determination. The adjusted R-squared takes into account the number of independent variables relative to the sample size. It generally measures the degree to which a set of variables explains outcomes in a given dependent variable, or the quality of the overall regression equation.	This coefficient answers: How much of the variation in the dependent variable is explained by the independent variable (expressed as a proportion)? The answer will have a value of .00 to 1.00.

Linking SPSS "Sig" Coefficients to formal tests of "null" hypotheses

Significance level	Labeled simply as "sig" in SPSS	= the statistical significance for a given slope, or difference in means, R**2, etc. The observed value for the SPSS "sig" coefficient will have a range of values from .00 to 1.00. The smaller the observed value, the more important or "statistically significant" the observed relationship, and the greater the confidence one has in rejecting the "null hypothesis". By tradition in exploratory social science research, the critical threshold is .05.	The "sig" coefficient answers questions like these: How much error should I expect if I reject the null hypothesis? If the error is less than .05 or 5%, you can reject the null hypothesis at the .05 level of probability, following the typical norms in the social sciences for exploratory "needs assessment" research as part of a formal strategic planning process. For large samples and follow-up research, the criterion for the "level of probability" threshold may be set at .01 or even .001 to reject the null hypothesis.
Null hypothesis	Ho:	= an assumption or prediction that the relationship between two variables is null, which the researcher typically wishes to disprove = in MRA an assumption that the dependent variable is not a linear function of the independent variable, and that variation in the dependent variable does not systematically vary as a "monotonic" function of the independent variable note: often "tipping point" analysis is used to identify specific levels of the independent variable above and below which the average scores of the dependent variable dramatically vary ANOVA measures the degree to which differences or variation in the dependent variable are greater between categories of the independent variable than within categories of the independent variable	This preliminary needs-assessment research tested the empirical relationships between school size and three outcomes, for given samples. The task was to see if the observed "sig" coefficient or "significance" level were small enough to reject the null hypothesis with a reasonable level of confidence that the same conclusions would be drawn by future research using analogous samples. This could be done, using the standard threshold for statistical significance. However, further research is needed to confirm relationships in different samples, such as those for elementary and middle schools.

SECTION 7 – Key Readings on Methods

This section summarizes key readings about optimal methods to research size outcomes.

In addition to author, title, and source, a key feature of each study is highlighted.

7A: How best to utilize MRA			
Jay Greene	The Education Freedom Index [September 2000]	*The Manhattan Institute for Policy Research* Civic Report 14	Illustrates the use of multiple regression analysis [MRA] to link institutional structures with education outcomes. His "control" variables include spending and class size, as well as the poverty and race of students. His "freedom index" and his dependent variables illustrate the use of composite indexes in MRA.
Jay Greene	2001 Education Freedom Index [January 2002]	*The Manhattan Institute for Policy Research* Civic Report 24	Further illustrates the use of multiple regression analysis to link institutional structures with education outcomes. His "ceteris paribus" controls again include spending per student, class size, poverty, and race of students. Such research provides ample precedent for similar controls in the present study.
Herbert J. Walberg & Fowler, W.	Expenditure and size efficiencies of public school *districts*. (1987). .	*Educational Researcher, 16*(7), 5-13.	Illustrates how "residuals" from multiple regression analysis can be used as an index of educational efficiency, and the need to model those residuals as a function of district size. By analogy, one can perform the same task for school size. See section 4.
Herbert J. Walberg.	District size and student learning. (1989).	*Education and Urban Society, 21*(2), 154-163	Shows how to use regression techniques to measure relationships. Illustrates the impact of district size on academic outcomes. Provides clear precedent for exploring another index of institutional size, namely school size.
Herbert J. Walberg,	Losing Local Control of Education: Cost and Quality Implications (1993)	Heartland Policy Study, The Heartland Institute, November 22, 1993.	Again uses regression analysis, this time with controls for spending and minority population, though his data refer to states. Provides clear precedent for applying similar methods to analyze individual districts or schools.
Robert L. Hampel	"The Long Road to Small Schools" (2002)	Education Digest, April 2002, Vol 67 Issue 8, 15-21, via ESBCO	Stresses the need to study multiple outcomes from school size. Traditional proponents of large schools in prior eras believed they offered multiple advantages. To refute traditional myths, empirical research must document the multiple advantages of small schools, and the multiple disadvantages of large schools, for the present era.

7B: The Need to Measure Lagged relationships			
David Mayston, University of York	Tackling the Endogeneity Problem When Estimating the Relationship Between School Spending and Pupil Outcomes (2002)	British Department for Education, Research Brief No. 328, January 2002, ISBN 1 84185 667 3	Stresses the take to take into account potential endogenous relationships when measuring linkages among school traits like spending, class size, school size, and educational outcomes. The Harrison research uses lagged relationships to minimize feedback problems, which offer many advantages over traditional regression procedures where predictors and dependent variables are measured in the same year.
Peter Blatchford, Clare Martin, Viv Moriarty, Paul Bassettt, and Harvey Goldstein, Institute of Education, University of London	Pupil Adult Ratio Differences and Educational Progress over Reception and Key Stage 2 (2002)	British Department for Education, Research Brief No. 335, May 2002, ISBN 1 84186 702 5	Emphasizes that class size may have little impact on school children's educational progress, versus other constraints on the educational production process. Also emphasizes the need to look at educational impacts over time. The Harrison research uses lagged relationship to take into account educational impacts over time. The new research shows that school size has become far more important than class size as a determinant of educational outcomes in New Jersey, "ceteris paribus" - all things else equal.

7C: The need to go beyond Money and Class size

An increasing number of scholars have begun to question the traditional public school mantras that money and class size are all that matter for education, at least on a macro-level of policy reform. Opponents of the traditional views include various "institutionalists" like Erik Hanushek, Caroline Hoxby, John Chubb, Terry Moe, Paul Peterson, Herbert J. Walberg, Chester Finn, Jr., even though they have not yet directly addressed the issue of school size.

E. A. Hanushek	(a) "The Impact of Differential Expenditures on School Performance" (1986)	Educational Researcher, 18 (4), 45-65.	In 1986 Erik Hanushek introduced a long line of meta-analyses that document the declining importance of both class size and finances in explaining educational outcomes. Since then other studies have documented the importance of other variables connected to the size of districts or schools. These include the types of cooperative decision-making, parental inclusion, "connectedness", "trust", "educational restructuring", and "professional learning communities" possible in smaller schools.
E. A. Hanushek	(b) "The Economics of Schooling: Production and Efficiency in Public Schools" (1986)	Journal of Economic Literature 1147	
Ronald Fisher	*State and Local Public Finance* (1988)	Glenview Illinois: Scott Foresman & Company, Ch. 18, "Education"	The traditional point of view on the importance of money in "educational production functions"
Helen Pate-Bain et al.	"Class Size Does Make a Difference" (1996)	In Jack R. Van Der Silk, Politics in the American States and Communities, A Contemporary Reader, pp. 254-259	The traditional point of view on the importance of class size for student academic performance

7D: Traditional Perspectives And Empirical Contradictions on Large Scale Educational Service Delivery Structures			
Ernest Reock	The Cost Impact of School District Creation and Consolidation in New Jersey. (1995)	Occasional Paper Series # 3, Center for Government Services and Public Affairs Research Institute of New Jersey, Inc., March 1995	Reock has been a major advocate for centralization and large-scale service delivery units. The 1995 report remains a primary reference for advocates of district mergers in New Jersey. He presents data that purport to prove that "fragmentation" increases costs. In fact, a reanalysis of the data reported reveals that the longer a district has been merged, the greater the growth in costs over time. The evidence actually confirms that adverse fiscal effects emerge over time from attempts to merge schools with students from different communities. Where schools serving different communities are merged into one big administrative structure, costs escalate. In any event, his evidence refers to districts, not to schools *per se*. Nor does he actually measure the size of the merged districts he studies. He simply reports when they were created out of their feeder districts. Thus his research as a whole most emphatically does not document the fiscal superiority of big schools, if one correlates the duration of mergers with growth in costs over time.

James B. Conant	The American High School Today (1959)	New York: McGraw Hill	The 1959 Conant study is one of the most widely cited studies that advocate the merits of large high schools. Conant presents a survey of 22 high schools to bolster his claim that bigger schools are better, especially for gifted and talented students. Even ignoring his biases in who should benefit from school reform, his survey does not support his thesis that big schools are best. (1) A reanalysis of his data reveals a negative correlation between school size and the proportion of students who are able to participate in the gifted and talented classes. The larger schools had a smaller per cent of their student bodies involved in gifted and talented classes, even though they had more students overall. This confirms that then - as well as now, big schools hurt the percent who benefit from what the school has to offer – especially for extra-curricular activities. They may have more specialized resources, but a smaller share of students benefits from them. (2) Worse, the reanalysis shows a positive correlation between school size and the proportion of students who fail to complete the basic number of courses in English and Social Studies that he recommends. Thus the students at the bottom are especially hurt, who fail to complete even the minimum core of the available courses. (3) Worst, the survey reveals that school size is positively correlated with various indices of chaos and conflict in the school climate. Larger schools have school climates marked by excessive chaos and conflict. Both teachers and students suffer from the dysfunctional social climate that is exaggerated in the larger schools, both then and now.

SECTION 8 – Key Research

Section 8 summarizes readings that clarify key research on school size outcomes and options for implementation of small school policies.

8A: Inventories of research on the multiple positive outcomes from small school learning communities –

Perspectives on School Size Outcomes and Implementation Options Section

Author	Title	Source	Feature
Kathleen Cotton	School Size, School Climate, and Student Performance (1996)	Close-up #20. Portland Oregon, Northwest Regional Educational Laboratory.	Provides an extremely comprehensive survey of positive outcomes from small schools, and the different research studies that document or at least discuss each type of outcome.
Kathleen Cotton	Affective and Social Benefits of Small-Scale Schooling (2000)	ERIC, Clearinghouse on Rural Education and Small Schools	Points out the multiple psychological benefits of small schools, including positive morale and sense of personal efficacy among teachers, a sense of belonging and social bonding among students, a greater sense of self-esteem and positive evaluations towards the school climate by both teachers and students. Outlines the social benefits of small schools which include less social disruption and behavioral problems, better attendance and fewer dropouts, a greater increase in the percent of students who participate in extra-curricular and advanced academic programs, unlike large schools where only a small proportion of students are given access.
Mary Anne Raywid	Downsizing Schools in Big Cities (1996)	ERIC Digest, the ERIC Clearinghouse on Urban Education	Points out the multiple benefits of small schools for a wide range of stake-holders – teachers, students, and parents
Mary Anne Raywid	Current Literature on Small Schools (1999)	ERIC Digest, the ERIC Clearinghouse on Rural Education and Small Schools, January 1999	Points out that both quantitative studies and case studies document superior outcomes for small schools.

8B: Other syntheses of favorable outcomes from Small School Learning Communities -

Perspectives on School Size Outcomes and Implementation Options

Ayers, William, Bracey, Gerald, and Smith, Greg. *The Ultimate Education Reform? Make Schools Smaller* [University of Wisconsin-Milwaukee, School of Education, Center for Education Research, Analysis, and Innovation, PO Box 413, Milwaukee WI 53201 SDIP Education Policy Project, CERAI-00-35; 12/14/2000]

Cotton, Kathleen. *School Size, School Climate, and Student Performance*. Portland, OR: NW Regional Lab. 1997

Raywid, Mary Ann, "Small Schools: A Reform That Works," *Educational Leadership*, 55:4 December/January, 1997/'98.

Fowler, W. J., Jr. "School Size and Student Outcomes." *Advances in Educational Productivity* 5 (1995): 3-26.

Sergiovanni, T. J. *Organizations or Communities? Changing the Metaphor Changes the Theory*. Paper presented at the Annual Meeting of the American Educational Research Association, Atlanta, GA, April 1993 (ED 376 008).

Gregory, T. "Small Is Too Big: Achieving a Critical Anti-Mass in the High School." In *Source Book on School and District Size, Cost, and Quality*. Minneapolis, MN: Minnesota University, Hubert H. Humphrey Institute of Public Affairs; Oak Brook, IL: North Central Regional Educational Laboratory, 1992, 1-31 (ED 361 159).

Stockard, J., and Mayberry, M. "Resources and School and Classroom Size." Chapter 3 in *Effective Educational Environments.* Newbury Park, CA: Corwin Press, Inc., 1992, 40-58.

Smith, D. T., and DeYoung, A. J. "Big School vs. Small School: Conceptual, Empirical, and Political Perspectives on the Re-emerging Debate." *Journal of Rural and Small Schools* (Winter 1988): 2-11

Barker, B. O. *The Advantages of Small Schools*. ERIC Digest. Las Cruces, NM: ERIC Clearinghouse on Rural Education and Small Schools, February 1986 (ED 265 988).

Cohen, B. P. *The Effects of Crowding on Human Behavior and Student Achievement in Secondary Schools*. Philadelphia, PA: Philadelphia School District, Office of Curriculum and Instruction, 1975 (ED 188 279).

8C: Specific Benefits of the Small School Learning Community involving test scores, violence, and/or "compounded inefficiency" costs

8C1: Raise student achievement [including minority or low-income students]

Howley, Craig, Bickel, R. The Matthew Project: National Report. ERIC: ED433174. 1999 — 1999

Howley, C. "Literature Review." In *Sizing up Schooling: A West Virginia Analysis and Critique*. Unpublished Doctoral Dissertation, West Virginia University, Morgantown, WV, 1996. — 1996

Howley, C. B. "The Matthew Principle: A West Virginia Replication?" Education Policy Analysis Archives 3/18 (November 15, 1995): 1-25. Electronic journal: http://epaa.asu.edu/epaa/v3n18.html — 1995

Howley, C. *The Academic Effectiveness of Small-Scale Schooling (An Update).* ERIC Digest. Charleston, WV: Clearinghouse on Rural Education and Small Schools, June 1994 (ED 372 897). — 1994

Huang, G., and Howley, C. "Mitigating Disadvantage: Effects of Small-Scale Schooling on Student Achievement in Alaska." *Journal of Research in Rural Education* 9/3 (Winter 1993): 137-149. — 1993

Fowler, W. J., Jr., and Walberg, H. J. "School Size, Characteristics, and Outcomes." *Educational Evaluation and Policy Analysis* 13/2 (Summer 1991): 189-202. — 1991

Friedkin, N. and Necochea, J. "School System Size and Performance: A Contingency Perspective," *Educational Evaluation and Policy Analysis*, Vol 10, No. 3, 1988, pp. 237-249. — 1988

Miller, J. W.; Ellsworth, R.; and Howell, J. "Public Elementary Schools Which Deviate from the Traditional SES-Achievement Relationship." Educational Research Quarterly 10/3 (1986): 31-50. — 1986

8C2: Reduce incidents of violent and disruptive behavior

Bailey, J. "The Case for Small Schools," Center for Rural Affairs Monthly Newsletter, 2000. — 2000

Berreth, D. "Supporting Schools as True Communities of Character," Testimony before the House Subcommittee on Early Childhood, Youth, and Families, 2000. — 2000

Rossi, R. and Daugherty, S. "How Safe are the Public Schools: What Do Teachers Say?" Washington, D.C.: National Center for Education Statistics, 1996 — 1996

Gottfredson, D. C. *School Size and School Disorder*. Baltimore, MD: Center for Social Organization of Schools, Johns Hopkins University, July 1985 (ED 261 456). — 1985

8C3: Decrease absenteeism and dropouts, increase graduation rates cost-effectively

Farber, P. “Small Schools Work Best for Disadvantaged Students,” *Harvard Education Letter*, March/April, 1998. 1998

Fetler, M. "School Dropout Rates, Academic Performance, Size, and Poverty: Correlates of Educational Reform." *Educational Evaluation and Policy Analysis* 11/2 (Summer 1989): 109-116. 1989

Jewell, R. S. "School and School District Size Relationships: Costs, Results, Minorities, and Private School Enrollments." *Education and Urban Society* 21/2 (February 1989): 140-153. 1989

Toenjes, L. A. *Dropout Rates in Texas School Districts: Influences of School Size and Ethnic Group*. Austin, TX: Texas Center for Educational Research, August 1989 (ED 324 783). 1989

Pittman, R. B., and Haughwout, P. "Influence of High School Size on Dropout Rate." Educational Evaluation and Policy Analysis 9/4 (Winter 1987): 337-343. 1987

Rogers, R. G. "Is Bigger Better? Fact or Fad Concerning School District Organization." *ERS Spectrum* 5/4 (Fall 1987): 36-39. 1987

Lindsay, P. "The Effect of High School Size on Student Participation, Satisfaction, and Attendance." *Educational Evaluation and Policy Analysis* 4/1 (Spring 1982): 57-65. 1982

Steifel, L., Berne, R., Iatarola, P., Fruchter, N. “High School Size: Effects on Budgets and Performance in New York City,” *Educational Evaluation and Policy Analysis*, Vol. 22, No. 1, Spring, 2000, pp. 22-39. See http://www.uwm.edu/Dept/CERAI/documents/archives/00/cerai-00-35.htm - _ednref7. 2000

Nachtigal, P. "Remapping the Terrain: School Size, Cost, and Quality." In *Source Book on School and District Size, Cost, and Quality*. Minneapolis, MN: Minnesota University, Hubert H. Humphrey Institute of Public Affairs; Oak Brook, IL: North Central Regional Educational Laboratory, 1992, 52-71 (ED 361 161). 1992

8D: Perspectives on how to implement Self-sustaining Small School Learning Communities –

Perspectives on School Size Outcomes and Implementation Options

Author	Title	Source	Feature
Mary Anne Raywid	*Taking Stock: The Movement to Create Mini-Schools, Schools-Within-Schools, and Other Small Schools* (1995)	ERIC, Clearinghouse for Urban Education, Columbia University: New York	The problems that plague symbolic attempts to achieve the benefits of small schools without actually establishing autonomous facilities and administrative structures for each school that permit a maximum of site-based decision-making. Also an excellent overview of the early research on the multiple benefits of autonomous small schools.
Kathleen Cotton	*School Size, School Climate, and Student Performance* (1996)	Close-up #20. Portland Oregon, Northwest Regional Educational Laboratory, 1996.	Provides a bibliography that lists key research on "alternative schools", SWAS/ schools within a school, and other structures that combine a limited range of student enrollment with the varied positive features of the small school learning community. The list of annotated articles can be obtained from the American Association of School Administrators, 1801 North Moore Street, Arlington, VA 22209-1813. It includes specific studies dealing with SWAS and "alternative schools", some of which feature "academy" style specializations.
Patricia A. Wasley and Richard J. Lear	"Small Schools, Real Gains" (2001)	Educational Leadership, 22-27.	Points out the multiple positive features of the small school learning community, and conditions that impede the successful implementation of such a community. These include legislative and judicial mandates that favor larger schools and centralize operations, including extra aid for larger schools, larger districts, and pro-consolidation "research" projects, plus attempts at the state and district level that force small schools to act like large schools.

SECTION 9 - Implementation

Section 9 outlines future research priorities for the New Jersey Commission on Business Efficiency in the Public Schools with regard to specific policies to implement small school learning communities:

Future Research Should Explore A Range Of Policies For Implementing a Small School Learning Community, ranging from incremental to radical.

A. Incremental reforms include the SWAS/ Schools within Schools/ approach. However, serious caveats must be imposed on its probability of success as a self-sustaining policy.
B. Incremental reforms include a close look at Focus schools or "Specialism" schools like those used in England to overcome the disadvantages of over-sized schools.
C. Incremental reforms include a revision in state mandates for consolidation studies. Future studies should measure and document the growth in adverse educational outcomes that occur over time in districts with larger schools.
D. Moderate reforms include a policy to facilitate the permission and certification process for small Charter Schools or other Alternate schools in "high risk" districts subject to federal "choice" guarantees. The process should be simplified in districts where student performance is poor, absenteeism and dropouts are high, and school size surpasses critical tipping points. Moreover, small new schools should be given extra time to document their successes, since school size produces positive benefits that extend over time.
E. A radical reform would require courts to take into account the possibility that school size is now a larger source of inefficiency and inequality in school operations than is class size, much less spending per student. Courts would be mandated to consider the implications of new research that shows a negative correlation between school size and the ability of school officials to operate a "thorough and efficient" system of education. Schools are not thorough where learning is minimized, and absenteeism and dropouts are maximized. Schools are not efficient, where money is spent with declining marginal returns, and where test scores fall far short of what one would expect from spending, class size, school resources, student ethnicity and poverty, and other factors.
F. Another radical reform would allow districts to trade-off smaller schools for smaller classes. Research is needed to document that the same per cent change in school size and class size would improve performance and cut costs, assuming that the per cent reduction in school size would match the per cent increase in class size.

Section 9A, 9B, 9C

Future research should explore incremental reforms as one strategy for Implementing The Small School Learning Community

9A: Incremental Reforms include Schools within Schools or SWAS structures.

- Research should clarify the need for implementation rules for Schools within Schools and similar policies that avoid common implementation errors outlined by Tom Gregory and others. See, among others:
  - Tom Gregory, "Breaking Up Large High Schools: Five Common (and Understandable) Errors of Execution", ERIC Digest EDO-RC-01-6, December 2001
  - Tom Gregory, "School Reform and the No-Man's-Land of High School Size", unpublished paper provided by author at University of Indiana, December 2000
- Research should clarify the dangers outlined by Kathleen Cotton, Mary Ann Raywid, and others about the limited payoffs of plans that do not guarantee independent physical facilities, autonomous administration, and relief from mandates that disproportionately impose undue burdens on smaller schools.

9B: Incremental Reforms include support for Focus Schools or "Specialism" schools like those used in England, or various "Academy" or "Alternate School" programs in the United States.

- To reduce the adverse effects of large schools in England, Focus/ Specialist Schools have been established, which now house a large proportion of all secondary students in the country.
  - The state legislature should fund new research on the effects of "focus" schools on education outcomes over time. To what extent can focus/specialist schools minimize the adverse effects of school size?
  - The research should not be limited to states like New Jersey where most such schools are relatively new, and the number of schools is relatively small. The research should look at evidence for settings like England, where the practice has had more time to produce effects over time, and where tens of thousands of students attend such schools.

9C: Another incremental reform would require the legislature to revise mandates for state funded "consolidation" studies, or replace them with a less biased approach to needs assessment

- The "needs assessment" must make use of environmental scanning techniques to document the effects of larger districts and schools over time, and not assume that all benefits will be beneficial.
- The "needs assessment" must measure the extent to which district consolidation projects result in escalating costs over time
- All consolidation needs assessment must measure and document the growth in adverse educational outcomes that occur over time in districts with larger schools, including lower test scores, increased violence, and greater inefficiency
- The "needs assessment" must identify those tipping points which are associated with significantly higher levels, and reject any plans that result in school enrollments that exceed those caps.

9D: A moderate reform would be to ease the task of creating charter schools and alternate schools in districts with over-sized and under-performing schools.

- New federal budget guidelines seek to implement the basic premises of the No Child Left Behind philosophy. This includes a notion that under-performing children in disadvantaged districts should be given a wider array of "choice" options – so their parents can help them choose an alternative school more suited to their needs that would help them realize their potential. Advocates of "competition" support this notion. They claim that choice and competition among schools improve educational outcomes, and especially the productivity and efficiency of the educational process.
- How would an expansion of small schools maximize the benefits alleged by the advocates of choice and competition? New Jersey officials could mandate that all at risk children be given the right to transfer to a small school, where enrollments are controlled to maximize efficiency and productivity in learning, and minimize social chaos.
- Research should also explore the validity of new rules to facilitate the creation of new Charter Schools or Alternate Schools within any district burdened with over-sized schools and under-performing children. Moreover, these new schools should be given a track record of at least three years of operation before measuring outcomes, since the benefits of small school size tend to accrue over time. Finally, research should explore the degree to which small charter schools produce the same positive payoffs as small public schools in general. In particular, research should look at value added, or what happens to test scores over time, as well as what happens to social behavior and attitudes within the school.
- If traditional public schools refuse to downsize, then "adequacy" mandates should be imposed which facilitates the creation of and transfer to competing small schools.

9E, 9F: Radical reforms

9E: One radical reform would place caps or ceilings on future school litigation, to ensure judicial restraint.

- The legislature should stipulate that no state funding will ensure from litigation unless the case decision is based on scientific Brandeis Briefs that take into account the actual determinants of education outcomes today, rather than the myth that money and smaller classes are the ultimate cure all for all problems facing schools, and that consolidation is a major source of efficiency in public school education production functions
- Legislative and judicial mandates should stipulate that courts must consider the fact that money and class size are no longer as important as school size as a determinant of outcomes, and that the traditional assumption that money and smaller classes are a cure all may be a major cause of inflated costs for state and local tax payers.
- Legislative and judicial mandates should stipulate that courts must consider the fact that the top decile poverty (poorest) districts in New Jersey already receive and spend more money from state and local sources, and especially from state sources, than do the bottom decile (richest) districts. They probably also receive much more federal aid, especially as a percent of their locally generated revenues. Research is needed to examine the degree to which dependence on outside funding is associated with a loss of local control and increased inefficiency in education, versus small schools that can increase local control and decrease inefficiency. Simply changing sources of revenues to restrict local contributions may not work as well as simply changing school size.

9F: Balancing tradeoffs between school size and class size

Another radical reform would be to take into account the possibility that class size and school size reforms produce quite different ratios of costs to benefits. Smaller classes have little ability to maximize positive academic outcomes. However, they do maximize spending per student. In short, a small class policy maximizes costs relative to benefits.

In contrast, smaller schools have a major ability to maximize positive academic outcomes. However, they have little or no impact on current spending per student, and may increasingly cut capital spending per student. Overall, small school policies maximize benefits relative to costs.

Consequently, policies that cut school size at the same rate than class size is freed will result in major costs savings plus improved academic outcomes.

Thus a policy that deserves further review is the following. Legislation should provide districts with prerogatives to trade-off smaller schools for larger classes, if they wish to minimize costs and maximize academic outcomes. Simultaneously, they should be freed from arbitrary state mandates for staffing and curriculum delivery options that impose disproportionate fiscal costs on small schools, and inflate staff/student ratios.

SECTION 10 - FOLLOWUP RESEARCH

This section outlines future research priorities for The New Jersey Commission On Business Efficiency In The Public Schools. It lists a range of specific studies that are needed to clarify how smaller schools can improve the efficiency and equity of education in New Jersey.

Summary of Needed Follow-up Research to the present study			
Dependent Variable or Outcome	Year 1 of overall project	Specific topics for research follow-up	
Test Scores	Rejected null hypothesis for HSPT scores (for high school students)	Test null hypothesis for ESPA and GEPA scores (elementary and middle schools)	Include lower grades in analysis.
Violence	Rejected null hypothesis for concentration of violence in High School districts	Test null hypothesis for elementary and middle schools Measure violence as well as non-violent crimes in lower grades as a function of school size. Include lower grades in analysis.	Test null hypothesis using data for individual schools Control for the DFG of each school to show that school size does not simply escalate violence in the poorest districts but also in middle class districts
Inefficiency	Rejected null hypothesis for compounded inefficiency which measures the combination of high spending and poor results	Test null hypothesis for elementary and middle schools. Include lower grades in analysis.	Use two-stage residual analysis to focus on separate components of the inefficiency index. . Create a new index of “efficiency” that isolates the effects of school size on each component of compounded inefficiency separately.

Specific outcome	Year 1	Needed Research Follow-up
Dropouts and Absenteeism as key indices of a dysfunctional "school climate"	Only examined as part of a larger composite index	Examine causes and consequences of dropouts and absenteeism separately.
		Test null hypotheses for dropouts and absenteeism separately, as well as how school size and absenteeism combine to shape dropouts
		Test null hypotheses separately for high schools and for elementary and middle schools – Examine results for all schools collectively.
		Utilize the Jay Greene index of de facto dropouts to see how many more dropouts NJ schools suffer than those reported using the de jure records
		Measure specific indexes of dropouts and absenteeism and evaluate how much school size affects dropouts and absenteeism over a four year period
		Develop "residual" indices of success in dealing with problems of dropouts and absenteeism, relative to spending, class size, and the social traits of students. Confirm that school size reduces how efficiently schools deal with problems of dropouts and absenteeism, relative to resources expended and the types of students served.

Specific outcome	Year 1	Needed Research Follow-up
Fiscal costs	Only examined as part of a larger composite index The index only included current spending on certain specific budget items.	Measure effects of school size on municipal overburden and **tax rates,** in part due to effects of school size on dropouts, youth crime, female heads of households, and other culture of poverty problems both in and out of school. Document that municipalities served by districts with larger schools develop higher tax rates over time.
		Measure effect of school size on **declining house values.** Document effects of school size on flight of middle class from communities with over-sized schools and subsequent loss of school quality in over-sized schools. Document how declining house values mean declining ratables, which drive up tax rates, in conjunction with increasing social problems
		Measure effects of school size on combination of construction, maintenance, transportation costs, land acquisition costs, suburban sprawl, and other major **indirect costs** of big school design principles Show that nationwide big schools are no longer as cost efficient as small schools when one takes into account: ➢ Cost of land acquisition and loss of open space, ➢ Loss of options to recycle and refurbish preexistent facilities possible with smaller schools, as well as modular options to mega-school boxes, ➢ The benefits of small schools as part of the "new urbanism" approach to neighborhood planning and architecture.
		Develop a computer simulation to document total fiscal costs over time to federal, state, and local government of dealing with dropouts produced by large schools, in addition to the loss in foregone income by those dropouts. **Include welfare, corrections, judicial, and public health costs.**

Specific outcome	Year 1	Needed Research Follow-up
Reduction in ability of traditional inputs to maximize academic outputs, especially spending per student and class size.	Not assigned for this study	Document that the growing size of schools reduces the marginal returns from traditional educational inputs like expenditures, class size, teacher training, computer resources, etc., so that now school size is far more important in shaping academic outcomes than any one of these inputs. Document that school size is over 100% more important than class size in shaping test scores. Document that school size is over 100% more important than spending per student in shaping test scores.
De facto discrimination and bias in academic achievement	Not assigned for this study	Document that school size exaggerates the adverse effects of poverty and minority status on test score achievements in a way that exaggerates inequality in learning. Discuss the constitutional law implications of this finding.
De facto segregation due to the isolation and concentration of poverty students in declining schools	Not assigned for this study	Document that school size is correlated with the loss of middle class students over time, and the subsequent isolation and concentration of poverty students into academic ghettoes. Discuss the implications for segregation laws and standards affecting NJ schools..
Overall student crime versus violence per se	Not assigned for this study	Test a null hypothesis linking school size to other varieties of student crime besides violent incidents per se. Document that school size exaggerates the degree to which community problems like drug use escalate into violence, and that school size therefore independently increases violence separate and distinct from catalysts like drug use Explore effects of school size on vandalism at various levels of schooling.

Specific outcome	Year 1	Needed Research Follow-up
Implementation methods for Small School Learning Communities	Empirical research on implementation options was not assigned for this study	
	Incremental reforms	Document the degree to which "focus" schools or "choice" schools in New Jersey may – or may not - maximize the advantages of smallness. [Focus schools include academy schools or "specialism" schools. In turn, focus schools are often the focus of SWAS/ school within a school structures.] Document the extent to which the benefits of "focus" schools in New Jersey are obscured due to their disproportionate recruitment of minority and poverty students. Examine the degree to which "focus" schools in other states and England maximize the advantages of smallness. Test a null hypothesis linking "academy" structures with higher test scores and fewer social problems like absenteeism for England. Document the extent which "focus" schools or "choice" schools in N.J. maximize test scores - independently of their size and resources which differ dramatically from other schools..
	Moderate reforms	Document the inadequacies of present state incentives for local districts to consider the merits of consolidation, regionalization, and centralization of administration. Document that whatever the effects of district size on academic costs and benefits, school size has an independent impact on academic outcomes, including absenteeism, dropouts, and overall school crime and violence.
	Radical Reforms	Develop a computer similar to document how many hundreds of millions of dollars would be saved, and how many thousands of incidents of violence, physical conflicts, fear, and intimidation would be eliminated, from the implementation of a tradeoff policy that would cut school size by 10% while allowing class size to rise by the same proportion over a ten year period.

	Radical Reforms	Measure the degree to which the traditional premises of “the public school finance reform litigation crusade” have become correlated with an increase in costs that far outweighs any increase in academic benefits. Test a null hypothesis linking traditional litigation outcomes from state supreme court decisions to compounded inefficiency outcomes. Show that an excessive emphasis on equity goals in court litigation versus efficiency litigations means that court rulings are no longer an effective way to maximize either equity or efficiency. Document that court reliance on old hypotheses about the impact of money, and their failure to emphasize the benefits of structural reforms like school size, increase inefficiency in educational production functions.

AD HOC COMMENTARY ON PROPOSED RESEARCH PROJECTS:

It is respectfully suggested that to follow-up the present study, the New Jersey Commission on Business Efficiency in the Public Schools should obtaining funding to research the following issues.

10A: TEST SCORES

New research should examine how school size affects GEPA test scores as well as HSPT scores. It is important to find out the extent to which school size hurts students in middle schools as well as high schools.

New research should examine how school size affects residuals in test scores, to see whether school size affects the efficiency of learning for different types of curriculum and age levels. Section 4 outlines a methodology to guide this effort.

10B: CRIME AND VIOLENCE

10A1: The Commission should sponsor a follow-up study to examine individual schools to document how size escalates problems of school crime and violence.

Prior research has measured school crime in New Jersey using district-wide aggregates, to avoid embarrassing individual schools, and to minimize measurement error. However, research should now proceed to look at crime in individual schools. Does the relationship linking school violence with the size of the student body, or perhaps the size of the school facility, or other indices of school size sufficient to reject the null hypothesis looking at individual schools, or a full sample of over 2,500 schools? How much does school size affect school crime, controlling for DFG categories or other socio-economic variables? Which kinds of schools are most efficient in controlling crime, relative to their levels of spending, class size, poverty, minority race, special needs students, access to computers, etc?

10A2: The Commission should sponsor a follow-up study to examine district size versus school size.

Prior research on New Jersey suggests that district size has a major impact on school administration. To what extent does school size affect student behavior in a way that is separate and distinct from district size? More importantly, what increases school problems like high school violence more – big schools or big districts?

TYPES OF CRIME

10C: The Commission should sponsor a follow-up study to examine violent versus non-violent school incidents.

Does school size produce multiplier effects on total school crime that are similar to student violence? Do larger schools have disproportionate problems with vandalism that increase the de facto costs of education, even when municipal officials pay the costs of removal? How about other non-violent crimes?

The Commission should sponsor a follow-up study to examine and analyze nationwide surveys to show that school size may be especially linked to violent versus non-violent school crimes.

This research shows linkages of school size with the geographical concentration of violence within certain types of high school districts.

Now research is needed to look both at New Jersey and in other states to see how school size affects not only violence, but other indices of school crime. In particular, to what extent does school size at specific tipping points exacerbate the growth in violence versus non-violent school incidents? To what extent does school size exacerbate school violence far more than less violent crimes like drug and alcohol abuse among students, vandalism, or even carrying weapons?

10D: The Commission should sponsor a follow-up study to examine the impacts of drug use that affects individual students versus school size that affects students collectively.

Prior research suggests that drug use is a major source of school crime and violence. However, such may not be the case in New Jersey, at least compared to the governance structures for schools. In New Jersey, which affects crime rates more – drug use, or school size? Does school size affect crime rates independently of drug use? Do small school learning communities produce a climate that overcomes the potential to student crime produced by problems of drug use in the school community? Do large schools exacerbate relationships between drug use and crime?

WHERE DOES SCHOOL SIZE HURT WORST?

10E: The Commission should sponsor a follow-up study to examine grade levels where big schools hurt students worst.

Prior research suggests that the size of districts, classes, and schools may produce bigger impacts on students at lower grades than at upper grades, like high school. For New Jersey, is the evidence for lower grade level students similar to the evidence for high school students? Is it possible that the effects of size may actually be greater for students at lower grades? Alternatively, are the adverse effects of school size exaggerated at upper grades?

In short, test prior research that suggests school size may hurt more at lower grades than at upper grades

Walberg, H. J., and Walberg, H. J., III. "Losing Local Control." *Educational Researcher* 23/5 (June/July 1994): 19-26. 1994

North Carolina State Board of Education, Department of Public Instruction, Division of Accountability Services, Evaluation Section, *School Size and Its Relationship to Achievement and Behavior* (Raleigh, North Carolina: NJ State government, April 2000) 2000

10F: The Commission should sponsor a follow-up study to examine types of grade configurations that exacerbate the adverse effects of school size.

What happens in schools or districts where the range of grades is restricted, so students experience little continuity with the same teachers and student peers? What types of grade configurations exaggerate the adverse effects of school size?

- To what extent does the same harm due to school size found among high schools in the state apply to elementary and middle schools?
- Are the relationships significant enough for schools of all levels that the null hypothesis can be rejected for all schools regarding:
  - The relationship of school size with test scores (e.g., ESPA and GEPA)
  - The relationship of school size with both violence and less violent forms of school crime found more often in lower grade levels
  - The relationship of school size with inefficiency at lower grade levels.

COMPARING SCHOOL SIZE TO CLASS SIZE AND EXPENDITURES

10G: The Commission should sponsor a follow-up study to examine multiplier effects from class size versus school size.

Certain prior research argues that class size is the major determinant of academic outcomes. In contrast, Erik Hanushek, Ludger Woessman, and other institutionalists have carefully reviewed the importance of class size nationwide. Nationwide, smaller classes are not efficient means to improve education outcomes, especially with respect to academic achievement.

What is the more appropriate conclusion for New Jersey? Is school size more important than class size. If so, for what outcomes, at what levels of education, and for what types of students?

- To what extent is there a decline in the importance of class size as a determinant of educational outcomes, either over time, or as a given cohort of students moves through grads 1-12. To what extent is the importance of class size relative to school size minimized at higher levels of education, when children are no longer confined to a single class through the entire school day? What is the effect of school size on value added by schools over time?
- Looking at all schools statewide, does school size exceed class size in lagged multiplier effects on adverse educational outcomes, looking at district test scores at all levels?
  - Looking at all schools statewide, does school size exceed class size in lagged multiplier effects on adverse educational outcomes, looking at violence and other types of school crime at all levels?
  - Looking at all schools statewide, does school size exceed class size in lagged multiplier effects on adverse educational outcomes, looking at dropouts and absenteeism at all levels?
  - Looking at all schools statewide, does school size exceed class size in lagged multiplier effects on adverse educational outcomes, looking at inefficiency at all levels?

10H: The Commission should sponsor a follow-up study to examine and measuring tradeoffs between changes in school size and class size.

To what extent would a balanced policy of trading off smaller schools for larger classes a means to maximize efficiency in the delivery of public education. Research is needed that would conduct an empirically-based computer simulation to answer the following question:

- If a state like New Jersey should trade-off cuts in school size of 10 percent, with increases in class size of 10 percent, over a decade how many hundreds of millions of dollars in revenues would be saved, how much of a reduction in dropouts and absenteeism could be expected, and how much of an improvement in test scores could be expected?

10I: The Commission should sponsor a follow-up study to examine the continuing validity of the old thesis that Spending is a Panacea, versus the problems produced by school size.

Prior court litigation implies that money is the major determinant of academic outcomes in schools, especially during the 1970s and 1980s? However, is the underlying premise of the "public school finance reform litigation crusade" still valid?

Erik Hanushek has carefully reviewed prior research on the importance of expenditures and other fiscal resources on educational outcomes nationwide.

Nationwide, spending and fiscal resources are not significant means to improve educational outcomes, especially with respect to academic achievement. How valid is this conclusion for New Jersey? In particular, is school size more important?

- To what extent is there a decline in how important money is as a determinant of educational outcomes, either over time, or as a given student cohort moves from grades 1 through 12? To what extent is there declining importance in how much is spent, versus how and where it is spent?
  - To what extent is the importance of spending per student relative to school size minimized at higher levels of education, when parental resources are no longer as important as a determinant of spending and/or successful educational outcomes
  - Looking at all schools statewide, is spending per pupil as important as school size in shaping educational outcomes over time?
  - To what extent do the poorest [top-decile poverty] districts in New Jersey now receive and spend more revenues than the richest [bottom decile poverty] districts?
  - Looking at all schools statewide, does school size exceed per student spending in lagged multiplier effects on adverse educational outcomes, looking at district test scores at all levels?
  - Looking at all schools statewide, does school size exceed per student spending in lagged multiplier effects on adverse educational outcomes, looking at violence and other types of crime at all levels?
  - Looking at all schools statewide, does school size exceed per student spending in lagged multiplier effects on adverse educational outcomes, looking at dropouts and absenteeism at all levels?
  - Looking at all schools statewide, does school size exceed per student spending in lagged multiplier effects on adverse educational outcomes, looking at inefficiency at all levels?
  - In the last 20 years, does a quantitative content analysis of state court intervention into school finance cases been characterized by bias in the degree to which courts focus on equity issues versus efficiency issues, either in New Jersey or other state courts which provide precedents for New Jersey courts? Has prior court intervention resulted in a growth in costs over time for state a taxpayer that has exceeded the growth in favorable educational outcomes, as outlined in Goals 2000?

ANOTHER LOOK AT WHERE SCHOOL SIZE HURTS WORST

10J: The Commission should sponsor a follow-up study to examine what is the Optimal School Size, or what are the critical tipping points for school size?

Prior studies have spent a lot of time debating the optimal size of schools. Rarely have they used outcomes data to determine when big becomes too big. Instead they generally focus on spending. However, when one also takes into account variables like test scores, absenteeism, or dropouts, when does big become too big? What are the key tipping points for size-outcome relationships?

- At what specific level of enrollment are the adverse effects of school size especially prominent? Where is the break-even point between per student spending and adverse educational outcomes like dropouts and absenteeism? To what extent are the enrollment caps proposed in other states, valid for New Jersey? What size tipping points are most significant for elementary, middle, and high schools respectively?
- How do New Jersey tipping points for schools correspond to the tipping points or caps proposed in prior research by:
  - Oxley
  - Lee and Smith
  - The National Association of Secondary School Principals
  - Howley and Bickel

10K: The Commission should sponsor a follow-up study to examine the extent to which school size hurts equality goals.

Previous court decisions have spent a lot of time saying that school policy should aim to achieve equality. However, generally the courts focused on equality of inputs like money, and ignored equality of outputs like learning or student behavior.

To what extent does school size affect equality of learning or student behavior?

In New Jersey, to what extent does school size hurt more in poverty districts and minority districts, or poverty schools and minority schools?

- To what extent is school size associated with the growth of inequality among students in rich and poor districts? Where are academic effects most adverse against at-risk students? To what degree does school size maximize inequality of achievement, and deny students equal access to a through and efficient education that benefits all children equally, including students in poor and minority districts? To what extent does school size exaggerate the adverse effects of poverty? To what extent does school size exaggerate the adverse effects of minority concentrations? To what extent does school size exaggerate the combined effects of poverty and minority concentrations? To what extent do poverty and minority concentrations exaggerate the adverse effects of school size?
- How do the patterns for New Jersey correspond to the patterns found in states like:
  - Georgia
  - Ohio
  - Texas
  - California

EVIDENCE OF ANOMIE AND ALIENATION

10L: The Commission should sponsor a follow-up study to examine and analyze nationwide surveys to link school size, Parental Alienation, and lack of Involvement by Parents in the life of the school.

Prior research suggests that school size is correlated with absenteeism by students. How about absenteeism by parents? Is there nationwide evidence to link school size with declining parental involvement in schools?

- To what extent does school size reduce the percent of parents who actively and positively participate in the life of the school, and thus increase the percent of teachers who report serious problems of parental alienation, absenteeism, and apathy regarding their school?

10M: The Commission should sponsor a follow-up study to examine and analyze nationwide surveys that link school size with the loss of consensus and rapport between teachers and principals.

Prior research indicates that the most successful schools have a school climate based on mutual "trust" and a sense of "connectedness" among staff. Such elements are essential to successful "restructuring".

Is there nationwide evidence to link school size with alienation and animosity among staff, or at least a loss of consensus?

- How much evidence is there to link school size with staff conflict and disagreements, including a lack of consensus between teachers and principals?
  - To what extent does school size result in a lack of consensus between teachers and principals on major problems facing the school, and how to deal with them?

10N: The Commission should sponsor a follow-up study to examine and analyze nationwide surveys that link school size with Physical Conflicts and Fear as problems facing schools.

Prior research indicates that a pervasive sense of fear and intimidation is a major problem in many school systems nationwide. Nationwide, school size may be closely linked to physical conflicts, which shape psychological stress and discomfort.

- How much nationwide evidence is there to link school size with fear and intimidation among teachers and students?
  - To what extent is school size correlated with a higher percent of teachers reporting problems of fear and intimidation and physical conflict that adversely affect the educational process?
  - Does school size increase problems with physical conflicts and fear among teachers independently of such status offenses as carrying or owning weapons?
  - Does school size increase problems with physical conflicts and fear among teachers independently of zero-tolerance policies?

INDIRECT COSTS

10O: The Commission should sponsor a follow-up study to examine and analyze nationwide surveys to link school size with the costs of construction, maintenance, and transportation.

In prior decades traditional estimation processes for construction costs indicated that schools with larger floor areas had lower costs per square foot. The implication was that construction costs were lower for schools projected to have larger enrollments. Such estimates ignored site acquisition costs. They also ignored indirect costs for future maintenance and transportation.

What is the evidence today? Is there nationwide evidence to document that school size has now become correlated with higher initial capital costs? Is school size now correlated with inflated costs for maintenance and transportation, whatever may have been the relationship in the distant past?

How about in New Jersey? Is there evidence for New Jersey that the physical size of schools is associated with extra costs for maintenance and transportation?

- To what extent does school size increase capital costs for schools, based on a meta-analysis of recent surveys of capital construction costs for school projects nationwide?
- To what extent does school size exaggerate the costs of dealing with vandalism problems?
- To what extent does the ***physical size*** of individual New Jersey schools affect the fiscal costs of dealing with academic problems, dropouts, absenteeism? What is the square foot "footprint" of each school, and how does physical size compound inefficiency problems with growing violence and declining test scores?
- To what degree is the physical size of schools correlated with transportation costs?

10P: SUBURBAN SPRAWL

To what degree do larger schools cause distortions in land use patterns, encourage suburban "sprawl", and discourage recycling and historical preservation goals in cities? To what degree is school size associated with metropolitan "sprawl" indicators?

10Q: The Commission should sponsor a follow-up study to examine and analyze linkages of school size with the need for school police and metal detectors.

Nationwide larger schools are far more apt to respond to problem of violence with programs to place police in the schools, and metal detectors at the front doors. The question is, do these responses help very much, compared to preventive measures like the small school learning community?.

- Is there evidence to document that school size is correlated with the use of remediation programs as Symbolic Responses to underlying problems, even where such programs do not eliminate the underlying problems?
  - To what extent does school size increase the need for remedial programs and intervention strategies to deal with school violence and other problems that increase costs for police and local taxpayers, and divert resources from mainstream educational programs?

10R: The Commission should sponsor a follow-up study to examine the effect of large schools on municipal tax rates, and aggregate local tax burdens.

Nationwide big schools are often found in urban communities faced with major "fiscal overloads". For example, municipalities with big schools tend to spend more on welfare and crime relative to taxable resources. How systematic is the relationship of school size with municipal overload, and why?

- Is there evidence to document that school size is correlated with aggregate municipal tax burdens among New Jersey communities?
  - To what extent do communities with larger schools faced inflated overall tax rates due to municipal overburdens from school crime, poor achievement, subsequent unemployment and other problems among dropouts and academic failures? To what extent are overall tax rates higher in municipalities where districts build larger schools?

10S: The Commission should sponsor a follow-up study to examine the adverse effects of school size on "hedonic" house prices.

A previous study in Ohio indicates that where districts consolidate and big schools produce big problems, the value of owner-occupied houses takes a nose-dive over time. What about New Jersey?

- Is there evidence to document that school size is correlated with decreasing house prices [relative to expected market values given the hedonic characteristics of the housing supply and the community].
  - To what extent is school size negatively correlated with house values? To what extent do districts with larger schools face declining house values, similar to problems other states face where house values decline over time in the face of inferior school quality like that found in larger schools?

10T: The Commission should sponsor a follow-up study to examine and calculate the extent to which dropouts deflate nominal spending costs for students in school, but maximize actual fiscal costs for governments in general.

This research indicates that school size is linked to more dropouts. However, once a student drops out, school costs may go down. Thus the linkage of school size with actual costs is often unclear, either short term or long term?

- What is the full scope of the long-term fiscal costs that governments face from dropouts?
  - What are the total fiscal costs faced by federal, state, and local government agencies from functional dropouts of the type disproportionately produced by large schools?
- Large schools often seem to spend less than very small schools per student. However, this often ignores the fact that large schools force large numbers of marginal students to drop out. If one took into account students who should be in school, but have dropped out, then the costs per potential graduate would appear much higher in large schools.
  - To what extent do districts with large schools actually cost more per **graduate,** after subtracting out from nominal enrollments both *de facto* and *de jure* dropouts who leave the school over time, including students who flee the system after their families rent or buy new houses in other districts to escape the problems produced by the factory-model school.

10U: The Commission should sponsor a follow-up study to examine and document the segregation effects of school size.

Large schools are often praised as an instrument to achieve integration. Are they?

- Large schools in many states disproportionately force out middle class families and their children from a district, leaving behind poverty students. To what extent is school size correlated with metropolitan sprawl and segregation of the poor in states like New Jersey?
  - To what extent do large schools in center city districts constitute "push" factors that isolate and concentrate poor students among the students who remain, while becoming a major factor that encourages metropolitan "sprawl".
  - To what extent do patterns of sprawl and de facto segregation over time for New Jersey resemble those for other educational systems in areas like
    - California
    - New York
    - Ohio
    - England

10V: The Commission should sponsor a follow-up study to examine the effects of school size on de jure versus de facto dropouts.

Jay Greene and others argue that many states obscure dropout rates by only counting "legally defined" dropouts. They fail to take into account how many students fail to graduate on time with a regular diploma, versus potential graduates predicted from prior enrollments by 7^{th}, 8^{th} or 9^{th} grade students. Even though students flee the schools, simply disappear into the underground economy, or end up in jail, they are not counted as dropouts.

Is this a problem for many districts or schools in New Jersey? More importantly, how does school size increase the need to look at *de facto* dropouts versus *de jure* "legally defined" dropouts? Using the Jay Greene index for *de facto* dropout rates, how much does school size affect *de facto* dropouts, and how much harm do these dropouts produce for themselves or for others?

A META-ANALYSIS OF INDIVIDUAL ATTITUDES AND BEHAVIOR RELATIVE TO PUBLIC HEALTH RISK BEHAVIORS

10W: The Commission should sponsor a follow-up study to conduct a meta-analysis of nationwide research to explain the effects of school size on Teacher satisfaction or dissatisfaction with the school climate. The research should begin with evidence from:

Hard, S. "Professional Learning Communities: What Are They and Why Are They Are Important," *Issues About Change*, Vol. 6, No. 1. Southwest Educational Development Laboratory, 1997	1997
Fine, M. and Somerville, J. (eds.) *Small Schools, Big Imaginations: A Creative Look at Urban Public Schools*. Chicago: Cross-City Campaign for Urban School Reform.	
Eberts, R. W.; Kehoe, E.; and Stone, J. A. *The Effect of School Size on Student Outcomes. Final Report*. Eugene, OR: Center for Educational Policy and Management, University of Oregon, June 1982 (ED 245 382).	1982

10X: The Commission should sponsor a follow-up study to conduct a meta-analysis of nationwide research to explain the effects of school size on Student satisfaction with the school climate. . The research should begin with evidence from:

Edington, E. D., and Gardener, C. E. "The Relationship of School Size to Scores in the Affective Domain from the Montana Testing Service Examination." *Education* 105/1 (Fall 1984): 40-45.	1984
Aptekar, L. "Mexican-American High School Students' Perception of School." *Adolescence* 18/70 (Summer 1983): 345-357.	1983
Lindsay, P. "The Effect of High School Size on Student Participation, Satisfaction, and Attendance." *Educational Evaluation and Policy Analysis* 4/1 (Spring 1982): 57-65.	1982

10Y: The Commission should sponsor a follow-up study to conduct a meta-analysis of nationwide research to explain the effects of school size on Student involvement in constructive extra-curricular activities, versus self-destructive drug use, alcohol abuse, sexual promiscuity, crime, and violence. The research should begin with evidence from:

Holland, A., and Andre, T. "The Relationship of Self-Esteem to Selected Personal and Environmental Resources of Adolescents." *Adolescence* 29/114 (Summer 1994): 345-360.	1994
Stevens, N. G., and Peltier, G. L. "A Review of Research on Small-School Student Participation in Extracurricular Activities." *Journal of Research in Rural Education* 10/2 (Fall 1994): 116-120.	1994
Schoggen, P., and Schoggen, M. "Student Voluntary Participation and High School Size." *Journal of Educational Research* 81/5 (May/June 1988): 288-293.	1988
Green, G., and Stevens, W. "What Research Says about Small Schools." *The Rural Educator* 10/1 (Fall 1988): 9-14.	1988
Hamilton, S. F. "Synthesis of Research on the Social Side of Schooling." *Educational Leadership* 40/5 (February 1983): 65-72.	1983
Grabe, M. "School Size and the Importance of School Activities." *Adolescence* 16/61 (Spring 1981): 21-31.	1981
Huling, L. "How School Size Affects Student Participation, Alienation." *NASSP Bulletin* 64/438 (October 1980): 13-18.	1980
Barker, R., and Gump, P. *Big School, Small School: High School Size and Student Behavior*. Stanford, CA: Stanford University Press, 1964.	1964