AMERICAN INSTITUTES FOR RESEARCH

Management Analysis and Planning, Inc.

The New York Adequacy Study:

"Determining the Cost of Providing All Children in New York an Adequate Education"

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versus school level functions as reflected in the fiscal reporting system in New York State.

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The AIR/MAP research team takes sole responsibility for the entire substance and content of this report and operated independently on arriving at any recommendations regarding the costs of adequacy.

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Executive Summary

What is the cost of providing all New York public school students a full opportunity to meet the Regents Learning Standards?

This report presents the results of a fifteen-month project undertaken jointly by American Institutes for Research (AIR) and Management Analysis and Planning, Inc. (MAP) to answer the question posed above. The following discussion summarizes the major components of this "costing out" study. "Costing out" is a term regularly applied to this type of analysis of adequacy in education. In the course of this endeavor, AIR/MAP obtained input from professional educators and convened a full-day meeting with representatives of taxpayers, school board members, parents, legislators, and other constituencies.

The Bottom Line

Excluding transportation and debt service, public schools in New York State spent about $31.71 billion in 2001-02 to educate its students.[1] This study suggests that an additional $6.21 to $8.40 billion would have been necessary in this same school year to ensure a "full opportunity to meet the Regents Learning Standards" to all students. Across this range of added expenditure, it was found that about 520 districts would have required additional funds, while the remaining 160 districts in the state were already spending at "adequate" levels.[2]

Research Methods

The methodological centerpiece for this study is referred to in school finance literature as a "professional judgment" approach. The AIR/MAP research team selected highly qualified New York State educators to serve on a series of professional judgment panels to design instructional programs necessary to meet the outcome goal specified above, i.e. a "full opportunity to meet the Regents Learning Standards."[3] These panels were then asked to specify the resources needed to deliver those programs.

AIR/MAP supplemented the information provided from these panels with commentary from an external cadre of researchers in the field, feedback from stakeholders outside of education, an analysis of staffing patterns in schools identified as "highly successful" in

[1] Analysis of expenditures on school transportation services and the debt service to acquire land and build school facilities was beyond the scope of the present study. Moreover, the $31.71 billion does not include federal and state funding for pre-kindergarten programs not administered by the Department of Education.
[2] The analysis omits districts designated as "Special Aid" as well as those with a minimal teaching staff.
[3] For a complete statement of the standards around which professional judgment panels were asked to design programs, see Appendix B in the full report.

serving their student populations, and econometric explorations of New York education labor markets.

AIR/MAP imputed costs to the instructional models resulting from this process. Various analytic techniques were used to estimate the costs of an adequate education. These included econometric modeling, analyses of "successful schools," and current research on school effectiveness.

Overview of Instructional Program Design

The instructional program designs developed by the PJPs added resources to reduce class sizes and add teaching specialists at all levels. This was especially true in the early grades to support improved reading and math programs. The panels also added resources for early education and extended day and summer school programs, especially for schools with higher proportions of students in poverty. Early education programs were included to help students prepare for school. The extended time programs were directed toward students currently unable to master the requisite skills during normal school hours. These programs were especially focused on children from economically disadvantaged families.

Why a Range of Numbers?

The range of numbers presented above reflects the fact that "costing out" methods are not an exact science. These analyses rely primarily on professional judgments regarding the services needed to achieve the outcome standard specified above. They also rely on assumptions regarding other factors likely to affect overall cost. An important example is the potential change in district administration that might be needed to support the instructional program descriptions derived through professional judgment. These alternative specifications and assumptions and their affect on the overall cost estimate for the state are described in detail in the full report. Reasonable people legitimately can disagree with these assumptions and would arrive at different conclusions using an alternative set. For this reason, full transparency regarding the full set of processes underlying this study, the varying assumptions used, and their effect on cost is essential. The state-of-the-art in pedagogy precludes predicting with certainty the ultimate effect of any intervention or outcome.

Public Engagement & the Professional Judgment Process

The initial stages of this project were devoted to a series of public engagement meetings in which the citizens of the state were provided an opportunity to express their views on what criteria should be used to define adequacy and what would be required to achieve adequacy in public schools. An important result of these meetings was the outcome standard specified for the study, i.e. providing all students with a "full opportunity" to meet the Regents Learning Standards.

Following the public engagement meetings, the AIR/MAP team developed a process for selecting "highly qualified" educators to serve on a series of professional judgment panels. Eight panels were organized to create descriptions of instructional programs that would meet the outcome criterion listed above for all children. These initial eight panels were asked to describe "adequate" programs for students living in poverty, for English language learners (ELLs), and for students in special education. Two additional panels were selected from the membership of the original eight to specify special education programs in more detail.

Following these initial meetings, the AIR/MAP team organized one additional panel from representatives of the first ten panels to help the research team synthesize, interpret, and revise the resource specifications. This panel, referred to as the *Summary PJP Team,* met on two occasions.

"Adequate" cost estimates were made at three stages of the professional judgment process. Stage 1 estimates are based on the initial specifications developed by the ten original PJPs that met during the summer of 2003.

Stage 2 estimates include revisions made by the *Summary PJP Team* at the first of its two meetings in December of 2003. These revisions included refined estimates of the variations in the enrollment patterns for add-on programs as well as other changes in the resource specifications.

Stage 3 include final revisions of the *Summary PJP Team* during their January 2004 meeting. This primary pertained to services for English language learners.

In general, the analysis of school program costs derived from the work of the PJPs show lower per pupil costs for larger schools, higher per pupil costs for schools with greater numbers of students in poverty, who require ELL services, or are in special education. Reflecting the judgment of the panels, poverty was seen to have an especially substantial influence on cost.

Central Administration, Maintenance, and Operations Costs

To compare the school program costs derived from the PJP process with current spending in the state, it was necessary to add cost estimates of such district-level functions as central administration and maintenance and operations, which were not included in the PJP process. Two alternative approaches were used to provide lower and upper bound cost estimates. One method simply uses current spending on these district-level functions. The alternative approach assumes that spending on at least some district-level functions will need to change in proportion to changes to instructional program spending based on the PJP specifications. While more precise analysis of district-level functions is beyond the scope of this study, it was felt that these parameters provide reasonable bounds for considering administrative costs within this context.

Geographic Cost Differences

The next step in the analysis was to develop an adjustment for geographic cost differences, i.e. variations in the cost of recruiting and employing comparable school personnel in districts across the state. These analyses focus on the compensation of public school teachers which, based on previous work by Chambers (1981b, 1997), has been shown to be highly correlated with cost differences for other categories of school personnel.

Four alternative models were used to estimate patterns of teacher compensation.[4] Each showed highly similar patterns that are highly correlated with one another (all above 0.97). Depending on the model, districts with the highest teacher personnel costs pay anywhere from 40 to almost 60 percent more than the lowest cost districts for comparable teachers.

The model finally selected for use in this report is the most conservative in terms of the range of costs. This model was selected because it controls more effectively than the others for differences across districts in the qualifications of the teacher workforce. This is in keeping with the goal to isolate the impact of factors outside local control.

The results of these analyses were compared to variations in the cost of housing in New York State and in compensation for non-education wage earners with qualifications and background characteristics similar to teachers. For the most part, these analyses exhibit patterns of variation in cost similar to those observed for public school teachers throughout the state. Correlations between the teacher cost indices and these alternative measures were well above 0.80.

These analyses also indicated that teacher qualifications and job assignments interact. While level of compensation is clearly associated with ability to attract fully certified staff, teachers also appear willing to accept somewhat lower wages when they are allowed to spend more time teaching in subjects for which they are fully qualified.

The Results

Stage 3 Cost Estimates

Based on the PJP specifications at stage 3, in order to provide all students a "full opportunity" to meet the Regents Learning Standards New York State would have had to spend an additional $7.20 billion in 2001-02 (see Exhibit 4-2) on districts not spending at "adequate" levels, while holding higher spending districts in place.[5] This represents an

[4] These include one that estimates separate equations for each of four years, a pooled cross-section time series model, a model that adjusted estimates for teacher turnover, and a teacher fixed-effects model. The availability of multiple years of data on individual school personnel permitted the analysis to compare and identify consistent patterns in cost differences over time.

[5] We have preserved the numbering of the exhibits in the Executive Summary to reflect those found in the main body of the full report.

increase of 22.7 percent (i.e., a total spending level of $38.91 billion) over the actual spending levels of $31.71 billion in that same year.[6]

Based on these results, New York City Schools, enrolling approximately 37 percent of the state's students, would require an additional $4.46 billion in 2001-02 dollars, an increase of 39.1 percent. Districts with average and high "needs to resource capacity[7]," accounting for 30.7 and 14.1 percent of the statewide enrollment, would require additional expenditures on the order of $1.23 billion and $1.00 billion, respectively. Districts in the four big urban cities outside of New York City (approximately 4.6 percent of state enrollment) would need an additional $0.42, billion.

Exhibit 4-2 - Total Expenditure Required to Bring All Districts to "Adequate" Spending Levels (Total Expenditure in Bold)

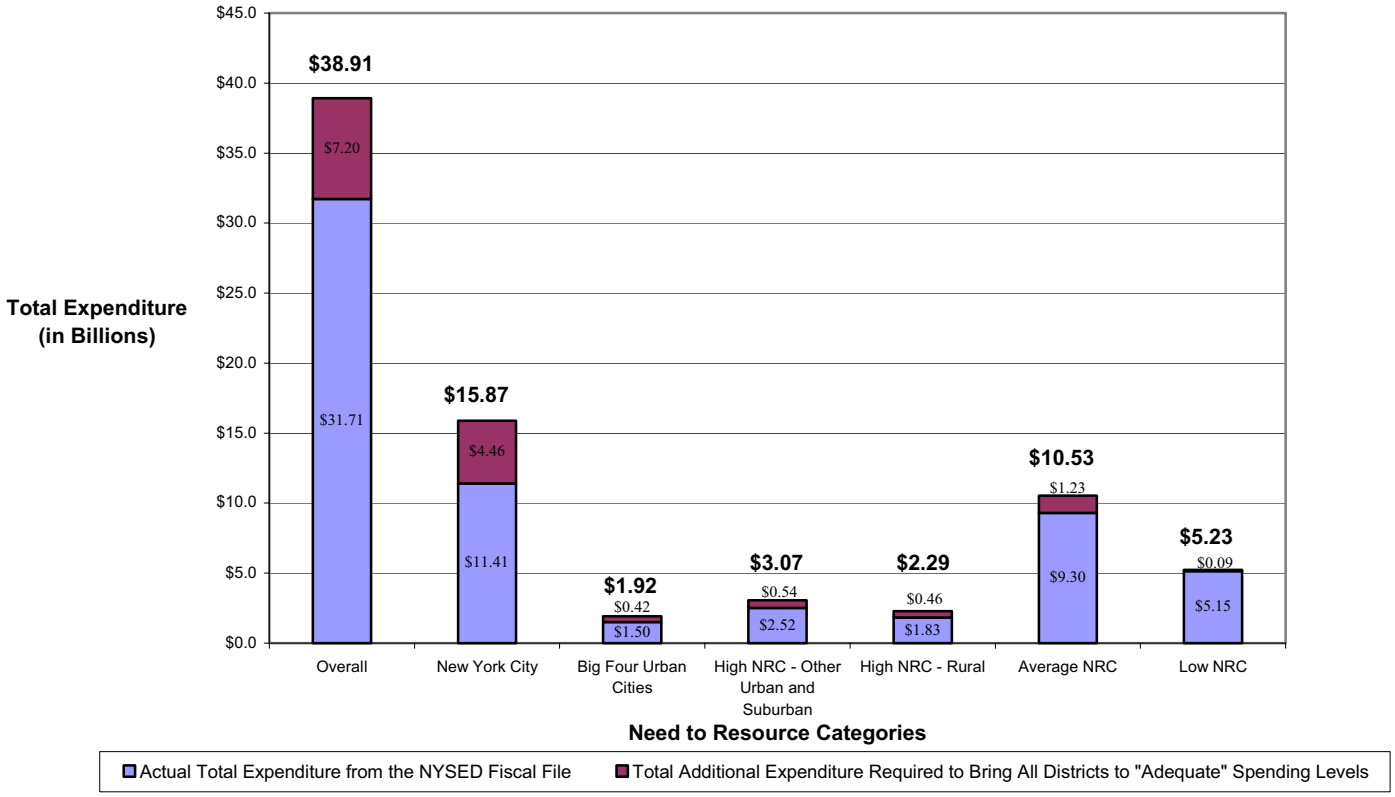

Exhibit reads: Total expenditure in 2001-02 was $31.71 billion. An additional $7.20 billion would have been necessary to bring all districts spending at less than adequate levels up to adequacy. Note, actual and additional expenditures may not add up exactly to totals (in bold) due to rounding errors.

[6] Neither of these figures, the estimate of needed $7.20 billion or the $31.71 billion in actual spending, include home-to-school transport, district debt service, facility construction costs, or inter-district tuition payments.

[7] The "needs to resource capacity" (NRC) index is a technical measure used by the New York State Education Department to capture the relationship between a school district's pupil needs and its locally taxable wealth.

Alternative Cost Estimates:

As suggested above, differing assumptions regarding how many stages of the PJP process to include and how to calculate district-level functions leads to different cost estimates. Exhibit 4-3 below presents overall differences in the estimates of the costs of adequacy at the different stages (1, 2, and 3) of the professional judgment process. In addition, it also displays the impact of allowing for some growth in spending on district-level functions (overhead) in association with changes in spending on instruction.

Exhibit 4-3 - Total Actual and Projected Expenditures by Simulation Model

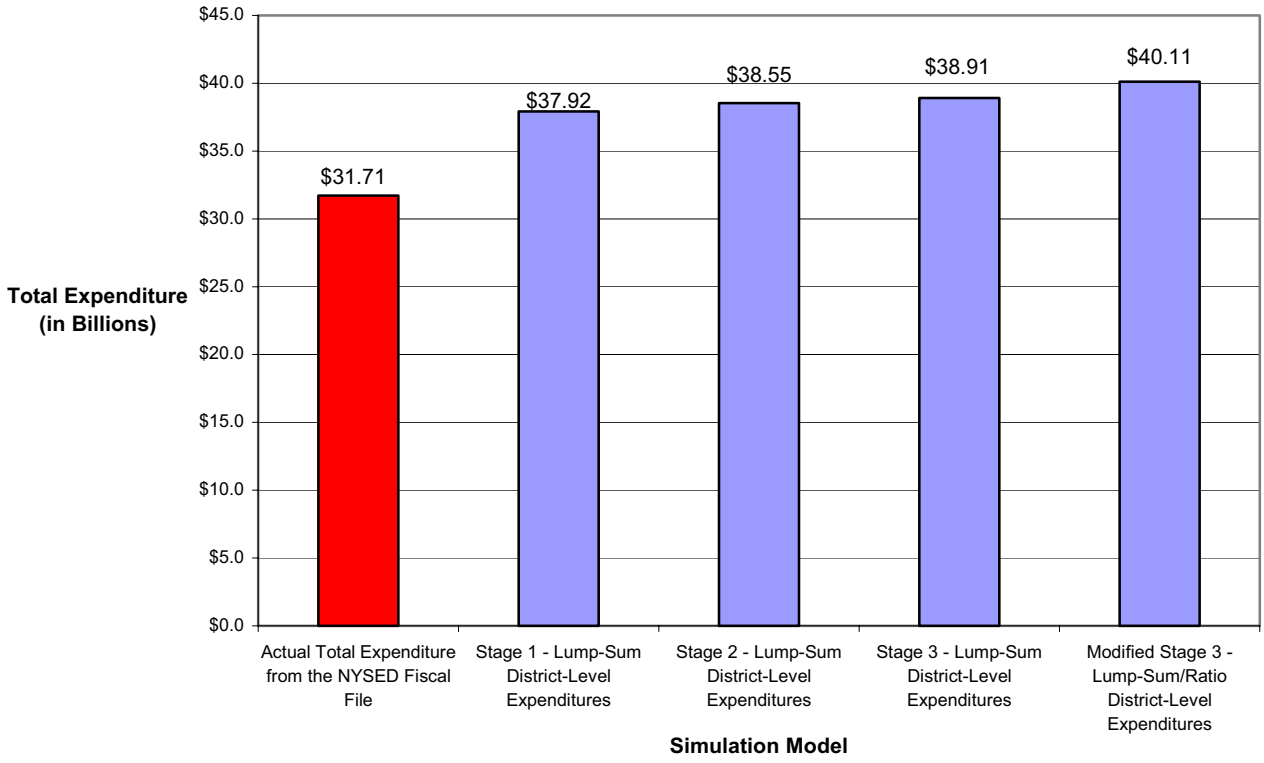

Exhibit reads: Total expenditure in 2001-02 was $31.71 billion. Using the Stage 1 resource specifications an additional $6.21 billion would have been necessary to bring all districts spending at less than adequate levels up to adequacy, making a total expenditure of $37.92 billion.

Compared to total current spending of $31.71 billion, the Stage 1 specifications suggest that an additional $6.21 billion would be necessary to achieve adequacy in New York State. At Stage 2, which reflects a revised estimate of the projections of targeted enrollments in the preschool and elementary extended time programs as well as modified resource configurations at the middle and high school levels, the estimated additional necessary expenditure increases to $6.84 billion.[8] The Stage 3 estimate (i.e., $7.20 billion) is the same as that presented in Exhibit 4-2. The difference between Stages 2 and 3 reflects an increase in the resources specified for ELL students that were considered

[8] The only change between Stages 1 and 2 at the elementary level was in the projected number of students who would be enrolled in the preschool programs and the extended time programs. There were no changes in the resource configurations in the preschool and elementary extended time programs. Chapter 4 in the main body of the report contains a more detailed account of how the specified resource configurations and targeted enrollments changed over the three stages of the professional judgment process.

during the January meeting of the *Summary PJP Team* carried out in response to comments made at the end of the December 2003 meeting of the *Stakeholder Panel.*

The modified Stage 3 cost estimate of $8.40 billion is highest because it includes spending on district-level functions that, to some degree, were assumed to grow in proportion to changes in instructional spending.

Thus, the estimates range from a low of $37.92 billion to a high of $40.11 billion. Using current (i.e., 2001-02) spending as a base, these estimates suggest that the additional investment required to achieve adequacy in New York State public schools ranges from 19.6 to 26.5 percent.

Patterns of Cost Differences

As shown in Exhibit 4-8, geographic cost variations, the scale of district operations, and differences in pupil need all play distinct roles in accounting for variations in the estimated cost of achieving adequacy. Analysis of the variations in the patterns of scale and need revealed that the five large urban districts tended to exhibit relatively high projected expenditures based on pupil needs, all else equal, and relatively lower projected expenditures associated with scale of operations, all else equal. New York City and other districts in the New York metropolitan area tend to exhibit the highest geographic cost differences associated with the salaries of school personnel.

Exhibit 4-8 - Relative Scale and Need Indices and Implicit GCEI by Need to Resource Capacity Category Based on Model Using Actual School Enrollment

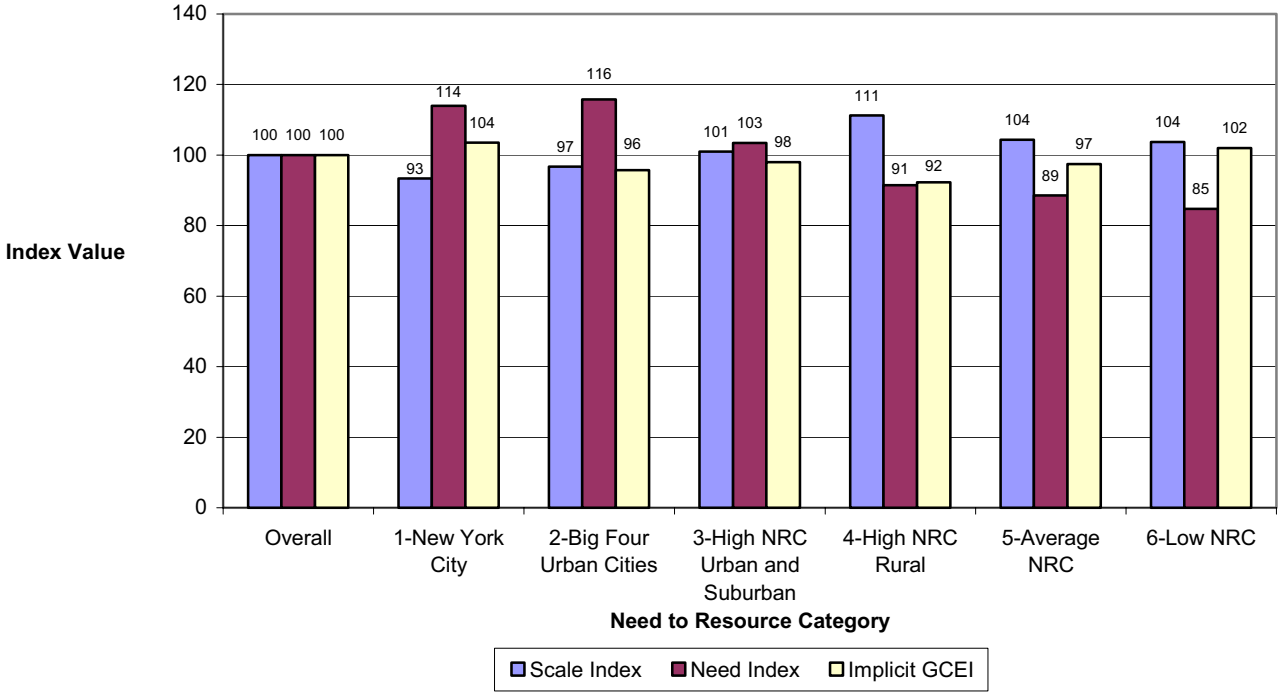

Exhibit reads: It costs approximately 4 percent more to hire a qualified teacher in New York City relative to a comparable teacher that instructs the average student in the state. Pupil needs in New York City are 14 percent higher that the statewide pupil-weighted average.

Concluding Remarks

Scale of operations and the distribution of special student needs (poverty, ELL, and special education) are the two major factors underlying the cost variations shown in this study. In turn, policy makers should consider the relative weights they choose to place on each of these factors. Due to the highly integrated fashion by which each of them was treated within the model, however, they may be best suited to block grant, as opposed to categorical, funding approaches. For example, categorical funding mechanisms such as special education funding weights will not be easily derived from this approach.

Also, although the Professional Judgment Panels derived instructional designs by which schools could construct an adequate opportunity to meet the Regents Learning Standards, this theoretical design does not include, or recommend, that the specific components of these models become mandates for local practice. However insightful the instructional designs created by Professional Judgment Panels or persuasive the case for their effectiveness, education continues to be as much of an art as it is a science. Harnessing creativity and commitment, and taking advantage of the experience of local educators, necessitates providing them with discretion to determine exactly how funds should be used.

Chapter 1 - Introduction and Overview

What is the cost of providing all New York public school students a full opportunity to meet the Regents Learning Standards?

This report presents the results of a fifteen-month analytic and scholarly effort undertaken jointly by American Institutes for Research (AIR) and Management Analysis and Planning, Inc. (MAP) to answer this question. This is a "costing out" study. "Costing out" is a term regularly applied to this type of analysis of adequacy in education. In the course of this endeavor, the AIR/MAP team obtained input from professional educators and held conversations with representatives of taxpayers, school board members, parents, legislators, and other interested constituencies.

With a combination of federal, state and local sources of revenue, the public schools in New York State spent a total of $31.71 billion in the 2001-02 school year to educate its students. This amount is subsequently referred to in this report as total current expenditure.[9] The estimates developed in this study suggest that the costs of an adequate education in New York State will require an additional investment of somewhere between $6.21 and $8.40 billion.

It is important to understand how to interpret these estimates. The range of estimates presented above reflect the amount of funds that will be needed to bring all districts not currently spending at levels deemed adequate by the analysis in this report up to a level to provide all students within those districts the opportunity to meet the Regents Learning Standards. The analyses contained in this report suggest, depending on the assumptions, that somewhere between 516 and 520 school districts are currently spending below adequate levels out of the total of 680 regular school districts in New York State.[10]

By implication, there are some districts in the State of New York that are already spending at adequate levels. This is not to claim that these districts spend too much money. They may well be spending more than the AIR/MAP projections of what is "adequate" simply because they are responding to community determinations of local needs or community preferences for added instructional and co-curricular activities. This is not a judgment that researchers are empowered to make, but rather a decision for local school boards and citizens.

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[9] Total current expenditure equals total expenditure less expenditures on transportation services and debt service. The present study excludes any analysis of expenditures on school transportation services and the debt service to acquire land and build school facilities. While these components are important, they are simply beyond the scope of the present study primarily because of time and budget limits to support the current work. Future work should be undertaken in these areas.

[10] As mentioned above, the analysis includes only those districts not defined as "Special Aid" or with a minimal teaching staff.

The foundation for these estimates is based on the recommendations of a series of professional judgment panels made up of highly qualified educators. The instructional program designs that they developed suggest the need for additional resources to reduce class sizes and add teaching specialists at all levels, but especially in early grades to support improved reading programs and programs designed to improve student facility with numbers. Additional dollars are also needed to support early education programs and extended day and summer school programs for schools serving greater proportions of children living in poverty. Early education programs help students prepare for school and be ready to learn the critical reading skills that will be essential to their educational success. The extended time programs are directed toward students who are currently unable to master the requisite skills during normal school hours. Moreover, additional support resources will be required to support children and families from economically disadvantaged families.

Why do we report a range of numbers rather than a precise estimate? The "costing out" methods are not based on an exact science. Studies of education are no different from other studies by economists that are built on a foundation of assumptions about services necessary to achieve a certain goal for society. What will it cost to land a man on the moon, to clean up an oil spill in Alaska, or to eradicate a deadly disease? Each of these questions requires analysts to build a structure for costing out similar to what has been done in the present study. It follows that different assumptions can lead to different results.

In this report, the AIR/MAP team has attempted to make transparent all of the important assumptions. Reasonable people legitimately can disagree with these assumptions and would arrive at different conclusions using an alternative set. The state-of-the-art in pedagogy precludes predicting with certainty the ultimate effect of any intervention or outcome. A range of estimates is presented here along with the series of assumptions underlying each estimate. The transparency of this process allows readers or policy makers to make their own assessment of what assumptions or foundations they are willing to accept and to come up with what they regard as a reasonable estimate of the cost of achieving the goal.

Research Methods

The methodological centerpiece for this study has been what is referred to in school finance literature as a "Professional Judgment" approach. Suffice it to note here that the AIR/MAP research team selected highly qualified New York State educators to serve on a series of professional judgment panels to design instructional programs necessary to provide an opportunity for all children to meet the Regents Learning Standards.[11] These panels were then asked to specify resource requirements needed to deliver those programs. Detailed descriptions of the manner in which these teams operated are provided in Chapter 2.

[11] For a complete statement of the standards around which professional judgment panels were asked to design programs, see Appendix B to this report.

AIR/MAP supplemented these panels with commentary from an external cadre of researchers in the field, feedback from stakeholders outside of education who represented parties with an interest in education, an analysis of staffing patterns in schools identified as highly successful in serving their student populations, and econometric explorations of New York State school personnel labor markets. AIR/MAP analysts imputed costs to the instructional models designed by Professional Judgment Panels.

Financial "Adequacy" in a New York State Context

The concept of education funding "adequacy" was initially raised in New York State by the Court of Appeals in its 1982 decision in *Levittown v. Nyquist*, 57 N.Y.2d 57 (1982) that the state's constitution guaranteed all New York children an opportunity for a "sound basic education." The Court did not, however, attempt at that time to define a "sound basic education."

In response to *Levittown*, the New York State Education Department convened a task force to define this critical term. That group decided that a "sound basic education" could best be defined not in the abstract, but in terms of learning standards. This decision led to an extensive state-sponsored research and public engagement process culminating in 1996 in the issuance of the Regents Learning Standards. The Regents Learning Standards establish detailed expectations for student achievement in seven academic content areas. In order to obtain a high school diploma, New York students must pass a set of Regents Examinations based on these standards.

Implementation of the Regents Learning Standards has led to extensive reforms in what and how schools teach and how classroom teachers are prepared and certified. However, there has not yet been a systematic attempt by the state to determine the amount of funding necessary to implement these reforms and to ensure that all schools have the resources needed to provide students an opportunity to meet the state's challenging new standards. The research results reported here are intended to remedy that gap.[12]

In 1993, the Campaign for Fiscal Equity (CFE) challenged the state's school financing system on the grounds that it failed to provide students sufficient opportunity for a sound basic education in New York City. CFE prevailed at the trial level. In 2001, State Supreme Court Justice Leland DeGrasse declared New York State's school finance arrangements unconstitutional. The decision was appealed and implementation of a remedy was consequently delayed.

In June of 2002, the state's intermediate appellate court, the Appellate Division, First Department, reversed Justice DeGrasse's decision. The New York Court of Appeals, the state's highest court, subsequently accepted jurisdiction of the case, and its final decision,

[12] It must be recognized that the success of schools also depends on other individuals and institutions to provide the health, intellectual stimulus, and family support upon which public school systems can build. Schools cannot and do not perform their role in a vacuum, and this is an important qualification of conclusions reached in any study of adequacy in education. Also, success of schools depends on effective allocation of resources and implementation of programs in school districts.

issued in June of 2003, reversed the Appellate Court's decision and largely upheld the trial court's original decision. Thus, New York State's current education funding arrangements have been definitively determined to be unconstitutional and must be altered to ensure that funding is "adequate."

Standards as a Means to Determine "Adequate" Resources

The Court of Appeals decision emphasizes the need for 21st century students to achieve academically at levels enabling them to perform productively in the economy and engage in civic activities such as voting in an informed manner and serving effectively as a juror. Previously mentioned, the New York State Board of Regents for reasons similar to those stated by Justice DeGrasse adopted "Learning Standards". Consequently, this research project's quest for "adequate" school funding relies upon the Regents Learning Standards as the performance criteria.

Conceptual Framework

To achieve this study's objectives, the AIR/MAP research team determined conditions associated with school cost levels. The rationale here is that available revenues should, at a minimum, be sufficient to provide an opportunity for all students to meet the Regents Learning Standards and should be adjusted for cost variations beyond a local school districts' immediate control.

AIR/MAP used a variety of analytical techniques in combination to estimate the costs of an adequate education. The professional judgment approach formed the centerpiece of the work. However, components of the analysis draw on other methodological tools and models to further support the results of the professional judgment model. These other methods include econometric methods, analyses of "successful schools," and current research on school effectiveness.

Professional Judgment Model (PJM)

AIR principal investigators involved with this research project pioneered means for involving informed educators in the process of designing costing-out models. Initial research in this arena was conducted in Illinois and Alaska (see Chambers and Parrish, 1982 and 1984). These early studies were primarily oriented around input models that geared toward defining programmatic models that were appropriate to meet the service delivery needs of different student populations.

MAP principals more recently built on these prior developments in research performed for the states of Wyoming, Maryland, and Minnesota. MAP constructed simulation exercises to take advantage of the professional knowledge and expertise of teachers, principals, business managers, superintendents, and others to construct instructional programs capable of achieving specified student learning objectives.

In this research project, AIR/MAP researchers used the Professional Judgment Model approach, tailored to New York State's various types of schools and districts to determine

the cost of an adequate education as designed by ten specially convened professional judgment panels (subsequently referred to as PJPs) of 56 highly qualified educators.

There are three elements that distinguish the current work in New York and some of the more recent applications of the professional judgment model (e.g., MAP, 1997, 2001; Augenblick, 1997, 2001; and Augenblick and Myers, 2003) from the earlier work of Chambers and Parrish (1982a, 1984) on professional judgment. First, the goals established for the professional judgment panels (subsequently referred to as PJPs) are clearly focused more on student outcomes. In the case of New York, it is represented in the Regents Learning Standards established by New York State.

Second, the professional judgment panels are asked to begin their deliberations by designing instructional programs at each school level. It is only after thinking about the content and structure of the educational program that the panels are then asked to develop the resource specifications necessary to delivery the services necessary to achieve the desired results for children.

Third, the professional judgment process is structured to provide for a more integrated approach to meeting the diverse needs of students. The early models developed by Chambers and Parrish organized separate panels to develop delivery systems for the various categories of children. The current process organizes educators to work together immediately to think about the instructional needs of all students in a more integrated fashion, and permits the educators to decide how to reflect the needs of the diverse groups of students to be served.

The professional judgment model as implemented in New York included organization of two additional panels. One of these additional panels was selected from representatives of the original professional judgment panels, and this panel was referred to as the *Summary PJP Team.* The *Summary PJP Team* was organized to review the synthesis that the AIR/MAP team developed of the delivery systems designed by the original PJPs. The second additional panel was made up of stakeholders who are non-educators who represent various parties who have an interest in the financing of education. These stakeholders represent parents, taxpayers, the state legislature, the governor's office, school board members, and the business community.

Econometric Methods

The availability of the large-scale databases maintained by New York State's Education Department, made it possible to undertake econometric analyses of education-related costs. AIR/MAP relied upon econometric tools and standard labor market models to ascertain differences in the costs of comparable school personnel (teachers) from one geographic region to another within New York.

Econometric tools were also relied upon in exploring the variations in the patterns of projected per pupil expenditures. Specifically, once the projections for each district were developed from the professional judgment model, the AIR/MAP team examined the

patterns of variation in the costs of adequacy and how these related to variations in the scale of district operations and pupil needs.

Analysis of Successful Schools

The AIR/MAP team also constructed indices of student performance for New York schools, and then used econometric and statistical methods to identify those schools that were "unusually successful" or who were "beating the odds," so to speak.[13] These schools were unusually "successful" in producing high student performance relative to what researchers conventionally would predict from the characteristics of students served. To ensure consistent success for a significant length of time schools were labeled "successful" by the AIR/MAP research team if they maintained superior performance on average over a four-year period.

The primary use of the *successful schools* analysis was to help AIR/MAP select candidates who might serve on the professional judgment panels (PJPs).[14] In addition, staffing data for the *successful schools* were provided as background for, and to be included in, the deliberations of a meeting of a group of PJP representatives, who were asked at a later stage of the process to review the AIR/MAP synthesis of the PJP program designs and specifications. For more on the successful schools analysis and staffing profiles of those schools deemed "successful" the reader is referred to Appendix I.

Current Research

Educational policy literature contains a number of empirical studies of the consequences of educational settings and instructional strategies on student performance. Several of these studies have suggestive findings about such things as class and school size, early intervention programs, and professional development. The AIR/MAP team distilled and synthesized these data and provided an objective description of some of the mainstream educational research as background for PJP deliberations. This account of potentially effective settings and instructional practices can be found in Appendix B.

What Professional Judgment Panels Were <u>Not</u> Expected to Accomplish

Panels were not asked to determine levels of service involved in transporting students, maintaining and operating buildings, operating a district office, or providing food service. Similarly, debt service and major facility construction matters were not within the purview of the PJPs. In a later analytic stage, the AIR/MAP team reincorporated cost estimates for district office functions as well as the maintenance and operations of district and school buildings.

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[13] The outcomes included in our analysis of successful schools include percentage of students meeting the Regents Learning Standards requirements for English and mathematics (for high schools) or students on a trajectory to do so (for elementary and middle schools), student attendance, and dropout rates (for high schools only).

[14] This selection process is described in further detail below.

It should also be noted that no analysis of the expenditures on home-to-school transportation services or on debt service for school facilities was carried out as part of this project. Exclusion of these components is not to say that they are not important. Both interact in significant ways with any effort to address the adequacy of funding for educational services. However, these components of school expenditure require specialized analyses beyond the original scope of this project.

PJPs were not asked to impute dollar costs to the instructional programs they designed. Relying on labor-market adjusted professional salary figures for educators and state mean costs for matters such as fringe benefits, AIR/MAP researchers imputed these costs. PJPs were not asked initially to develop sophisticated cost adjustments for economies and diseconomies of scale accompanying large or necessary small schools and school districts. The AIR/MAP team used statistical methods in combination with the PJP specifications to estimate school and district scale economies. However, a subsequent meeting of the *Summary PJP Team* was convened to review and revise the AIR/MAP projections to account for the impact of small school size on resource specifications.

PJPs were not asked to convert instructional designs into state education finance distribution formula components. Presumably, this is a legislative and executive branch prerogative and not one for which most professional educators are equipped by training or temperament to perform.

PJPs were not requested to determine instructional programs or costs associated with a transition from what now exists to what might or ought to exist. Many individuals have raised questions regarding the resource intensity that PJPs accorded elementary and early childhood education in their design of what is "adequate." These panels repeatedly expressed a philosophy or instructional strategy of early intervention. Moreover, they were certainly sensitive to the large body of students now in secondary school ill positioned to benefit from proposed early interventions.

In the same manner, PJPs were not asked to reform other, often quite important, components of New York's education system. School district consolidation, charter schools, devolution of authority in large districts, school board structural reform, and a long list of other possible changes might well be in order. However, they were not the focus of PJP deliberations.

Finally, professional judgment panel participants were not asked to consider per pupil or aggregate costs or the statewide (re)distributional consequences of instructional designs. However important these school finance dimensions, they were set aside as policy-system prerogatives beyond the purview of professional educators. Their role was focused on developing appropriate delivery systems to achieve desired student outcomes.

An Overview of the Project

Exhibit 1-1 provides an overview of the organization of the project so the reader can see how the various steps in the process relate to one another.

Phase 1 of the project focused on the public engagement and initial successful schools analyses. The public engagement processes, which are described in more detail in Chapter Two, were designed by the Campaign for Fiscal Equity (CFE) to provide the general public with the opportunity to provide input on the goals and objectives of the process and on their thinking about what would be required to achieve the desired results for children. Immediately prior to the implementation of the public engagement process, CFE organized the Council for Costing Out (CCO), which encompasses a multitude of organizations and agencies with an interest in education and school finance in New York State. It is through the CCO that AIR/MAP was able to establish linkages with numerous agencies that facilitated the legitimacy of the study and helped gain access to necessary data during the course of the project. The CCO also provided a linkage to organizations from which the AIR/MAP team was able to obtain nominations for those who might participate in the professional judgment process.

The initial components of the successful schools analysis was directed toward identifying schools that would be contacted to search for highly qualified educators to participate on the one of the PJPs. The members of the PJPs were ultimately selected by the AIR/MAP team based on responses to the inquiries.

Phase 2 of the process included the meeting of the professional judgment panels. These included eight general education panels and two special education panels.

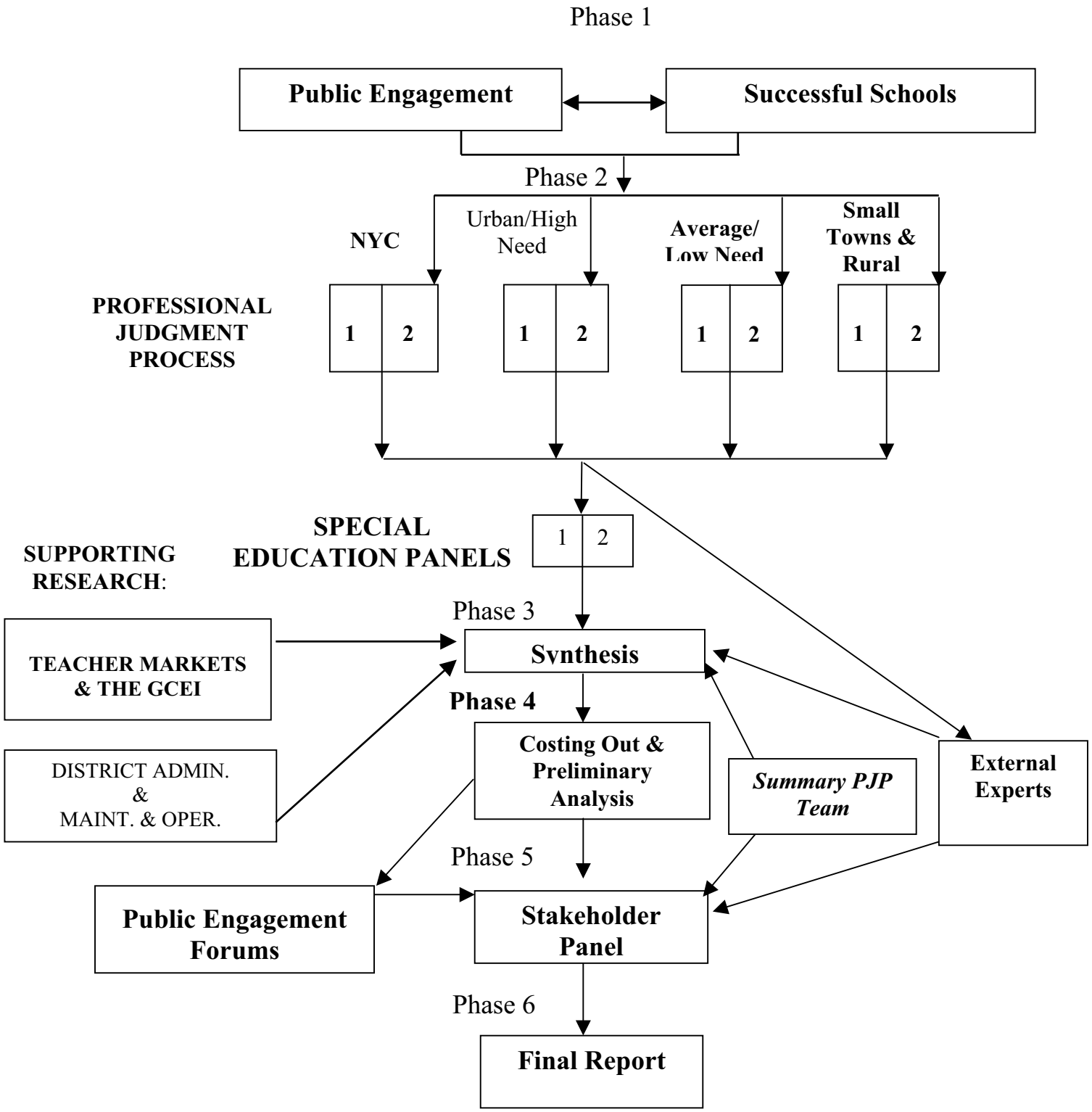
Phase 3 included three components: namely, the synthesis of the initial program specifications, an analysis of teacher markets and geographic cost differences, and an examination of current fiscal data to estimate current spending on district level functions not included as part of the professional judgment process. The analysis of teacher markets was, for the most part, focused on ascertaining how much more or less it costs to recruit and employ comparable resources across geographic locations within the State of New York.

Phase 4 included development of the initial estimates of the cost of the school prototypes and some preliminary numbers related to the cost of adequacy. It also included the conduct of reviews by the external panel of experts: Henry Levin, Margaret McLaughlin, Kenji Hakuta, and Gary Natriello.

Phase 5 included meetings of the *Summary PJP Team* and the *Stakeholder panel* along with public engagement forums that presented the preliminary results of the analysis to the public.

Phase 6 is the production of the final report, which brings all of the various pieces together.

Exhibit 1-1: Overview of Project Components



Organization of This Report

This report contains five main chapters and an extended set of formal appendices available in a separate document. Chapter 1 provides some context to the project and provides an overview of the results. Chapter 2 describes how the professional judgment process is utilized to construct the foundation for estimating the cost of an adequate education. Chapter 3 shows how geographic differences in the cost of school personnel are accounted for in the analysis. In Chapter 4 the detailed results of the actual "costing out" are presented. Chapter 5 offers conclusions and observations regarding processes involved with and outcomes from this study.

Report Appendices (A through L) contain technical information and copies of materials provided to the 56 New York education professionals who comprised the professional judgment panels upon which the AIR/MAP research team depended to design instructional programs capable of delivering an "adequate" education for public school students in the state. Because of the magnitude of these appendices, they have been placed in a separate document.

The five chapters of this report and detailed appendices will enable a reader to comprehend fully this study's results. In addition, however, this detailed reporting is intended to fulfill one of the research team's principal objectives, rendering transparent the processes by which "adequate costs" were determined. These detailed materials and descriptions of processes should enable other analysts to repeat these methods and to substitute their own assumptions for those of the AIR/MAP researchers, should they desire. As will be illustrated in a subsequent section, costing out analyses are highly sensitive to the underlying assumptions.

Chapter 2 - Measuring Pupil Need Through the Professional Judgment Process

The key element of this study's approach to estimate the cost of providing all students an opportunity to meet the Regents Learning Standards is what is commonly referred to as professional judgment (PJ). The primary characteristic of PJ methodology is that the levels of resources necessary to deliver desired outcomes are estimated from systematically derived judgments of groups of highly qualified education professionals. In most instances where PJ methodology has been employed, researchers have relied solely, or almost exclusively, on the outcome of the professional judgment process. In this study, the researchers have attempted to augment that judgment by engaging other interested parties in addition to examining resource allocation patterns of successful schools.

The first phase of the study entailed a process of public engagement and identification of successful schools. The successful schools analysis is discussed in more detail in Appendix I of this report. Public engagement is a unique component of the AIR/MAP study that tends to set it apart from similar studies. In this study, the opinions of a broad base of individuals and groups interested in public schools were obtained to augment and to inform the judgment of professional educators who participated directly in the professional judgment process.

Public Engagement

During the spring of 2003 the New York State Council for Costing Out[15] (CCO) convened 13 meetings around the state to provide a forum for interested parties to address two questions:[16]

- What constitutes an adequate educational opportunity?
- What do public schools in New York need in order to ensure all their students an opportunity for an adequate education?

The first question was fundamental to the PJ process. Any estimation of costs requires first the definition of "cost to do what?" That is, what are the specific outcomes to be produced? The Court of Appeals in 1982 articulated a "sound basic education" as the standard. The Regents defined sound basic as meeting the Regents Learning Standards, and Judge DeGrasse considered, in part, the need for students to be able to perform productively in the economy and engage in civic activities such as voting and serving as

[15] The Council for Costing Out (CCO) is comprised of representatives of a number of stakeholder organizations with an interest in education. The complete list of representatives and their organizations is included in the acknowledgments to this report.

[16] For a detailed report on public engagement see: New York State Council on Costing Out, Adequate Funding for New York's Schools: Communities Speak Out on What Students Really Need to Succeed; June 2003. A copy of this report is provided in Appendix A of this report.

jurors. Forum participants quickly agreed that the outcome standard should be the Regents Learning Standards, but struggled with whether universal achievement was realistic. Consensus ultimately was reached that the outcome standard should be that all students be provided with a *full opportunity* to meet the Regents Learning Standards.

On the second question, there was a strong consensus that the following interventions and programs were critical to providing all students, especially those who are deemed at-risk, a full opportunity to meet the Regents Learning Standards:

- Early childhood programs, such as Head Start, full-day pre-kindergarten, and full-day kindergarten, supplemented with strong parent education components should be available for all students.
- Intensive early literacy programs, with specially trained teachers or tutors, are essential to ensure that all children read and write at grade level by the third grade.
- Academic intervention services, including after-school, summer school, and other programs that extend time on task should be available for all students who need them.
- Depending on concentrations of students with special needs, small classes of 10 to 20 in elementary grades, 20 to 25 in middle grades, and up to 25 in high schools were recommended.
- All students should have adequate access to guidance, social, and psychological support services.
- High-quality professional development aligned with learning standards directly related to teacher capacity and student-learning needs should be available to all teachers.
- Schools should make a maximum effort to involve all parents in their children's education.
- All special education students should receive the services of well-trained and highly qualified teachers in addition to other aids and services necessary for them to succeed in inclusion settings. Regular classroom teachers should be trained to meet the need of special education students.

All of the above information was provided to the educators participating in the PJ process prior to their being convened.

Professional Judgment Panels

Several researchers have used professional judgment methodology to estimate the cost of providing an adequate educational program.[17]. Although they have employed various procedures, all have in common a reliance on the judgment of professional educators derived through some systematic procedure. Just as there is no one best way to estimate the cost of providing an adequate education, there is no one best way to conduct a study that relies on professional judgment. There are, however, a number of criteria against

[17] For example, see Chambers and Parrish (1982, 1984) and MAP Reports (1997, 2001) for previous studies that have used this approach.

which any professional judgment study can be measured. These may not be the only criteria one would use to evaluate the professional judgment process, but AIR/MAP proposes these as common sense standards against which any study of this type should be evaluated.

Criteria for evaluating professional judgment adequacy studies:

1. **Transparency**

   Transparency is the primary advantage attributed to the professional judgment method for estimating adequacy. Therefore, the entire process conducted should be explicit so that policy makers and others can consider the validity of each aspect of their recommendations as well as the overall quality of its outcomes. This would include, at a minimum, that the following be reported:

   - Outcome standards used to define an adequate education
   - Participant selection criteria and procedures
   - The role of the participant and the purpose of the process
   - Participants' knowledge of the purpose to which their work product will be put
   - Participants' qualifications
   - All assumptions and instructions provided to the participants
   - The roles of facilitators, observers and others participating in the process
   - The original work product of each group
   - Who made decisions leading to substantive conclusions, including the supporting rationale

2. **Qualifications of Participants**

   Participants should be professional educators recognized as highly competent educators who are experienced in allocating resources and producing high-quality student outcomes.

3. **Potential Conflict of Interest**

   To the extent possible, participants should be free of conflicts of interest. To the extent that they have potential conflicts, these should be made explicit.

4. **Reliability**

   Multiple groups of similar expert educators should complete identical exercises to enhance the reliability of the process.

5. **Records for Replicability**

   Sufficient records of the process should be reported to allow others to replicate it.

6. **Pricing**

   Prices used to estimate costs should be market prices or result from rigorous economic analysis. (Price estimates tend to be beyond the expertise of school and classroom professionals.)

Recruiting Process

The objectivity and expertise of the educators involved in the professional judgment panels (PJPs) is critical to the validity of the final product. Objectivity of participants is difficult to measure, but it is fair to note that all participants were aware that their work product would be used to attempt to influence levels of resources made available to public schools in the State of New York.

AIR/MAP engaged in an extensive effort to recruit highly qualified educators to participate on each of the PJPs. Approximately 1,000 educators were considered for participation in the study. These individuals were identified as a result of their association with the Education Trust list of schools that are "beating the odds"[18], successful schools identified through a separate AIR/MAP methodology described in Appendix I, and through nominations by members of the Council for Costing Out, school superintendents, and the New York City Schools Chancellor. See Appendix B for samples of correspondence with potential participants.

Selection Process

Approximately 275 educators responded to the invitations, and 56 were chosen to participate. To ensure that the diverse categories of districts across New York State were represented among the PJPs, the 275 responses were first sorted according to four categories of school districts. These four categories are described below:[19]

- *PJP 1 - New York City*[20]
- *PJP 2 - Mid- to Large-Sized Cities, Urban Fringes and Other Districts With High Needs-to-Resource-Capacity* – Districts other than New York City characterized by a high Needs-to-Resource-Capacity index located in the vicinity of any:

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[18] This list can be found at http://www2.edtrust.org/edtrust.

[19] For more details about the categorization of school districts see Appendix B (*District Categorization Methodology for the New York Adequacy Study*). A discussion of the "needs-to-resource capacity" index used by the New York State Education Department may be found in http://www.emsc.nysed.gov/repcrd399/similar.html.

[20] Most of the participants in the two New York City panels (PJP Category 1) were approved by the Chancellor's Office for New York City Public Schools.

  - Mid-size city (i.e. having a population less than 250,000) of a Metropolitan Statistical Area (MSA) or Consolidated Metropolitan Statistical Area (CMSA).
  - Large city (i.e. having a population greater than or equal to 250,000) of a CMSA.
  - Urban fringes of mid-sized and large cities (i.e. including any incorporated or census designated place) or places defined as urban by the Census Bureau.
  - Four select large and small towns (i.e. with populations greater than or equal to 25,000, and between 2,500 and 25,000 inhabitants, respectively) and one rural place (Cortland, Ogdensburg, Olean, Plattsburgh and Watertown).[21]
- *PJP 3 - Mid-sized Cities, Urban Fringes and Other Districts With Average or Low Needs-to-Resource-Capacity* – Districts characterized by an average Needs-to-Resource-Capacity index located in:
  - Mid-size cities (same as in PJP 2 definition, above).
  - Urban fringes of mid-sized and large cities (same as in PJP 2 definition, above).
  - Large and small towns (same as in PJP 2 definition, above).
- *PJP 4 – Rural Areas Across All Needs-to-Resource Capacities* – Districts located in:
  - Any place defined as rural by the Census Bureau.
  - Fifteen select places defined as rural according to the N/RC index and as mid-size or large city urban fringe by the NCES locale classification.[22]

The next step was to ensure that each of the four general education PJPs was comprised of at least one superintendent, elementary school principal, middle school principal, high school principal, classroom teacher, special educator, and business official. With the exception of New York City, no panel was to include more than one employee of a single district.

Finally, within these constraints, every effort was made to select participants who represented the size and geographic diversity of school districts in New York.

Overview of the Process

Over the course of this study AIR/MAP convened 12 professional judgment panel sessions. In all, 55 outstanding educators participated, some on multiple PJPs.[23] Eight of the PJPs were designated general education and asked to design instructional programs for student populations of varying incidence of poverty and English language development needs. Two PJPs, comprised of selected members of the initial eight,

[21] Detailed census definitions of CMSA and MSA are included in Appendix B.

[22] In these instances, where the NYSED and NCES classification schemes contradicted each other, the classification rule was determined by the NYSED N/RC index.

[23] While 56 educators were originally invited and agreed to participate on the PJPs, one of the panel members was unable to attend the scheduled meetings due to an unavoidable conflict. A subset of the original eight PJPs served on the special education panels and subsequent *Summary PJP Team*.

addressed the specific needs of students identified for special education. The final PJP, which was referred to as the *Summary PJP Team*, met twice and assisted the AIR/MAP research team interpret, clarify, review, synthesize, and revise as necessary the results of the previous ten PJPs.

All of these PJPs were comprised of educators representing the four distinct categories of New York State school districts described above.

On July 21-23, four general education panels, representing each of the four district categories (i.e., PJPs 1, 2, 3, and 4), assembled at the New York State School Boards Association office in Latham, New York.[24] The following weekend, four additional PJPs representing these four district classifications met and completed exercises identical to those done the prior week. For this initial set of panels, the participants in each were entirely comprised of members from these types of districts (i.e., the two PJP 4 panels were entirely comprised of educators from rural districts). This produced eight sets of initial results, two for each of the PJP categories 1 through 4.

All panels deliberated independently of one another. Each general education panel was comprised of one superintendent, one special educator, one elementary school principal, one middle school principal, one high school principal, a school business official, and a classroom teacher. Except in the case of PJP 1 (New York City) no two participants on a PJP were from the same school district. See Appendix B for lists of educators serving on each PJP.

Prior to convening, each participant received a summary report of the public engagement process, a summary of research on effective educational practices and interventions, and instructions for completing the professional judgment process.[25] Panelists were informed that the public engagement report and summary of research were provided for their information, and they could rely on them to the extent that they chose.

Participants were directed to design instructional programs for prototypical elementary, middle, and high schools that they agreed would provide a full opportunity to the student populations specified in the instructions to acquire the knowledge currently specified by the Regents Learning Standards. Specifically, the panels were asked to design programs to achieve the following objective:

[24] The AIR/MAP team is deeply indebted to the NYSSBA leadership for providing their conference facilities for not only the meetings of the PJPs, but also for a number of other strategic meetings that occurred during the project.

[25] See Appendices A and B for copies of the materials provided to the PJPs and other relevant information associated with the selection and organization of the panels.

Exhibit 2-1 – Desired Educational Outcomes

The federal No Child Left Behind Act and state law require all students in every school district to meet the Regents Learning Standards within the next 11 years and to make steady progress toward that goal each year. As of 2005, all high school students (except for certain special education students) will be required to achieve a passing score of 65 on the Regents examinations in English, social studies, mathematics, and science to receive a high school diploma. As of the 2005-06 school year, students in grades 3-8 will be tested in English, and mathematics (and shortly thereafter in science) to determine whether they are making satisfactory progress toward meeting the Learning Standards. Rates of yearly progress toward these goals will be disaggregated by racial, economic, disability and limited English proficiency categories.

Your job is to design an instructional program that will provide all students in the school a full opportunity to meet the Regents Learning Standards, and to attain a Regents diploma. For students in the early grades and preschool, this means designing an instructional program that will seek to address any learning problems with which students enter school. For students further along in their educational career, it means addressing any deep-rooted educational deficiencies that may have developed as thoroughly as possible, and minimizing dropout rates.[26]

Only after they had designed instructional programs were the panel participants asked to determine the types and levels of resources necessary to implement those programs.

The instructions developed by the AIR/MAP team contained 14 assumptions that described the context in which an instructional program was to operate and certain constraints on the resources the PJP could affect. The purpose of the assumptions was to make the exercise as realistic as possible within the constraints of available participant time and expertise. For each PJP, prototypical school enrollments were the average enrollment of elementary, middle, and high schools within that school-district category. Panelists were instructed to assume that specified levels of spending on facilities, district administration, and transportation were given and could not be changed as part of the exercise. They were told that the levels of textbooks, instructional supplies and equipment, and teacher training are typical of schools in the district category under consideration. That is, panelists were to assume that prototypical schools were not being newly created, but rather that these schools were to be thought of as ongoing enterprises. Also, they were told to use their professional judgment of what types of special education students should be served in neighborhood schools, as opposed to other locations (e.g., programs provided by the Board of Cooperative Educational Services (BOCES)).[27]

[26] This statement was presented to the PJPs in the original instructions provided to the panels to carry out their job during the summer meetings.

[27] The two special education PJPs addressed this issue in greater detail.

Finally, panelists were instructed to assume that all personnel were state-certified and that salaries were adequate to attract and retain these personnel. Asking panels to make these assumptions does not necessarily imply that they are true; but these issues are beyond the scope of this study and, in some cases, participants would have lacked specific knowledge or expertise to render a professional judgment.

The first task completed by each PJP required all participants to review and agree upon a list of program elements (e.g., personnel, supplies, assessment) required to implement an instructional program sufficient to produce the outcome standard specified above. Over the next three days the PJPs completed six additional tasks. The final task was an evaluation of the process by each participant. The other five tasks required each PJP to develop instructional programs calculated to meet the educational needs of various student populations, in accordance with the specified outcome standard. These student populations were characterized by varying percentages of students in poverty and of English language learners (ELLs). The poverty levels ranged from the 25th to the 90th percentile of eligibility for federally subsidized meals within the specified PJP and the median and 90th percentile of English language learners (ELLs) specific to each PJP. All PJPs completed a common exercise where the student eligibility for free- or reduced-price lunch and ELL identification were set at the state median. See Exhibit 2-2 for a tabular summary of the scenarios presented to each of the PJPs.

Exhibit 2-2 – Permutations of Scenarios Completed by Professional Judgment Panels

		Scenario				
		1	2	3	4	5
PJP 1	% Free/Reduced Lunch	34.2	65.8	85.3	93.0	96.6
	% English Language Learners	1.5	9.7	9.7	9.7	26.7
PJP 2	% Free/Reduced Lunch	34.2	45.9	62.5	79.7	91.9
	% English Language Learners	1.5	2.6	2.6	2.6	18.8
PJP 3	% Free/Reduced Lunch	4.5	11.7	23.6	34.2	36.0
	% English Language Learners	0.9	0.9	0.9	1.5	0.9
PJP 4	% Free/Reduced Lunch	18.1	30.6	34.2	40.4	49.7
	% English Language Learners	0.0	0.0	1.5	0.0	1.8

Grey cells denote state median values. Yellow cells denote PJP-specific median values.
Exhibit 2-2 states that for their first scenario PJP 1 was required to design an adequate instructional program to serve a student body in which 34.2 percent were eligible for free or reduced lunch and 1.5 percent were English language learners.

On August 18-19 and August 25-26, two separate PJPs were convened to specifically address services for special education students – one panel for each set of dates. These panels were comprised of a subset of educators who had served on the original eight panels.[28] As their focus was special education, these two panels included all eight special educators from the prior PJPs, one from each of the PJP types 1-4. This placed four special educators on each of the special education PJPs, which were then balanced by

[28] Only a single member of one of the special education PJPs did not participate in any of the general education PJP meetings.

four general educators. These were selected to balance the range of professional expertise found in the general education PJPs (i.e., teaching, school administration, and business office). Selection was also guided by the desire to have two representatives from each of the four categories of general education PJP on each committee. Thus, each of these two special education panels had four general and four special education representatives from the New York City to the rural PJP types. Both special education PJPs were given the same instructions (see Appendix B).

On December 10, 2003 and January 14, 2004, a summary panel was convened for the purpose of assisting the AIR/MAP research team in clarifying, interpreting, and synthesizing the results of the previous ten panels. The *Summary PJP Team* members were selected from the larger set of participants engaged in the initial ten panels. The *Summary PJP Team* members were selected to achieve a professional balance comparable to the initial general education panels described above (i.e. to include general and special education instructional expertise, as well as administrative and business office representation). Members were also chosen to allow a regional balance between New York City, other large to mid-level cities, and rural areas.[29]

The members of this summary panel also represented and described the process to date and program results at a Stakeholder Meeting, held in Latham on December 11, 2003. In addition to these PJP representatives, the stakeholder panel consisted of representatives from various constituency groups with an interest in the reform of school finance. These additional stakeholder panel members included representatives of parents, school board members, taxpayers, legislators, the New York State Education Department, the Governor's staff, and the current Commission appointed by the Governor of New York to review school funding alternatives.

The stakeholder committee was provided the latest data used by the AIR/MAP team to develop the adequacy cost estimates. The non-educator members of the stakeholder panel had the opportunity to query the members of the professional judgment panels about their program designs and specifications and to provide input to the AIR/MAP team prior to the final processing and analysis of the data. This meeting included a general presentation of study approach, comments from PJP participants regarding their experience and results to date, three breakout sessions to discuss a specific set of questions posed by the research team, and a general discussion regarding the specifications and the process. The questions discussed in the breakout meetings as well as notes from each of the sessions from this day are included in Appendix B.

Synthesis of the PJP Specifications – Translating Specifications into Cost Estimates

Following the initial meetings of the PJPs in the summer of 2003, the AIR/MAP team had 40 data points from the general education panels and 8 additional data points from the special education panels. These data points included all of the resource specifications alongside the designated mean enrollment levels for each school level (i.e., elementary,

[29] See Appendix B for the instructions used with this panel.

middle and high schools) and the composition of student needs as reflected by the percent of students eligible for free and reduced lunch programs, English language learner programs, and special education services.

The first step was to discern whether these data reflected any systematic patterns of variation. The first graphics that were created to begin exploring these data are presented in exhibits 2-3A, B, and C. Each exhibit shows the relationship between per pupil expenditures for school program costs across the poverty levels presented to each of the PJPs during their exercises. School program costs include the total expenditures on the school-level resources specified by each PJP excluding preschool programs (i.e., pre-kindergarten and early childhood development programs), which were treated separately.[30]

To aggregate to total expenditure, it was necessary to multiply the full-time equivalencies of personnel by the average compensation levels for the various categories of school personnel included in the elementary, middle and high school prototypes developed by the PJPs.[31] The total personnel costs were then added to the total of the non-personnel costs for instructional supplies, materials, equipment, professional development, and student activities to determine the total per pupil expenditure.

[30] As indicated previously, school program costs also exclude district-level functions such as central administration, maintenance and operations, school facilities, and transportation services. In addition, discussion with members of the *Summary PJP Team* in subsequent meetings indicated that these school program costs excluded interscholastic athletic programs and expenditures on non-personnel resources for school administration.

[31] Average compensation levels were derived from the Personnel Master Files (PMF) provided by the NYSED. AIR/MAP calculated the pupil-weighted averages of the full-time salaries for teachers, principals, and other certified personnel and estimated from Census sources the average salaries of non-certificated personnel. These data were pupil-weighted so that the salaries represented those paid to personnel working in the district attended by the average student in New York State. Use of a pupil-weighted average compensation level allows us to use a geographic cost adjustment in a way that is fiscally neutral with respect to the number of students within a district. The data on benefit rates was provided by Charles Shippee of the NYSED and were derived from the ST3 fiscal data files maintained by the department.

Exhibit 2-3A - Necessary Per Pupil Expenditure for Elementary School Program Specifications Across School Poverty

(excludes preschool program costs as well as district administration, maintenance and operations, school facilities, and transportation)

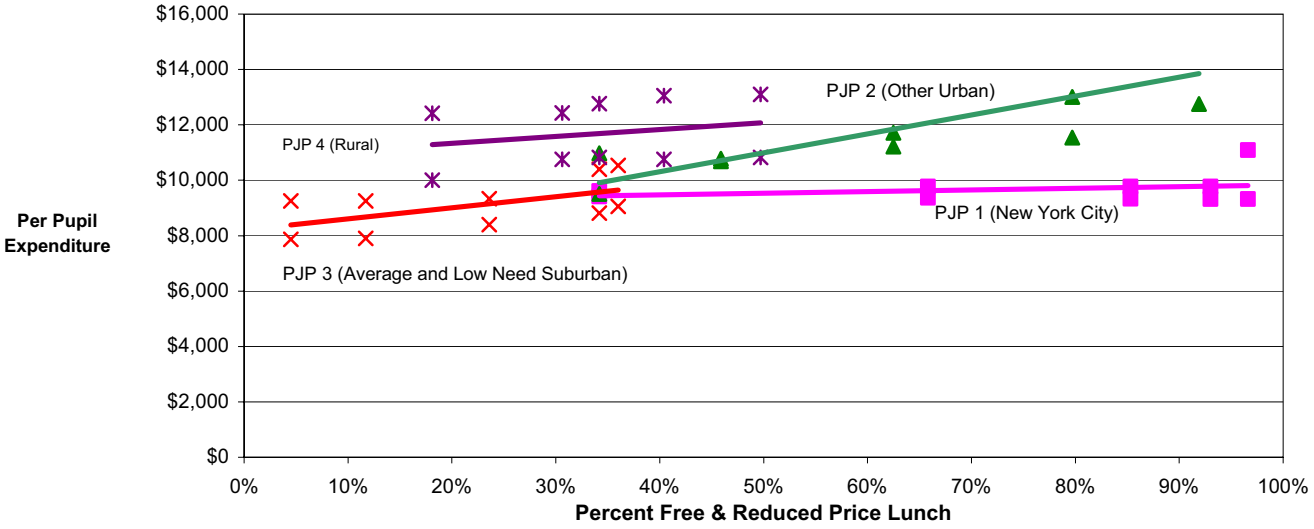

Exhibit reads: The calculated per pupil costs of the specifications developed by the PJPs representing rural districts for an elementary school with relatively low poverty (i.e., 18.1 percent of the student body eligible for free or reduced lunch) are $10,000 and $12,417, respectively.

Exhibit 2-3B - Necessary Per Pupil Expenditure for Middle School Program Specifications Across School Poverty

(excludes preschool program costs as well as district administration, maintenance and operations, school facilities, and transportation)

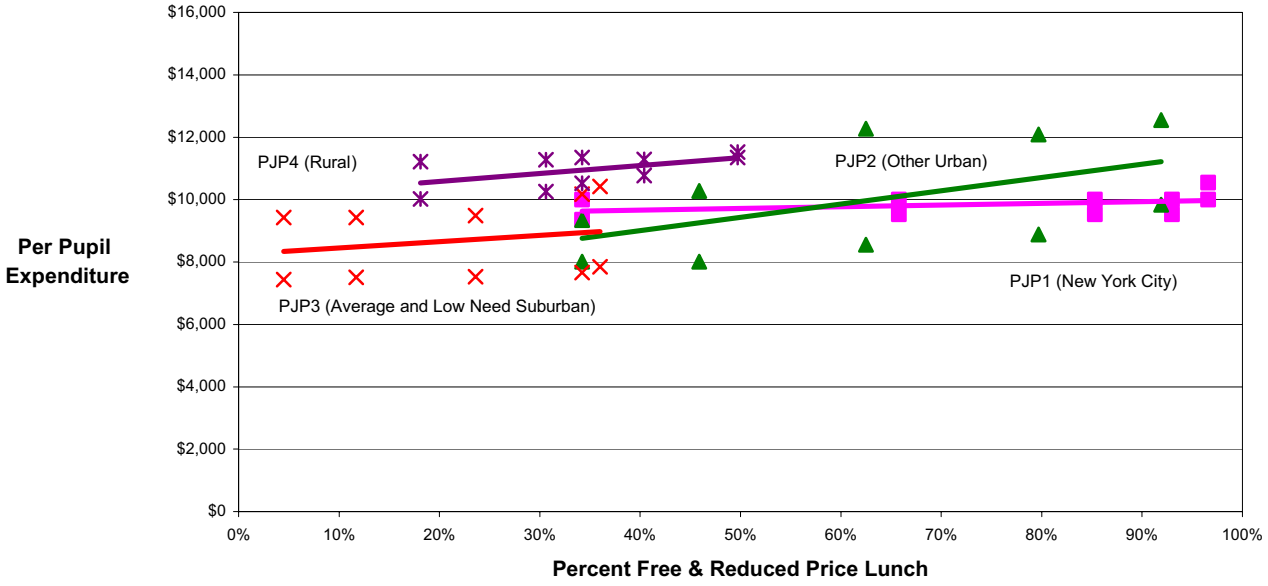

Exhibit reads: The calculated per pupil costs of the specifications developed by the PJPs representing rural districts for a middle school with relatively low poverty (i.e., 18.1 percent of the student body eligible for free or reduced lunch) are $10,028 and $11,210, respectively.

Exhibit 2-3C - Necessary Per Pupil Expenditure for High School Program Specifications Across School Poverty

(excludes preschool program costs as well as district administration, maintenance and operations, school facilities, and transportation)

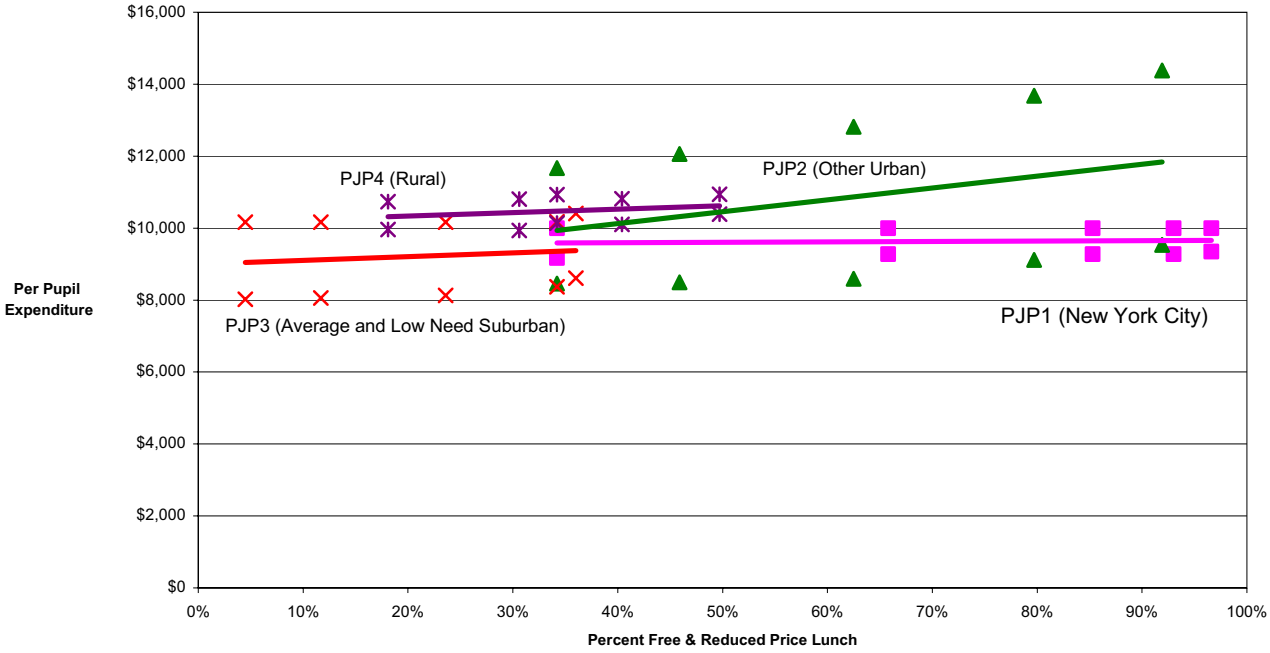

Exhibit reads: The calculated per pupil costs of the specifications developed by the PJPs representing rural districts for a high school with relatively low poverty (i.e., 18.1 percent of the student body eligible for free or reduced lunch) are $9,361 and $10,735, respectively.

The various points on each diagram represent the total per pupil expenditure derived from each of the exercises, and each point is color coded according to the PJP from which it came. There are four trend lines on each of the diagrams, and each trend line corresponds to one of the four PJP categories. Each trend line starts and stops at the extreme values of the poverty levels reflected in the set of exercises for each PJP category. For example, one can see that the poverty levels included in the exercises for PJP 2 (Other Urban) ranged from about 34 percent to over 90 percent of students eligible for free and reduced price lunch programs.

At first glance, these exhibits suggest a disparate pattern of variation of adequacy with respect to one dimension of pupil need: namely, poverty. However, a more detailed examination of these data reveals some interesting patterns. Each of the PJP four categories was instructed to specify resources for schools that were of a different sizes equal to the within-PJP average. For example, the average enrollment for elementary schools in PJP 1 (New York City) was 774, while the average enrollment of elementary schools in PJP 4 (Rural) was set at 414. It turned out the average elementary enrollment levels for elementary schools in PJPs 2 and 3 (Other Urban and Average and Low Need Suburban) were quite similar at 504 and 492, respectively. With this in mind, one can see that school size appears to play a role in the way panels specified resources. The smaller schools specified for the rural PJP show somewhat higher per pupil costs than the

larger suburban and urban schools, and the significantly larger elementary schools in New York City exhibited even lower costs at any given level of poverty.

Virtually, all of the lines exhibit a positive slope with respect to poverty (i.e., higher levels of student poverty are associated with higher per pupil expenditures), though the slope for the New York City line was relatively gentle. The impact of increases in poverty in PJP 2 (Other Urban) tended to be much larger as reflected in the steeper slope of the trend line for this category.

The next step for the AIR/MAP team involved synthesizing the patterns of variation reflected in these initial specifications developed by the PJPs. Using the range of size and pupil needs reflected in the 40 data points provided by the general education PJPs, the AIR/MAP team used statistical methods (i.e., *multivariate regression models*) to construct representative patterns of variation in the specified personnel and non-personnel resources required to achieve the goal put forth in the PJP exercises (i.e., that in Exhibit 1) across the schools of varying size and pupil demographics in New York State. Eight additional data points provided by the special education PJPs, making a combined total of 48 data points (i.e., 40 from the general education and eight additional from the special education PJPs), were utilized to obtain further information about how special education resources varied across different levels of identification of special education eligible students.[32]

The multivariate analysis was utilized to generate a set of worksheets that presented the patterns of variation in elementary, middle, and high school program specifications and subsequent expenditures in relation to school enrollment and pupil needs as proxied by the percent of students eligible for free and reduced priced lunch programs (henceforth referred to as student poverty), English language learner (ELL) programs, and special education services. The worksheets represented the best estimate, vis-à-vis a multivariate analysis of the patterns of variation observed in the initial PJP data points, of the necessary resources at each schooling level (elementary, middle and high) required to achieve the objective put forth in Exhibit 2-1 across schools of varying size and need. Therefore, the estimated FTE staffing levels and expenditures contained in the worksheets represented an amalgam of the specifications of the various PJP teams from all across the state.[33]

Summary PJP Team Review

This synthesis of the initial PJP specifications were used as the basis for presentations made by the AIR/MAP team to the Summary PJP Team and Stakeholder Panel meetings held in December of 2003. The worksheets were explicitly designed to present the specifications in a way to obtain reactions from the Summary PJP Team and to permit

[32] The raw data derived from these initial exercises are presented in Appendix G along with the regressions that were used to synthesize the resource specifications.

[33] Appendix G contains each of the major sets of worksheets from which all simulations contained in this report have been run. It also contains the raw data derived from the initial specifications of the summer meetings of the PJPs along with the regressions used to process those data and create the initial worksheets used for the Summary PJP meetings in December of 2003.

them to make any revisions deemed necessary to achieve the desired results for the children of New York State as described in Exhibit 2-1. The worksheets lay out the estimated total FTE for each category of school personnel and the total expenditure for each specific type of non-personnel resource by school level (i.e., elementary, middle and high) across schools of varying levels of size and need.

The AIR/MAP research team next selected representatives from the original panels to serve on the Summary PJP Team. Through a structured set of exercises, the AIR/MAP team asked the Summary PJP Team to review the patterns of resource utilization represented in the worksheets in Appendix G and to provide further input as to whether these patterns of resource use are appropriate to achieve the desired goals. At all points along the way, the AIR/MAP team encouraged the Summary PJP Team to keep the goals in mind and to evaluate how each resource specified will be used to achieve the desired outcomes. Based on the advice of the Summary PJP Team modifications were made to the synthesized specifications.

Description of the School-Level Worksheets

The school-level worksheets were organized around instructional programs or service delivery systems directed at specific populations of students. First, there were separate worksheets for elementary, middle, and high schools, and each of these worksheets included the resources required for the specified grade-level appropriate instructional programs. Exhibit 2-4 below lays out the programs included in each of the school-level worksheets.

Exhibit 2-4 – Programs Specified in PJP Worksheets by Schooling Level

Program	Elementary School	Middle School	High School
Kindergarten		■	■
Grades 1 through 5		■	■
Grades 6 through 8	■		■
Grades 9 through 12	■	■	
Pre-kindergarten (4 year olds)		■	■
Early childhood development (3 year olds)		■	■
Extended day			
Extended year			

The elementary school included programs for kindergarten students, students enrolled in grades 1 through 5, pre-kindergarten students (i.e., 4 year olds), those in early childhood development (i.e., 3 year olds), and programs for students requiring extended day and/or extended year (i.e., summer school) services. The middle and high school programs included the appropriate services for grades 6 through 8 and 9 through 12, respectively, along with the extended day and year programs.

Within each program component there were two types of resources: personnel and non-personnel. The personnel data on these worksheets were expressed in the form of total

full-time-equivalent staff, while the non-personnel data are expressed in total dollar expenditures.

Summary and An Example of the Synthesis

The exhibits presented in this section provide an example of the patterns of variation found in the data following the final stage of meetings between the AIR/MAP team and the Summary PJP Team that occurred in January of 2004. It is important to recognize that this set of results represents only one of the possible specifications underlying the adequacy cost estimates presented later in this report. The AIR/MAP team has conducted a full simulation of the PJP specifications at various stages of the work. For ease of future reference, each stage of the analysis and synthesis process is described below:

> **Stage 1. Initial specifications—Summer 2003**. This stage reflects the synthesis of the initial specifications presented to the AIR/MAP team by the original ten general and special education PJPs following the summer meetings.
>
> **Stage 2. Summary PJP Revisions #1—December 10th, 2003 meeting.** This stage reflects the revised specifications that were based on the December meetings of the Summary PJP Team.
>
> **Stage 3. Summary PJP Revisions #2—January 14th, 2004 meeting.** This stage reflects the revised specifications that were based on the January meetings of the Summary PJP Team that were held, in part, to respond to comments of the full Stakeholder panel meeting of December 11th, 2003.

The expenditure figures represented in the exhibits that follow represent total school program expenditures per pupil only and do not include preschool programs or any of the district-level functions such as central administration, maintenance and operations, home-to-school transportation, and school facilities that were not included in the school prototypes developed by the PJPs. The way in which these four components are handled is discussed later on in this chapter. These figures also use standardized or average compensation rates (including salaries and benefits) for the various categories of school personnel included in the school prototypes. Adjustments for geographic differences in the costs of education are used to apply these prototypes at a subsequent stage of the analysis.[34]

The Base Level of Resources: the Effects of School Size

Based on our analysis, some resources vary significantly with school size, while others do not. Exhibit 2-5 shows the relationship between expenditures per pupil and school size, controlling for pupil needs, within the ranges of enrollment represented in the original PJP exercises this summer for elementary, middle, and high school, respectively.[35] At each school level, the PJP specifications generate a negative relationship between overall expenditures per pupil and the enrollment of the school.

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[34] Details on construction of the index used to adjust the cost figures for geographic differences are contained in Chapter 3.

[35] We are only able to reflect the economies of scale that are represented within the range of schools sizes included in the PJP exercises. To go beyond these limits would not be an appropriate use of the data.

Exhibit 2-5 reveals that, based on the PJP specifications, the total estimated cost per pupil decline by 16.8 percent in moving from the smallest prototypical elementary school (with enrollment equal to 414) to the largest (with enrollment equal to 774) the PJPs were required to specify resources for.[36] In addition, this exhibit also shows that the average middle and high school of sizes within our sample range (543 to 951 and 576 to 1,184 for middle and high schools, respectively) cost more per pupil than an elementary school of the same scale.[37]

Exhibit 2-5 - Index of Per Pupil Expenditure by Enrollment Level for Elementary, Middle, and High Schools

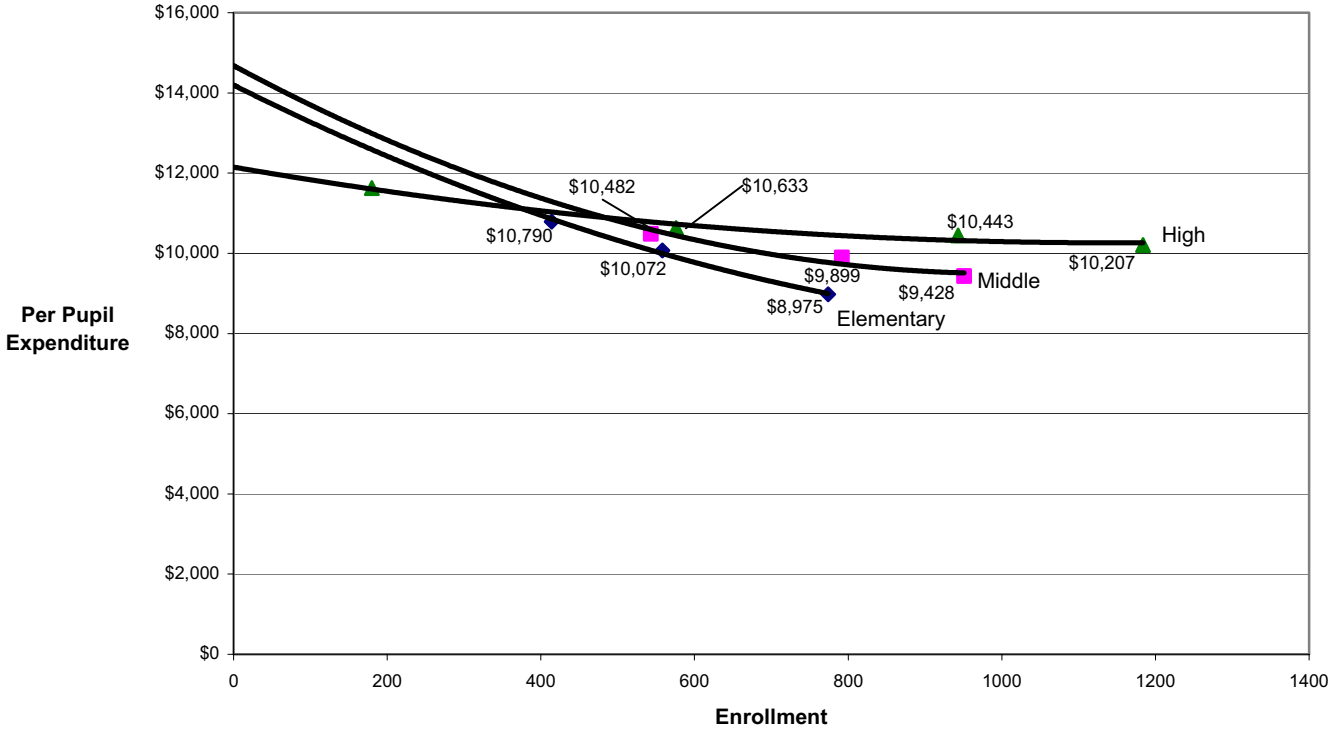

Exhibit reads: The projected per pupil costs of large elementary, middle and high schools (with enrollments of 774, 951 and 1,184, respectively) are $8,975, $9,428 and $10,207, respectively.

The Resource Effects of Increases in Poverty

Exhibit 2-6 shows the relationship between expenditures per pupil and the percent of students eligible for free- and reduced price-lunches, controlling for school enrollment and the percent of other special need students. The exhibit shows a positive relationship between per pupil costs and school poverty, based on the responses of the PJPs. Based on these specifications, it appears that poverty has a very dramatic impact on elementary

[36] This is easily calculated as follows:
(Per Pupil Expenditure $_{Enrollment=414}$ - Per Pupil Expenditure $_{Enrollment=774}$) / Per Pupil Expenditure $_{Enrollment=414}$ or ($10,790 - $8,975) / $10,790 = 0.168.

[37] This is shown by the fact that for all enrollment levels above 543 the elementary school line falls below the middle school line, and the middle school line in turn falls below the high school line.

relative to middle and high school programs. For an elementary school at a low poverty level (i.e., with 4.5 percent of its students eligible for free or reduced lunch) per pupil expenditure would be 18.1 percent lower than a school with average poverty (i.e. with 34.2 percent of its student body being free/reduced lunch eligible).[38]

Exhibit 2.6 - Per Pupil Expenditure for the Base Program by Percent of Pupils Eligible for Free & Reduced Price Lunches for Elementary, Middle, and High Schools

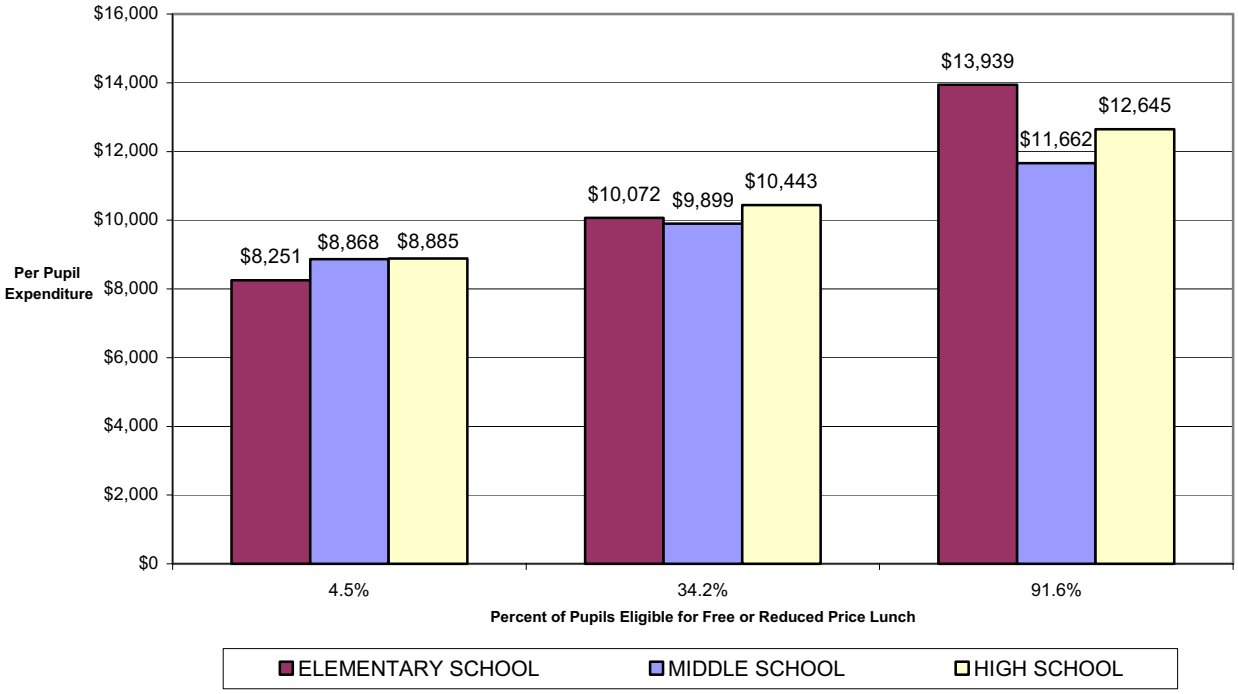

Exhibit reads: The calculated per pupil costs of average poverty elementary, middle and high schools (with percent of student body eligible for free or reduced lunch equal to 34.2 percent) are $10,072, $9,889 and $10,443, respectively. Note, this assumes percent of special education and English language learner students equals 9.8 and 0.9 percent, respectively.

The Resource Effects of Additional Students Eligible for Special Education Services

Exhibit 2-7 shows the relationship between total expenditures per pupil and the percent of students eligible for special education services in the elementary, middle and high school models derived from the PJP specifications. For each school level, an increase in the identification of special education students from 9.8 percent to 14.2 percent is associated with approximately a 2 to 3 percent increase in total spending per pupil. It is at 2.8 percent at the elementary level, 2.0 percent at the middle school, and 2.6 percent at the high school level.

[38] This can also be easily calculated:
(Per Pupil Expenditure $_{34.2\% \text{ Poverty}}$ - Per Pupil Expenditure $_{4.5\% \text{ Poverty}}$) / Per Pupil Expenditure $_{34.2\% \text{ Poverty}}$ or ($10,072 - $8,251) / $10,072 = 0.181.

Exhibit 2-7 - Per Pupil Expenditure by Percent of Students Receiving Special Education Services Across Elementary, Middle and High Schools

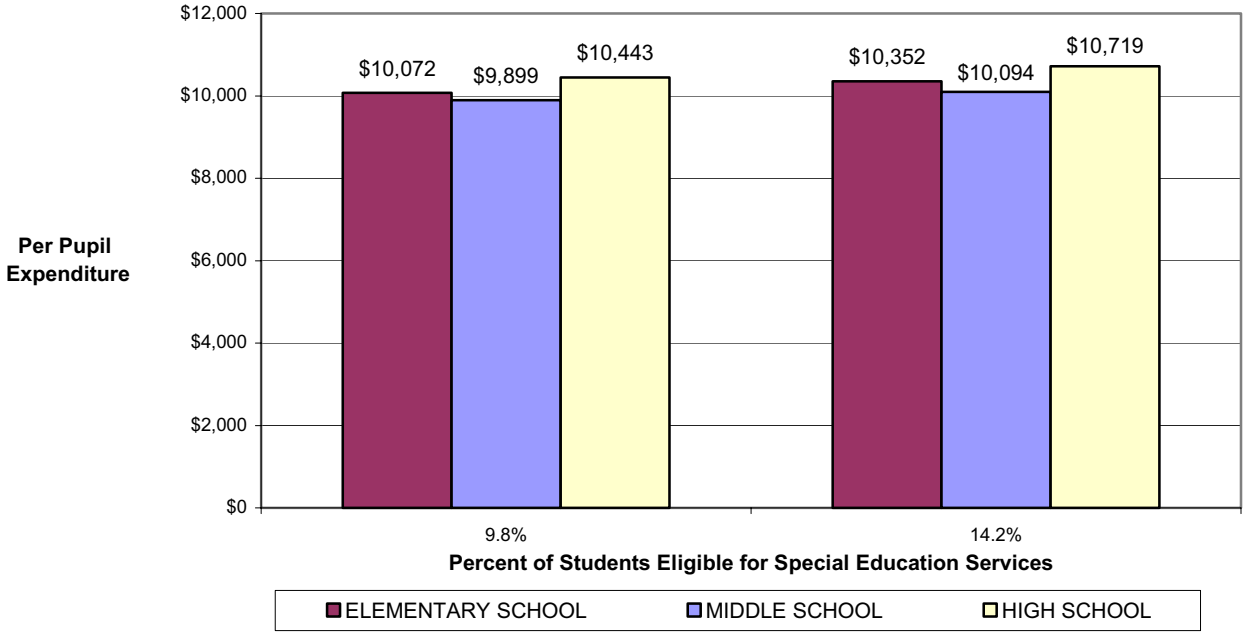

Exhibit reads: The calculated per pupil costs of elementary, middle and high schools with percent of student body in special education equal to 9.8 percent) are $10,072, $9,889 and $10,443, respectively. Note, this assumes percent of students eligible for free or reduced lunch and English language learner students equals 34.2 and 0.9 percent, respectively.

The Resource Effects of Additional English Language Learners (ELL)

Exhibit 2-8 shows the relationship between total expenditures per pupil and the percent of students eligible for ELL programs in the elementary, middle and high school prototypes. For each school level, an increase in the percent of students who are identified as ELL from 0.9 percent to 18.8 percent is associated with an approximate 3.2 percent at the elementary level, 3.5 percent at the middle, and 3.4 percent high school level.[39]

[39] Note that the charts presented in this section attempt to isolate expenditure changes in response to variation in a particular scale or need characteristic holding all other characteristics constant. Therefore, the preceding charts illustrate the *marginal* expenditures with respect to changes in scale or needs. It is important to note that the analysis does not imply that the PJPs devoted no resources for poverty, special education or ELL in school exercises where the percentage of student with these special needs were low.

Exhibit 2-8 - Per Pupil Expenditure by Percent of English Language Learners for Elementary, Middle, and High Schools

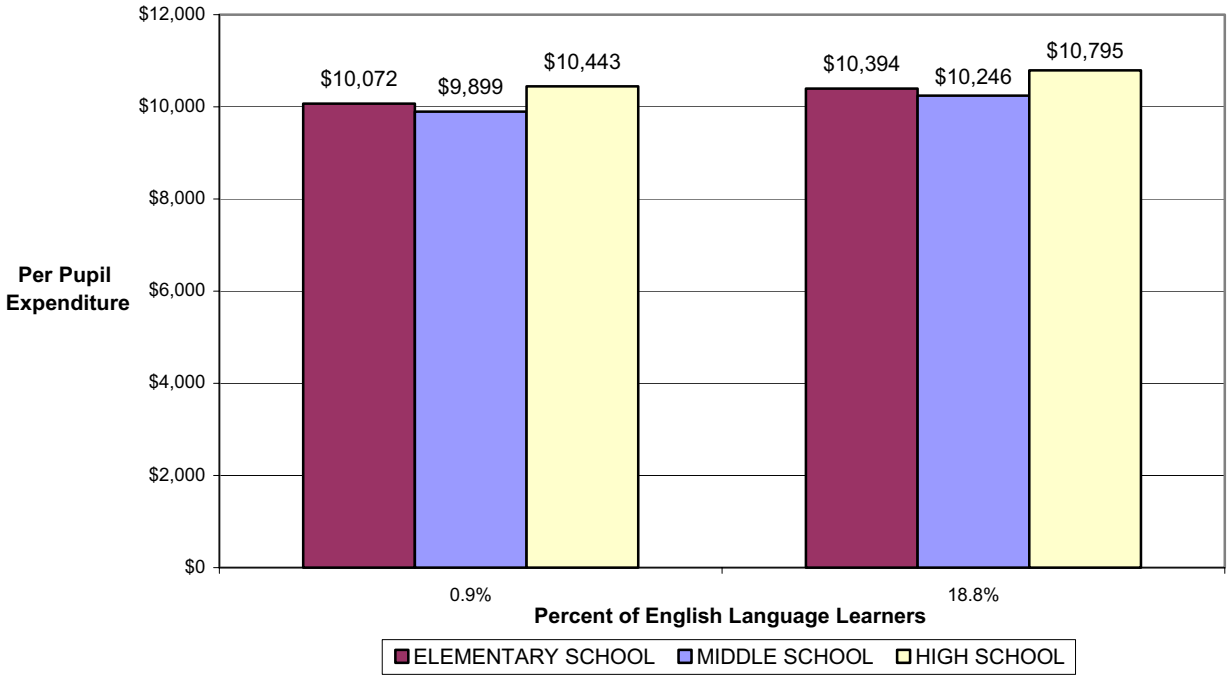

Exhibit reads: The calculated per pupil costs of elementary, middle and high schools with percent of student body that are English language learners equal to 0.9 percent) are $10,072, $9,889 and $10,443, respectively. Note, this assumes percent of students eligible for free or reduced lunch and in special education equals 34.2 and 9.8 percent, respectively.

Description of the District-Level Special Education Resources

The district level worksheet reflects specifications developed by the special education PJPs, and it encompasses three dimensions of special education services.[40] A portion of these resources reflect related service personnel who serve multiple schools throughout the district, but who generally operate out of the district office or possibly other agencies such as the BOCES. These resources have been specified in terms of personnel or non-personnel resources, but may be translated into tuition or other kinds of transfers among districts or between districts and other agencies. In addition, there are some special education teaching resources specified in this district model that are available to serve other low incidence special education students who are unlikely to be distributed evenly across schools. Finally, the special education PJPs decided to specify the preschool special education resources at the district level rather than attach them to schools. For this reason, all preschool special education resources originally specified at the school levels were set to zero. As with the school-level worksheets, personnel resources are expressed in FTEs, while the non-personnel resources are expressed in dollars per pupil.

[40] An example of this worksheet can be found in Appendix G.

There is one important change, however, in the way personnel FTEs are calculated at the district level. The special education PJP tied these resources to district enrollment rather than to the number of students specifically identified as eligible for special education services. That is, regardless of the actual special education identification rate, FTEs are expressed as a total per one thousand (1,000) students enrolled in the district. To be clear, the enrollment figures refer to total enrollment and not enrollment in special education. The numbers in the worksheet represent averages over the values specified by the two special education panels. The model district represents the average size of school districts in New York State, which enrolls about 4,225 students. For example, the panels specified that a district enrolling 4,225 students would need 1.10 FTE physical therapists to serve the population of students who might need such services. This calculates to represent an average of 0.26 FTE physical therapists per 1,000 students enrolled (i.e., (1.10 FTE / 4,225 District-Level Enrollment * 1,000 Students) = 0.26 FTE Per 1,000 Students Enrolled).

Exhibit 2-9 shows the average per pupil expenditures attributed to these components of the special education at the district level. The overall per pupil expenditure required to cover the necessary district-level resources for special services was $437 for each pupil in the district, regardless of their status with respect to special education. The largest proportion (42 percent) of this is attributable to personnel services for kindergarten through grade 12, while smaller shares are earmarked for preschool personnel and non-personnel resources for all students (34 and 24 percent, respectively).

Exhibit 2-9 - Per Pupil Expenditure on District-Level Special Education Resources (Share of Per Pupil Expenditure in Parentheses)

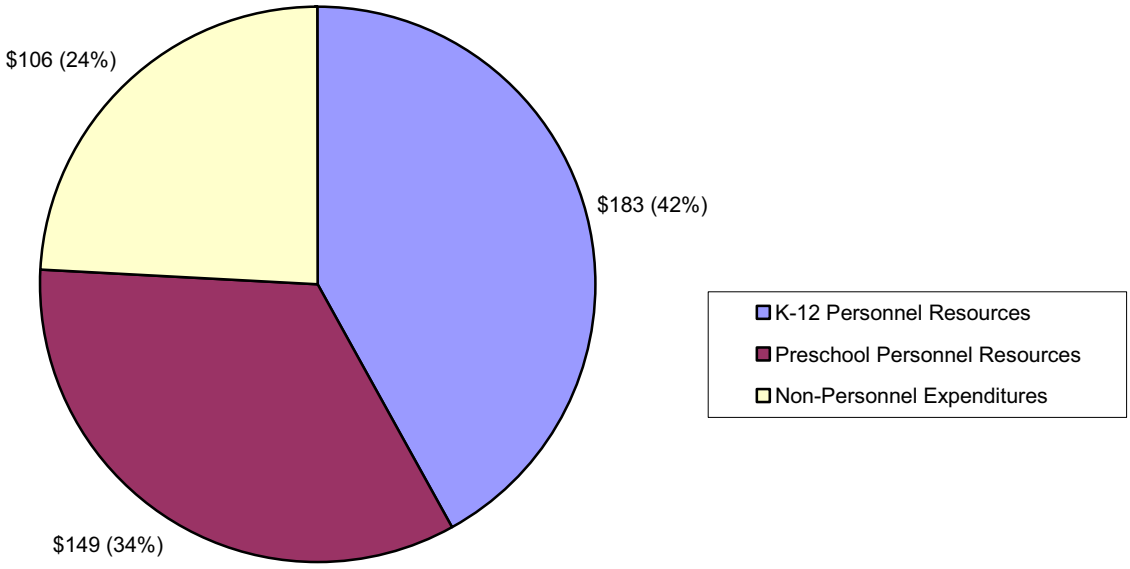

Exhibit reads: The projected per pupil costs of district-level for special education services for kindergarten through grade 12, preschool and non-personnel services (spread over all students) are $183, $149 and $106, respectively. Note, these respresent costs per pupil over all pupils in the district, regardless of whether they are in special education or not.

Summary Description of the PJP School Program Specifications

The most important point to keep in mind in interpreting the levels of education resources emanating from the PJP process is the outcome standard specified for this study. Each committee was asked to design a program that *would provide all students in a school a full opportunity to meet the Regents Learning Standards, and to attain a Regents Diploma.* Committee discussions focused on considerable challenges associated with meeting this outcome standard[41], especially in the state's high poverty schools. It is with this outcome standard in mind that the program specifications resulting from the PJP process must be interpreted.

The main component of the PJP specifications underlying the adequacy standards found in this report is a strong instructional base for all students; with additional resources added as school poverty rises. In addition, the base instructional program was built around a solid foundation of professional development for all staff members.

The program developed by the PJPs also includes a substantial investment in early childhood programs, including full-day kindergarten for all. High quality early childhood and preschool programs targeted to children ages three and four, respectively, were also included and subsequently costed out. The program specifications provided public support for these programs targeted to the proportion of three and four year olds in poverty based on school-level free and reduced lunch eligibility.

A highly integrated program was designed for children with disabilities. More than 95 percent of the elementary children with disabilities were expected to be served in neighborhood schools, while about 90 percent of middle or high school children with disabilities would be served in their neighborhood schools.

Extended day and year programs were also considered a critical component of meeting the outcome standard. As with the early education programs, enrollments in these extended time programs were linked to the percent of students living in poverty attending the school.

The discussion below summarizes the PJP results in terms of alternative student to staff ratios. In interpreting these ratios, it is important to keep in mind that the purpose of the PJP exercises was to specify the resources considered necessary to achieve educational adequacy. Although resource quantities resulting from these exercises are specifically delineated (e.g., core classroom teachers, other teachers, instructional assistants, etc.), no intent is implied that individual school districts and schools should be constrained by these specifications. Rather, it is believed that individual schools should be allowed

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[41] As evidence of its high standards, *The Education Week, Quality Counts 2001 Report* gave New York an "A" for its standards and accountability. In addition, the American Federation of Teachers report, *Making Standards Matter, 2001*, offered the following: "The standards are strong, most of the tests are aligned to strong standards." It should be noted that this high standard has been incorporated into the state's obligation to meet levels of proficiency as dictated by the federal No Child Left Behind Act. A summary of New York's approved NCLB accountability plan can be found at http://www.emsc.nysed.gov/deputy/nclb/accountability/2-03-att-b.htm.

flexibility to use their resources in ways they believe will be most effective within each local context. Thus, in interpreting the class size estimates shown below, it should be kept in mind that localities should be free to make trade-offs among the various categories of personnel (i.e., core classroom teacher, instructional aides, and other non-teaching staff) as they see fit to meet the programmatic needs of students. How local school officials decide to use these resources will affect such measures as class size within each school. Such decisions would continue to be determined locally.

Core Educational Programs

Three alternative ratios may best summarize the program specifications emanating from the PJP process. The first measure is class size, which results from dividing the number of students in the school by the number of core teachers specified by the panelists. The pupil-teacher ratio includes all of the teachers in the school in this type of calculation. For example, this ratio includes art, music, and physical education teachers, as well as specialists in the areas of special education and Title I. Yet, a third ratio would be that of pupils to all professionals in the school, which would also add other professional staff specified for the school to the counts above. These include such supplemental staff as counselors, nurses, psychologists, social workers, and building administrators. In interpreting these last two ratios, keep in mind that unlike current practice in most New York school districts, virtually all special education service providers have been directly assigned to neighborhood schools.

These three ratios are shown for elementary, middle, and high schools at the three levels of school poverty specified for the panels. Because each of these successive measures counts more of the school's professional staff, these ratios become progressively smaller. One observable trend is added emphasis on the earlier grades, with the ratios generally growing progressively larger in the upper levels of schooling.

The resource ratios shown in the table below also generally decline as poverty rises, reflecting the general view of the panels that more resources are needed in high poverty schools to meet the outcome standards specified for this study. However, this is not always the case as shown for middle school class size, which remains constant as poverty increases. In reviewing this trend, the summary PJP panelists argued that this relationship between class size and poverty made sense in middle schools because of the fairly generic nature of the middle school curriculum. Bigger issues for this population, they argued, were programs such as dropout prevention and counseling. Thus, while class sizes remained flat as poverty rises, more "other" (non-core) teachers and support staff were added. Conversely, given the much more specialized nature of the high school programs, substantial class size differences were specified for this level of schooling with rising poverty. To allow for these kinds of differences, the relationship between allocations of education staff and poverty is best viewed through the types of multiple measures featured in the Exhibit 2-10, below.

Exhibit 2-10 – Alternative Measures of Pupil to Staff Ratios

Schooling Level	Class Size and Staffing Ratios	Percent Students Eligible for Free and Reduced-Priced Lunch		
		4.5%	**34.2%**	**91.6%**
Elementary	Class size	16.8	15.7	14.0
	Pupil-teacher ratio	12.3	10.6	8.4
	Pupil-to-all professional staff ratio	9.9	8.6	6.8
Middle	Class size	22.6	22.6	22.6
	Pupil-teacher ratio	15.1	14.7	14.1
	Pupil-to-all professional staff ratio	12.3	11.9	11.3
High	Class size	29.1	24.3	18.4
	Pupil-teacher ratio	16.9	15.1	12.6
	Pupil-to-all professional staff ratio	13.1	12.1	10.3

Notes: All class sizes and pupil-staff ratios presented in the table above are based on resource specifications at Stage 3 of the professional judgment process.

Class size = Total Enrollment / Core Classroom Teachers

Pupil-teacher ratio = Total Enrollment / (Core Classroom Teachers + SE Teachers + Other Teachers)

Pupil-to-all-professional-staff ratio = Total Enrollment / (Core Classroom Teachers + SE Teachers + Other Teachers + Guidance Counselors + School Psychologists + Social Workers + Other Pupil Support + SE Pupil Support + Nurses + Librarians-Media Specialists + Principals + Assistant Principals + Other Professional Staff)

Elementary School[42]

For grades 1-5, class size for an elementary school at the average poverty level for the state (34.2 percent free and reduced lunch eligibility) was set at about 17, falling to 14 students in very high poverty schools (i.e., where 91.6 percent of the students were free or reduced lunch eligible). These class sizes, as well as all of the other resources included in their specifications, were based on the professional judgment of the panel members. Rationale for these determinations cited by panel members included research[43], the need for reduced class size due to the much higher integration of special education students as compared to current practice[44], and the high educational outcome standard set by the state.

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[42] Discussions of resource specifications at each schooling level focus on resources required for a school with enrollment set approximately at the mean size for each level, elementary, middle or high. Systematic variations in staffing ratios were also associated with variations in school size that exist across the state.

[43] As an example class size research, see the Tennessee Project STAR Final Report by Word et al. (1990).

[44] Data from the 2002 Annual Report to Congress on the Individuals with Disabilities Education Act (IDEA), distributed by Office of Special Education Programs (OSEP), US Department of Education, reveals that nearly one-half of all special education students in New York State spend over 20 percent of their school day outside the general education classroom. For more on this, go to http://www.ideadata.org/.

On average, one teaching assistant was included to be shared across three elementary classrooms. In addition to core classroom teachers, one "other" teacher was included for every three core classroom teachers, with this ratio increasing to about one "other" teacher per two core classroom teachers in very high poverty schools. This "other" category includes specialists teaching such things as art, music, and physical education. In high poverty schools, reading teachers, language arts specialists, and math specialists were included in this "other teacher" category. Additional pupil support personnel such as social workers, school psychologists, guidance counselors, nurses, and librarians were specified for the highest poverty schools.

Middle School

Average class size for grades 6 to 8 was set at about 23 students. "Other" teachers were allocated to the average middle school at a ratio of about one for every 2.6 core classroom teachers. For middle schools with high percentages of students in poverty this ratio dropped to one "other" teacher for every 2.2 core teachers. This resulted in a pupil-teacher ratio for middle schools at the average poverty level of about 15.

In addition, social workers, school psychologists, guidance counselors, nurses, and librarians were specified. In the average middle school of 950 students, a total of ten full-time-equivalent professional support staff was included. Accounting for all professional staff, the average pupil-to-all professional staff ratio for middle schools at the average poverty amounted to approximately 12.

High School

Class size for grades 9 through 12 was set at 24, dropping to 18 in very high poverty schools. On average, "other teachers," as described above, were allocated to high schools at a ratio of one for every 2.2 core classroom teachers. Counting all teachers in a school, the student teacher ratio for high schools was set at an average of 15, ranging from 13 to 17 in high to low poverty high schools, respectively.

In addition, in the average high school of 1,131 students, 12.1 full time equivalent professional support staff were included. Including all credentialed staff, the ratio of students to all professional staff at the high school level was 12, ranging from 10 to 13 in the state's highest and lowest poverty high schools.

Special Education

All of the PJP panels came up with a fairly similar vision of the sub-population of special education students that should be served within their neighborhood school as opposed to more centralized assignments (e.g., a special class in some neighborhood school or a special school). Nearly all of the panels placed this percentage at about 90 to 95 percent.

For grades 1-5, the average caseload across all categories of disabilities was about ten students per special education teacher in schools with average incidence of special education and average poverty. With changes in poverty, this ratio ranged from an average of 11.4 in low poverty schools to 7.8 in higher poverty schools.

For grades 6-8, the average caseload across all categories of disabilities was about 11.5 students per special education teacher in schools with average incidence of special education and average poverty. At the high school level, the average caseload across all categories of disabilities was about 13 students per special education teacher.

It should be noted that the numbers above refer to average caseloads for special education service providers, rather than class size. Under the specifications above, a large percentage of special education students would be served in general education classrooms. Indeed, the PJP class size specifications shown above were developed with a high degree of inclusion of special education students in mind. Nevertheless, even when included in general education classrooms, special education students will receive some supplemental services from specialists. Since these students are generally not in the same classrooms with these specialists, but rather are supported by them in general education classrooms, the ratios for these specialists are cited as caseloads.

Because the vision for special education described above is fairly different from what is currently seen in many districts throughout the state, and because many of the staff supporting special education students would also have responsibilities for all students (e.g., psychologists, counselors, and social workers), it really is not possible to compare the cost of the model above against current spending for special education in New York State. The notion is that resources devoted to special education services become blended with resources for all students and are not as easily separable as they might be under more "traditional" models of service delivery.

However, it is clear that cost supplements, as well as cost savings, are included in the model specifications. The special education service approach described above adds to the cost of serving special education students by virtue of the need for more general education classes of a smaller size to fully accommodate their inclusion. On the other hand, these added costs must be considered in light of cost savings associated with the substantially reduced use of separate facilities for students in special education. These forgone costs include the need for extensive services to transport students to centralized schools, the cost of maintaining separate facilities, and the cost of an extensive administrative infrastructure to maintain them. In addition, on the benefit side, the panelists argued for a highly integrated special education program to allow students in special education the increased access to the core curriculum they considered essential to a receive a full opportunity to acquire the knowledge specified by the Regents Learning Standards

Extended Day and Extended Year Programs

At all levels, the PJPs felt that even schools with zero poverty would have students at risk of not passing or meeting Annual Yearly Progress (AYP). Therefore, extended-day programs should be offered to even the lowest levels of poverty, and extended-year programs should be offered to comparable proportions of students, as set by poverty level.

For elementary students, the panels felt that on average 20 percent of all students could benefit from extended-day/year programs, with estimated need ranging from 10 to 50 percent of all students from low to high poverty schools. At the middle school, as the 8th grade pass rate is low, these percentages were extended somewhat to an average of 30 percent, and a range of 10 to 60 percent of all students in accordance with school poverty.

At the high school level, extended day needs were estimated to be somewhat lower than for extended year, with averages of 30 percent and 35 percent, respectively. The need for extended day programs was estimated to range from 10 to 40 percent in accordance with poverty, as compared to 15 percent to 50 percent for extended year programs.

Summary

These program provisions call for bolstered education spending in many districts, and for the state overall. The panel members deliberated carefully over what would be needed to meet the high educational outcome standard that has been adopted by the state. In addition to enhanced educational outcomes resulting from this investment, panelists as well as expert consultants agreed that some cost reductions over these higher levels of spending should be realized over time. For example, strong early childhood programs should reduce the need for special education and remedial services.

Central Administration and Maintenance and Operations: District-Level Functions Outside of the School Prototypes

With the exception of the district-level components of the special education instructional program, the instructional program prototypes developed by the PJPs were focused at the school level. However, one of the ultimate goals was to compare these results with current levels of spending in New York State. Thus, the next step in the process for developing the full cost model was to obtain an estimate of those functions and activities that were excluded from the deliberations of the PJPs.

Because of the special complexities involved in determining district administration, maintenance and operations services, home-to-school transportation services, and capital facilities costs, this study did not attempt to determine "adequate" levels for these components of educational expenditure. Rather, we utilized extant fiscal data provided by the NYSED to determine current allocations for the first two components (district administration and maintenance and operations services) for each district in order to permit comparisons of total expenditures estimated from AIR/MAP models. The AIR/MAP models of adequacy focused on allocations at the school level for instruction, support, and administration. The discussion that follows provides some details of how these costs were actually estimated and then added back to the expenditures derived from the school prototypes developed by the PJPs, thus allowing us to compare the costs of adequacy with actual current expenditures.

Transportation Services and School Facilities

For the purpose of comparison, the analysis conducted by AIR/MAP excluded home-to-school transportation and debt service associated with the acquisition of land and constructions of school facilities. In the original proposal for this project, these elements of expenditure were declared as beyond the scope of the project given the availability of funds to support the research. This is not to say that transportation and school facilities are not important. Moreover, the school prototypes developed by the PJPs may have serious implications and impacts on expenditures in these areas.

With respect to transportation, one of the components stressed by the PJPs during their deliberations was the inclusion of students with disabilities as much as possible in programs provided in neighborhood schools. If the emphasis was to involve a decrease in the extent to which students with disabilities are transported out of their neighborhood schools, this greater degree of inclusion could have the impact of reducing the costs of home-to-school transportation. Further analysis is necessary to determine precisely what impact this might have and whether, in fact, there would be any savings in transportation costs.

Based on the results of this study, the PJPs specified that adequacy would require additional school-level resources to achieve the desired results for students. This took the form of smaller classes and additional instructional and support staff. Along with these staff would be the need for additional classroom and office space in which to work that would undoubtedly have important implications for spending on school facilities. Again, further research and analysis is be required to addresses these needs as they were beyond the scope of the present project.

Determination of Total Current Expenditure – The Point of Comparison

For comparative purposes, the AIR/MAP team deducted expenditures for transportation and school facilities (i.e., debt service) from total expenditures.[45] This figure, which is subsequently referred to as *total current expenditure* (TCE), became the primary point of comparison for the expenditures derived from the prototypes developed by the PJPs. However, in order to use TCE, it was necessary to add on top of the AIR/MAP expenditure estimates for the school prototypes all of those expenditures that were not included in the PJP specifications. Extended discussions were held with members of the *Summary PJP Team* during and after the January meeting to ascertain what was and was not included in the PJP prototypes.

[45] AIR/MAP removed expenditures on tuition payments to other school districts and payments to charter schools. In the case of tuition payments, it was determined that expenditures for actually serving the children for whom tuition payments were made were reflected in the districts in which they were served. In the case of charter school payments, AIR/MAP excluded these expenditures since charter schools operating outside of the district were not included in any of the school level or district level calculations. In both cases, AIR/MAP was able to obtain unduplicated enrollment counts to appropriately calculate per pupil expenditures. Finally, it should be noted that the TCE used here can be seen as a lower bound, as not all expenditures on preschool programs that occur in New York State (i.e. Head Start, Even Start, etc.) are captured in the ST3 data (further discussion of this issue is contained in Chapter 4).

For the most part, the components that were taken off the table during the PJP deliberations included central administrative expenditures and maintenance and operations. However, there were a couple of additional items that were also not reflected in the PJP specifications. Each of these items is described briefly below.

- **Central administrative functions** – Items included in this category are expenditures on the board of education, chief administration, general support staff, personnel and business functions, other special items, curriculum development and supervision, research planning and evaluation, and community service.
- **Maintenance and operations and related central services** – This includes building maintenance and operations, the central storeroom, central processing.
- **Other components** – School level spending not included in the PJP prototypes include are non-personnel expenditures associated with school-level administration (i.e., non-personnel components of instruction are in the model, but not those corresponding to school administration) and interscholastic athletics as well as the school administrative and support functions for extended year or summer school programs.

There are two different approaches one could take to add the expenditures from the above-mentioned district-level components to those projected from the prototypes depending on whether you expect these centralized (district-level) components to vary with an expanded instructional program. On the one hand, one could assume that no additional expenditure is needed and simply add the current actual expenditures on these centralized services. However, this may be an unrealistic assumption for several reasons. For instance, as the size of an instructional program changes, one might anticipate certain elements of centralized services to change as well. If the instructional program involves increased staff-to-pupil ratios, services that support human resources and payroll systems may well increase. Similarly, more elaborate instructional programs might generate the need for additional resources for administrative oversight. A relative increase in staff also likely has implications for the space allocated in school buildings, which would in turn affect maintenance and operations costs as well as those related to other centralized services. With these issues in mind, using an approach that accounts for the potential relationship between breadth of instructional program and need for corresponding centralized services to estimate these specific district-level expenditures may be more appropriate.

Unfortunately, a precise determination of the extent to which these kinds of resources might be needed was beyond the scope of the current study. Further analysis would be necessary in future studies of this kind to ascertain what kinds of changes in these types of resources are likely to be appropriate and to what extent they might change. Nevertheless, it was decided that the current study could help to place some limits on the possible changes in the costs of centralized services. To this end, the AIR/MAP team has described in detail the two alternative methods used in the present study to place some limits around the estimates of the total cost of an adequate education. Each of these

alternatives for adding back the items excluded in the PJP prototypes is briefly described below, and estimates associated with these alternative methods will be presented later in this report.

The Lump-Sum Approach
This first method, which shall be referred to as the *lump-sum* approach for short, is the one originally specified in the AIR/MAP proposal. That is, the per pupil amounts currently expended in each district for these components that were excluded from the prototypes would be added back on top of the projected school program expenditures deemed necessary to achieve adequacy.

Combined Lump-Sum/Ratio Approach
This second method divided the expenditures for the components that were excluded from the school prototypes into two groups: those not expected to grow with an expanded instructional program and those thought to increase with the size of the instructional program. Based on conversations with fiscal experts in New York, it was suggested that the following categories of centralized district functions may tend to grow with increases in the instructional program: finance administration, staff administration, maintenance and operations, special items[46], curriculum development and supervision, and research and planning. An overhead ratio was calculated based on the 2001-02 NYSED fiscal file (ST3 data), which determined the ratio of these expenditures to the actual current spending on items that were included in the prototype models. For example, the overhead ratio for maintenance and operations (M&O) would include the M&O expenditures in the numerator and the actual 2001-02 expenditures on those resources included in the prototype models for the denominator. This ratio would have then been applied to (multiplied by) the projected spending on the school-level programs derived from the PJP specifications. This ratio may well represent an upper bound since it essentially assumes that the growth rate of these centralized services would be the same as the growth rate in instruction. While this may have some intuitive appeal, we have no empirical evidence on which to determine how accurate such an approach might be. Further research on this issue is beyond the scope of the present project.

The remaining components of the district functions and other items excluded from the PJP specifications thought not to vary with instructional program would simply be added as lump-sum per pupil amounts to the projected spending derived from the PJPs. For this reason, this approach represents a combined lump-sum/ratio approach.

Summary

This chapter has described the full set of procedures used for carrying out the professional judgment approach to determine the costs of adequacy in New York State. The initial stages of this project were devoted to a series of public engagement meetings in which various constituencies within New York State had an opportunity to express their views on what would be required to achieve adequacy in public schools and what

[46] These are defined as those with function codes 1710 through 1989 in the NYSED ST3 fiscal file.

criteria should be used to define adequacy. Adequacy was ultimately defined in terms of providing all students with an opportunity to meet the Regents Learning Standards.

Following the public engagement meetings, the AIR/MAP team organized processes for selecting highly qualified educators to serve on a series of professional judgment panels. Eight panels were organized to develop specifications for the instructional programs necessary to achieve the desired results for all children. While the original eight panels were asked to address programs for students living in poverty, ELL students, and students with disabilities, two additional panels were selected from the membership of the original eight to address issues related to special education programs that may not have been covered in the first eight.

Following these initial meetings, AIR/MAP team organized one additional panel from representatives of the first ten panels to help the research team synthesize, interpret, and revise the specifications. This panel was referred to as the *Summary PJP Team,* which met on two occasions.

There were three stages of the professional judgment process at which adequacy cost estimates were made. This chapter described these three stages as follows:

Stage 1. Initial specifications—Summer 2003
Stage 2. Summary PJP Revisions #1—December 10th, 2003 meeting
Stage 3. Summary PJP Revisions #2—January 14th, 2004 meeting

Details of the changes in the school program prototypes that occurred at each stage of this process will be described in Chapter 4 along with the results.

As an example of the analysis done by the AIR/MAP team, exhibits were presented showing the variations in per pupil program costs for elementary, middle, and high schools by enrollment and levels of student need. The results showed, all else being equal, lower per pupil costs for larger schools and higher per pupil costs for schools with greater numbers of students in poverty, requiring ELL services, or eligible for special education services. The effect of poverty was especially dramatic showing a substantial influence on per pupil costs.

The work of the PJPs involved more than just the resource specifications underlying the school program cost estimates. The members of the PJPs offered a rich description of some of the programmatic elements upon which the cost estimates are based. This chapter provided a description of the nature of some of those recommendations by the panels. Smaller class sizes, enhanced availability of extended time programs, and increased access to early intervention services highlight the school prototypes developed by the PJPs. All of this was suggested in view of what would be necessary to meet the Regents Learning Standards.

Additional expenditures were included to reflect the costs of certain specialized resources for school-aged and preschool students with disabilities. In addition, the prototypes also

include targeted preschool programs geared toward serving more students in higher poverty schools.

Finally, this chapter describes the procedures for comparing the projected expenditures derived from the professional judgment process with actual current spending in New York State public schools. Such a comparison required the AIR/MAP team to add to the projected school-level costs derived from the PJP specifications the estimated amounts spent on those district-level functions that were not included as part of the PJP process.

Two alternative approaches were used to provide a lower and upper bound on the adequacy cost estimates: one method that simply adds the current spending on these district-level functions as a lump sum and an alternative that adjusts spending on these functions to reflect some of the potential changes that may occur with changes in the size of the instructional program. While more precise analysis of district level functions is beyond the scope of this study, it was felt that these two estimates provide reasonable bounds within which the true costs of these functions lie.

Chapter 3 - Geographic Cost Differences

Introduction

State legislatures are increasingly aware that educational dollars don't go quite as far in some parts of their state as they do in others. Because any such inequalities in purchasing power undermine the equity and adequacy goals of school finance formulas, legislatures are searching for appropriate mechanisms for geographic cost adjustment.

The primary determinant of geographic variations in purchasing power is variation in the price school districts must pay for their most important resource—teachers. Therefore, this study has undertaken a comprehensive analysis of teacher compensation.[47]

The first step in this analysis involved identifying a comprehensive list of variables that affect the patterns of variation in the salaries of teachers. Clearly, the qualifications and other attributes of the teachers themselves influence the salaries they are willing to accept and the salaries that districts are willing to pay. Teachers with advanced training or experience will expect higher wages from school districts than teachers who recently received a bachelor's degree. Working conditions also influence salaries. Teachers will require additional compensation to teach especially challenging students or take on additional duties. Finally, because teachers must live in reasonably close proximity to their workplace, the community surrounding the school district will influence the salary expectations of teachers. Districts in isolated or high cost-of-living areas will need to offer higher wages to attract qualified teachers.

The variables in this list are of two types: *cost* factors and *discretionary* factors.[48] The *cost* factors are those characteristics of the community and school district within which the teacher is employed that are, for all intents and purposes, outside the control of district decision makers. For example, the cost of living or the physical remoteness that characterize a region in which a district or school is located cannot be changed by school officials.

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[47] While there are other factors that can play a role in variations in the costs of educational services within states, the present study limits the analysis to school personnel, which make up the largest portion of school district budgets. A more refined analysis would include energy costs and the costs of transporting goods and services to districts in more remote regions of a state. However, these kinds of analyses would require more detailed data than are readily available and would only apply to a small portion of the expenditures incurred by public school districts.

[48] In the traditional economics literature, these *discretionary* and *cost factors* have been referred to as the *demand* and *supply factors* that affect teacher salaries. The terms *discretionary* and *cost factors* have been adopted here to convey a critical distinction between the *demand* and *supply factors*—that is, the extent of control by local school district decision makers. Local decision makers have control, at least in the long run, over the *demand factors* which include the characteristics and qualifications of personnel, while they have no control over the factors which affect the willingness of school personnel to *supply* their services to local school districts. By virtue of their effect on the supply of school personnel, these factors affect the cost of comparable personnel in different locations—hence the name cost factors.

The *discretionary* factors are those that are within the control of local school district decision makers. Over the long run, districts can adjust the levels of experience, education, and the job assignments of individual school personnel.[49] The balance of experience and inexperienced teachers, the percentage of teachers who hold master's degrees, and the class assignments of these teachers are all factors that may impact the willingness of an individual to accept a job, and they are all within the control of the district.

Variations in school district purchasing power are reflected in *uncontrollable* variations in teacher compensation. Therefore, the final step of the analysis was to use a model of teacher compensation to predict the salary that each school district would need to pay to hire a comparable individual. The ratio of the salary we predict that the Rochester school district must pay to hire the typical teacher in the state, divided by the state average predicted salary for such a person, represents a measure of the geographic cost of education in the Rochester city school district.

Modeling Teacher Compensation

The *hedonic wage model* was first adapted for the purpose of estimating geographic cost of education indices by Chambers (1981b) and is now widely used by economists for this purpose.[50] Within this framework, teacher compensation is determined by the full collection of teacher, job and community characteristics.[51] The specific explanatory variables included in the analysis are presented in Exhibit 3-1.

[49] In the face of catastrophic or unforeseen events, controllable factors can be temporarily outside of local control. For example, if sudden changes in the economy cause changes in the population that result in declining enrollments in schools, this can result in a district facing a teaching force with a higher level of experience than they would have otherwise chosen. Thus, in these short-run events, even teacher characteristics can be outside local control and may be considered to be part of the cost factors in calculation of the cost-of-education index. This can only be determined as a matter of policy and based on evidence that external changes have occurred that create such changes for the district. Nevertheless, these are the kinds of factors that need to be considered in discussions with school, district, and state officials in the application of the cost index methodology presented here.

[50] See for example, Chambers (1978, 1980, 1981a, 1981b, 1995), Chambers and Parrish (1982, 1984), Augenblick and Adams (1979), and Wendling (1979).

[51] Measures of a district's ability to pay are notably absent from a willingness-to-accept model of teacher compensation. Most teachers are not willing to accept less compensation from poor districts simply because the districts are poor. Instead, highly qualified and mobile teachers tend to accept the most attractive job offers, leaving teachers with fewer options or fewer skills to accept the remaining positions. Thus the distribution of teacher characteristics varies according to each districts' ability to pay, but the salary of a teacher with given characteristics does not.

Exhibit 3-1 – Determinants of Teacher Compensation

Teacher Characteristics: • Total years of teaching experience • Educational attainment • Age and gender • Certification status • College attended (bachelor's degree) Discretionary Job Characteristics: • Teaching assignment • Job classification • Certified math teacher • Certified science teacher • Certified elementary teacher • Percent time in field of certification • Assignment to a high school • Assignment to an elementary school • School size	District Characteristics: • District enrollment • Distance to center of New York City • Distance to center of nearest large city • Climate Community Characteristics: • Population • Population density • Population growth rate • Unemployment rate • Market concentration in education • Land price • MSA size • Indicator for NYC metropolitan area

Our measure of compensation is the full-time equivalent salary for individual teachers, adjusted upward to reflect average district outlays for benefits. All of the data on individual teachers, their compensation and characteristics are drawn from New York State Education Department (NYSED) databases (i.e., the Personnel Master File or PMF for short, and the Teacher Certification File). Data from NYSED Fiscal Analysis and Research Unit (FARU) are used to estimate the average benefit outlay for each district.

The teacher characteristics include experience, educational attainment, age and gender. Because other studies have found experience to be the primary determinant of educator salaries, it is important to ensure that this indicator is consistently defined.[52] Individual records indicating full-time equivalent salaries below $20,000 or above $120,000 are considered implausible and are omitted from the analysis. Teachers who are employed

[52] We used multiple years of data to construct a timeline of experience for each teacher, and flagged each record that was anomalous. Common anomalies include having 0 years of experience for three years running, or having recorded experience decline through time. Whenever possible, we used the multiple years of data to impute anomalous values. (For example, if the time line indicated that years of experience were 7 in 1999, 8 in 2000, 8 in 2001 and 10 in 2002, we adjusted the value for 2001 to indicate 9 years of experience). Anomalies that could not be resolved were flagged as missing data. Records with missing data were assigned an experience value of 0 and flagged with an indicator for missing experience.

less than 8 months of the year or who are employed by multiple school districts are also excluded.

Teacher certification is particularly important in light of the recent changes in federal law. For this reason, a series of indicator variables reflecting certification status are included in the analysis. These variables include whether the teacher holds a permanent teaching certificate, a 5-year provisional certificate, a certificate of qualification, or a temporary teaching certificate. It is hypothesized that, all other things being equal, a teacher with a permanent teaching certificate will command a higher wage than other teachers.

Finally, to more closely control for variations in teacher qualifications, we also included indicator variables for the college from which teachers received their bachelor's degree. Any school from which 25 or more teachers graduated was assigned a unique indicator. There were a total of 742 college indicators. One would expect that teachers from more selective or better quality schools will be preferred and will be able to command higher compensation or employment in more attractive districts, all else equal.

In addition to personal characteristics, individual-specific job characteristics are also included in the model. Indicator variables are used to capture common classroom assignments (English, Mathematics, Physical Education, Reading/Language Arts, Science, and Social Science). Job classification indicators capture the fact that teachers can also be given "specialist" assignments (resource specialist, subject matter specialist, and media specialist).

Because a teacher can hold a certificate and still not be certified in their assigned subject, we include indicators for whether or not teachers are certified in the specific subjects to which they are assigned (Mathematics, Science, Elementary Education) and the percent of time the individual spends teaching in his or her field of certification. One would expect that teachers who are teaching in their field would be more attractive to potential employers. On the other hand, teachers may find job assignments less attractive that require them to teach outside the field for which they are fully certified. In either case, whether or not teachers are assigned to subjects in their field is clearly a matter that is both influential on salaries and within school district discretion.

While most working conditions are generally viewed as within school district control, other district characteristics that are largely uncontrollable also influence teacher compensation. Two that have proved particularly influential in previous analyses of teacher compensation are school district size and school district location. School district size is reflected with a series of indicator variables classifying districts as small (student enrollments between 500 and 1,000 students), smaller (student enrollments between 250 and 500 students), and smallest (total enrollments below 250 students). Twenty-nine percent of New York school districts fit into one of these three categories. Emphasis is placed on small districts because those are the districts unable to take advantage of economies of scale and therefore likely to have unusually small class sizes for reasons that are beyond school district control. The expectation is that small class sizes represent

particularly attractive working conditions and that teachers would be willing to accept lower compensation in exchange for smaller class sizes.

Three school-specific dimensions of location are also included in the analysis: namely, distance from the center of the nearest large city, distance to the center of New York City, and average annual precipitation at the closest weather reporting station. In most cases, the latitude and longitude of individual schools are provided by the National Center for Education Statistics Common Core of Data (CCD). However, where the CCD lacks information on school location, the school is assigned the latitude and longitude of the center of the zip code area in which the school is located.

The key community characteristics are labor market conditions and urbanicity. To capture general labor market conditions, the unemployment rate for the relevant labor market was used in the model. [53]

There are also labor market dimensions that are unique to education. Communities with a limited amount of educational competition have very different labor markets than communities with an array of educational choices. The option value of being able to change employers without changing houses may make educators willing to accept lower wages in communities where there are more potential employers. In addition, the lack of employment choices could give districts monopsony power and hold wages down. On the other hand, a lack of educational choice may allow districts to generate economic rents, some of which could be distributed to educators in the form higher salaries. Therefore, while the degree of educational competition clearly influences wages, increased levels of competition could either raise or lower wages.

We use a Herfindahl index to measure competition in public education. The Herfindahl index is the sum of the squared market shares (in this case, enrollment shares) and ranges from 0 to 100. It is used extensively in the analysis of monopoly power and has a demonstrated ability to explain teacher compensation. Within New York, the Herfindahl index ranges from 3.5 in the Albany metropolitan area (the most highly competitive education market in New York) to 57.5 in Yates County (the most concentrated education market in New York). The New York City metropolitan area has a Herfindahl index of 32.9.

Urbanicity is the other key community determinant of teacher compensation. Urban areas offer obvious amenities but at the cost of urban disamenities such as crime, congestion and a high cost of living. Previous studies of labor markets for school personnel and intuition about metropolitan labor markets generally suggest that large central cities tend to pay higher salaries for comparable personnel to compensate them for the difficulties of working in the environments common to the inner city schools. Crime

[53] Throughout the analysis, the labor market was defined to correspond to the metropolitan area in which the district is located for urban districts and to correspond to the county for districts in non-metropolitan areas. The only exception was that the unemployment rate used in the estimation was measured at the county level in upstate metropolitan areas. It is expected that defining the unemployment rate at the county level for the upstate metropolitan areas has a negligible impact on the final index.

rates are higher in the central cities and these districts tend to serve a more diverse population of students with respect to their educational needs. These factors create challenges to teachers for which they tend to expect compensation. On the other hand, previous studies have also shown that one has to compensate teachers for living and working in relatively remote areas with more limited access to shopping, medical, and cultural facilities that are common in the more urbanized areas.

Distance from the centers of economic activity capture one dimension of urbanicity. Data from the 2000 U.S. Census on the population of the community, its population density and growth rate are included in the analysis to capture other dimensions of urbancity. As a general rule, larger communities and more densely populated communities tend to have more of both the amenities and disamenities of urban life. In addition, relatively rapid population growth tends to signal a relatively attractive place to live.

Undoubtedly, some community characteristics that could influence wages have been omitted. However, these characteristics should be capitalized into the value of land in the community. To capture these effects, and to reflect unmeasured variations in the cost of housing, the price of undeveloped land in the metropolitan area/county and a measure of the geographic size of the metropolitan area/county are included in the model.[54] Assuming that land prices fall systematically as the distance from the city center increases, one can approximate the land price at any radius from the city center using these two indicators.[55]

Finally, it is important to recognize that the New York metropolitan area is a unique labor market, containing over 60 percent of the teachers in our sample. Therefore, an indicator variable for the New York metropolitan area is included in the model. Including such an indicator prevents the characteristics of New York City from totally dominating the estimated relationships between teacher compensation and community characteristics.

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[54] Data on the price of undeveloped land comes from the 1997 Census of Agriculture.

[55] Land prices fall as one moves further from the center of a metropolitan area. One can describe this relationship as $P_r = (1-\gamma)^r P_{core}$ where r is the radial distance from the center, γ is the rate of depreciation, and P_{core} is the average price of undeveloped land at the center of the metropolitan area. Taking logs of this equation, $\ln(P_r) = r\ln(1-\gamma) + \ln(P_{core})$. We lack data on the price of undeveloped land at the center of the metropolitan area (largely because there isn't any), but we have information on the average price of undeveloped land in the MSA. If we assume that such land is located on the fringe of the MSA, the price of land at the center becomes $\ln(P_{\tilde{r}}) - \tilde{r}\ln(1-\gamma)$ where $\tilde{r}$ is the distance from the fringe to the center. Knowing the price of undeveloped land and the radial distance from the center to the fringe, we can approximate the price of land at any radial distance from the center as $\ln(P_r) = (r-\tilde{r})\ln(1-\gamma) + \ln(P_{\tilde{r}})$. Therefore, to capture the price of land in the vicinity of the school district—an important determinant of housing costs—we include the log of the price of undeveloped land in the MSA, the approximate distance from the center to the fringe in the MSA and the distance from the school to the center of the MSA as explanatory factors in the hedonic wage model. For rural areas, we presume that undeveloped land is available throughout the county and therefore that the distance from the center of the market to the fringe is effectively zero.

Estimating Index Values

Regression analysis is used to quantify the systematic relationship between teacher compensation and the collection of *discretionary* and *cost* factors. Then the personnel cost indices are calculated by running simulations of the salaries and wages paid to comparable personnel across local schools and districts. More concretely, these simulations involve examination of the *variations in wages or salaries associated only with the variations in the cost factors, while controlling for (holding constant) the influence of the discretionary factors.*[56] The personnel cost indices reflect *how much more or less it costs in different geographic locations (i.e., school districts) to recruit and employ comparable school personnel*.

Multiple strategies are followed to estimate the relationship between the factors and teacher compensation. The first strategy is to develop a model of teacher compensation for the 200102 school year (the most-recent data available for analysis). The second strategy is to pool data from the 200102 school year with data from the three previous school years into a single model wherein the parameter estimates of the model are constrained to be the same in all years.[57] Pooling the data makes use of a greater number of observations and therefore generates more precise estimates of the statistical relationship between teacher compensation and the characteristics of individuals, jobs and communities (provided, of course, that the underlying relationship is stable over time). Pooling also minimizes the impact of transitory effects and one-time events, making it a better estimate of persistent cost differentials than an estimate based on a single year of data.

While pooling generates more precise estimates of the relationship between compensation and the factors included in the model, it is still vulnerable to omitted variables bias. Scholars have expressed particular concerns that even a broad array of observable teacher characteristics cannot fully capture variations in teacher training, professional qualifications or classroom effectiveness.[58] If omitted teacher characteristics are correlated with the uncontrollable cost factors, then the estimated index can wind up misinterpreting high spending districts as high cost districts and low spending districts as low cost districts.

One way to address this concern—and the third modeling strategy—is to allow for teacher fixed effects. The fixed-effects methodology removes from the index any variation that might arise from unobservable time-invariant teacher characteristics. Unfortunately, in so doing it also removes much of the variation in that is driven by time-invariant characteristics of school districts. Stable district characteristics—such as geographic remoteness—will only exhibit impact through those teachers who change districts and thereby experience different values of these characteristics over time. If

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[56] See Chambers (1997b) for a comprehensive description of the empirical methods used to derive the geographic cost-of-education index.

[57] Arguably, we should use random effects estimation to capture the possible correlation among errors for a specific individual. The large number of individuals makes the computational cost of such estimation prohibitive.

[58] See, for example, Goldhaber (1999).

teachers who change districts are not representative of the teaching population as a whole, the fixed-effects index can be potentially misleading.

The final strategy makes use of information about employee turnover. Turnover may be interpreted as a sign that the existing salary is insufficient from the perspective of the person who quits. Therefore, following the approach suggested in Taylor, Chambers and Robinson (forthcoming), it is assumed that the observed salaries of job leavers as lower than their (unobserved) *desired* wage (i.e., the wage they would have required to remain in their jobs), and estimate the salary relationship using a specialized statistical technique called censored normal regression.[59] For each individual, an indicator variable is constructed to reflect whether or not the individual held the same job in the district in the subsequent year. Individuals who did not hold the same job in the following year were identified as job leavers. Because no information was available for the 2002-03 school year, it was not possible at the time of this analysis to identify job leavers in the 2001-02 data. Therefore, this modeling strategy relies exclusively on data from the three previous school years to generate coefficient estimates.

The four modeling strategies yield very similar pictures of teacher compensation in New York State. Teacher compensation is an increasing function of age, experience and educational attainment. Teachers with a permanent teaching certificate are more highly paid than other teachers, all other things being equal. Teachers in small districts are paid less than otherwise comparable teachers in larger districts. Teacher compensation increases as the price of land increases and as the distance to the city center increases. Compensation is highest in rapidly growing communities, and those with either large populations or a high population density. Teacher compensation is higher in markets where there is more competition for teachers. The complete set of coefficient estimates and standard errors is presented in Appendix J.

Exhibit 3-2 provides descriptive statistics for the index values that stem from each of our four modeling strategies. In all cases, the models are used to predict salary and benefits demanded from each district by the typical teacher in New York State. The index value is the predicted compensation divided by the pupil-weighted average of the predicted salaries of all districts.[60] Thus, an index value of 1.00 indicates that the typical teacher in the given district would demand the state average compensation from the district, an index of 0.90 indicates that the typical teacher in the district under scrutiny would accept 10 percent less than the state average to work in the district, and an index value of 1.10 indicates that the district's typical teacher would require 10 percent more than the statewide average to work in the district.

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[59] The term *censored* in this context is a technical term that refers to the fact that we are unable to observe the *higher* wage that the individual is assumed to require to remain in the job.

[60] Pupil-weighted averages are used so the index values are neutral with respect to any revenues that might be generated through the use of a geographic cost index in a state aid formula. The geographic index is primarily used to reflect relative differences in the costs of education and should not, in and of itself, generate additional needs for education revenues. Centering the index around a pupil-weighted index helps to ensure this neutrality.

Exhibit 3-2 – Descriptive Statistics for Geographic Cost of Education Index*

Model	Mean	Standard Deviation	Minimum	Maximum
Annual	0.93	0.12	0.73	1.15
Pooled	0.92	0.12	0.72	1.14
Fixed-Effects	0.95	0.08	0.80	1.09
Turnover-Adjusted	0.92	0.12	0.70	1.13

*Note: Figures are unweighted so that each district was treated with equal weight in the calculation of these descriptive statistics.
Exhibit reads: Based on the *fixed-effects* model, the teacher cost index for the average district in the state is 0.95, which implies that costs for comparable teachers are about 5 percent lower than the district attended by the average student. The highest cost district pays about 9 percent above the district attended by the average student, while the lowest cost district pays about 20% less.

As Exhibit 3-2 illustrates, we find evidence of substantial variation in the uncontrollable cost of education. The fixed-effects index has a noticeably narrower range than the other three indexes, but it still suggests that the highest-cost New York districts must pay at least 36 percent more than the lowest-cost districts in order to hire the same individual.[61]

The index values are remarkably well correlated with one another (Exhibit 3-3). The correlation coefficients all exceed 0.97, and with the exception of the fixed-effects model, they all exceed 0.99.

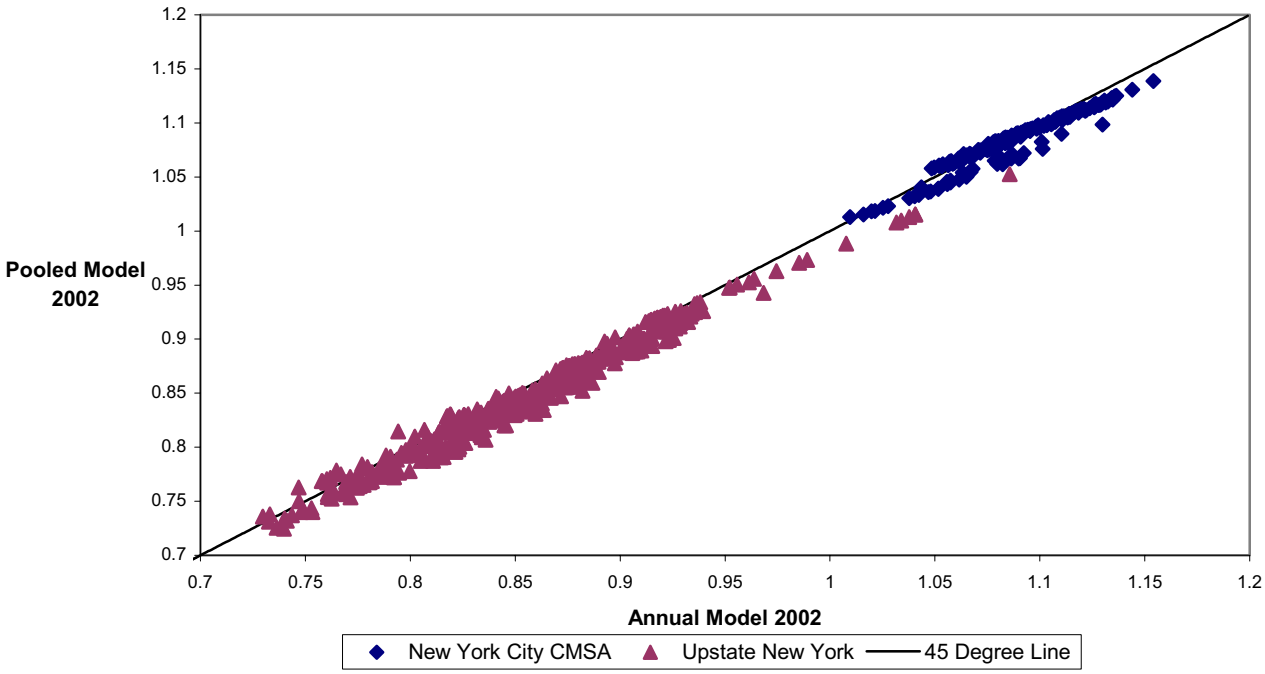
Exhibit 3-3 – The Correlation Across Indexing Strategies

	Annual	**Pooled**	**Fixed-Effects**	**Turnover-Adjusted**
Annual	1			
Pooled	0.9976	1		
Fixed-Effects	0.9751	0.9745	1	
Turnover Adjusted	0.9939	0.9987	0.9752	1

While the indexes are highly correlated, there are significant differences for specific districts. For example, Exhibit 3-4 illustrates the relationship between the Annual and Pooled indices. As the exhibit illustrates, pooling tends to slightly reduce the index values in most parts of the state.

[61] This can be calculated as follows:
$(\text{Fixed-Effects}_{Max} - \text{Fixed-Effects}_{Min}) / \text{Fixed-Effects}_{Min} = (1.09 - 0.80) / 0.80 = 0.3625$.

Exhibit 3-4 - Pooling the Data Tends to Lower Index Values



The greatest differences across indexes arise from comparisons with the teacher fixed-effects model. Exhibit 3-5 illustrates the relationship between the Pooled and Fixed-Effects Indices. Both models draw on the same four years of data, so any differences in the index values arise because including fixed effects in the model alters the estimated relationship between uncontrollable cost factors and teacher compensation. Differences arise either because there are unobservable aspects of teacher quality that are correlated with the cost factors (so that unobservable quality is higher where index values are revised down) or because the cost factors are essentially fixed in nature (so that estimated costs are dominated by the preferences of teachers who change locations, and those teachers disproportionately favor districts where the index values are revised down). As the exhibit illustrates and on net, the fixed-effects model tends to lower index values for districts in the New York City metropolitan area, and raise them for districts in the rest of the state.

Exhibit 3-5 - The Fixed-Effects Model Compresses Index Values

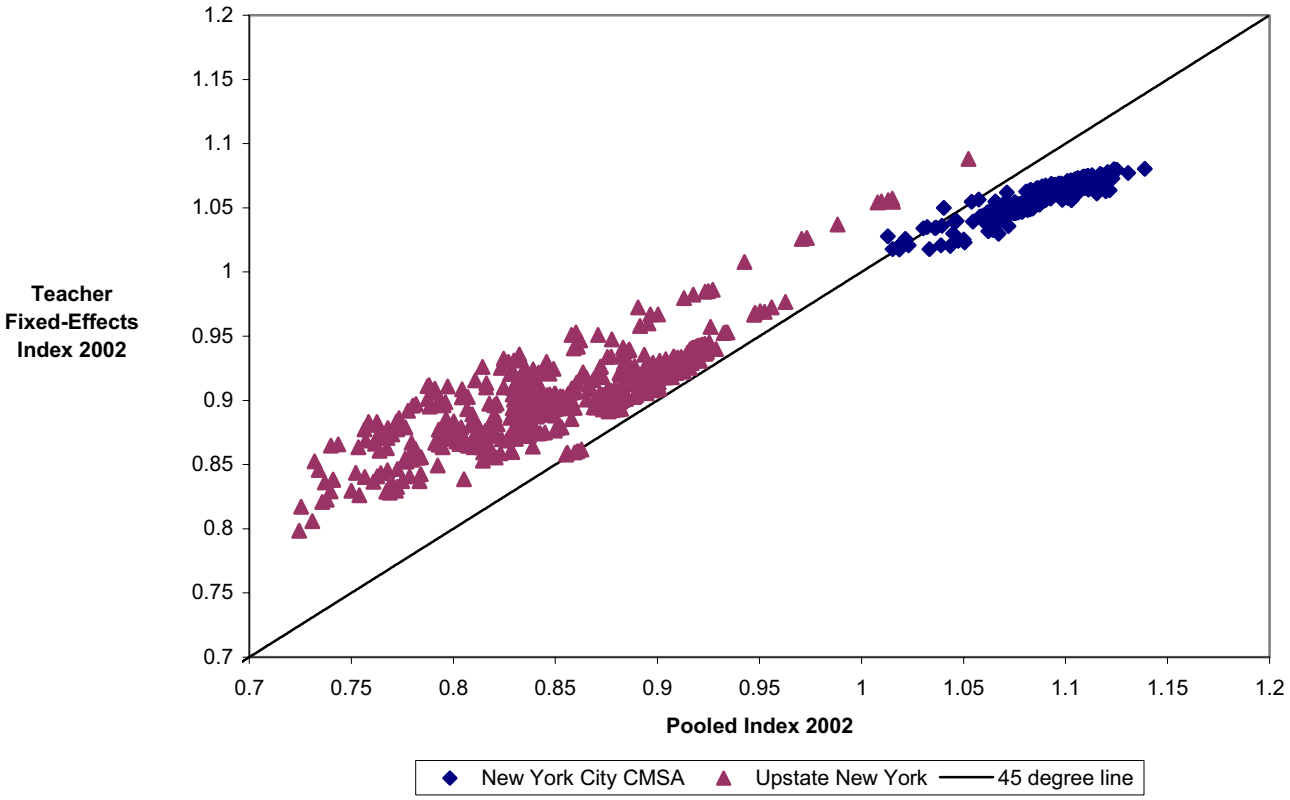
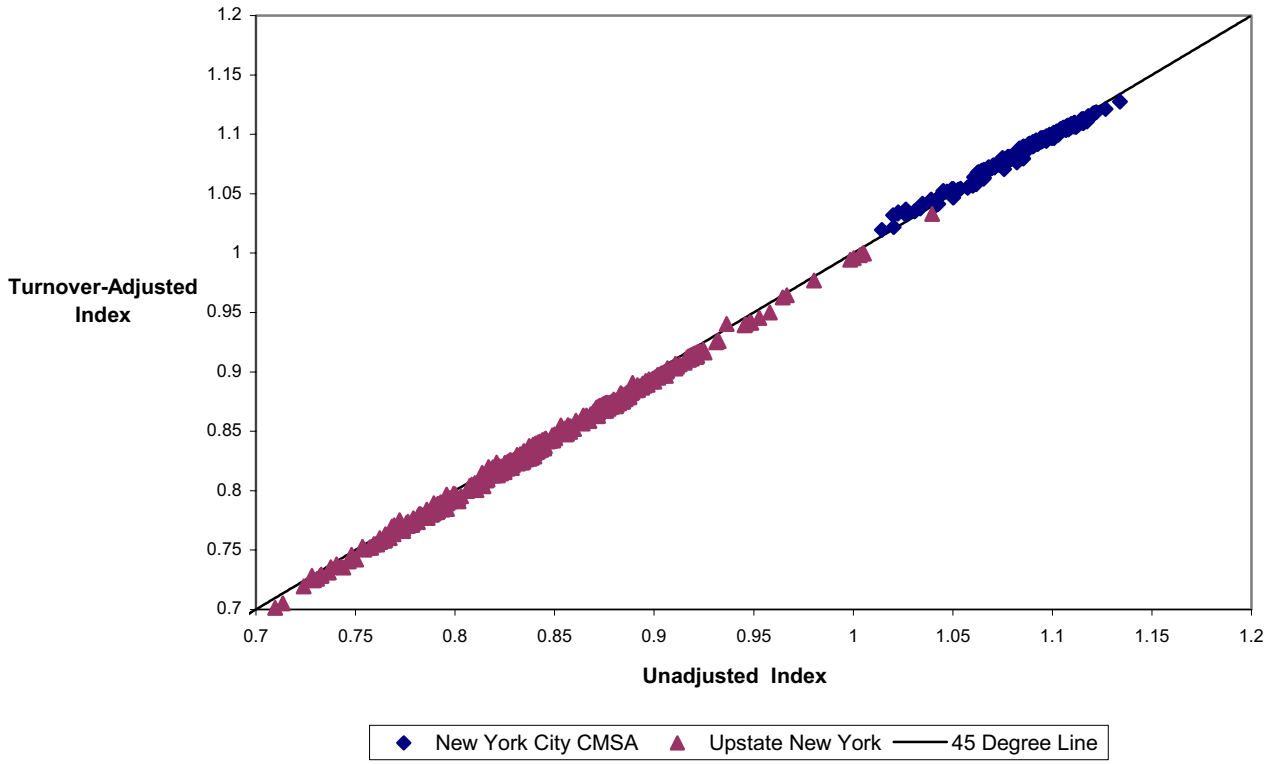


Exhibit 3-6 illustrates the impact of the turnover-adjusted model. The exhibit compares the turnover-adjusted index with an otherwise comparable index that has not been adjusted for turnover (and thus was estimated using ordinary least squares). Both models draw on identical data, so any differences reflect the estimated impact of uncontrollable cost factors on teacher turnover. As the exhibit illustrates, there is little evidence that differences in teacher turnover across districts are systematically related to differences in uncontrollable costs. The turnover-adjusted index lies virtually on top of the unadjusted index. The only discernable patterns appear to be that turnover-adjustments lower the index values for the least-cost districts and for the smallest districts.

Exhibit 3-6 - Little Evidence that Uncontrollable Cost Factors Explain Turnover



Choosing a Preferred Model of Teacher Compensation

Arguably, any of the indexing strategies discussed above could generate a viable geographic cost of education index (GCEI) for New York State. Pooling the data—with or without teacher fixed effects—reduces the risks associated with year-specific measurement errors or selection biases. It also generates index values that reflect only persistent relationships between compensation and cost factors. For these reasons, a multi-year model of teacher compensation is preferred.

The turnover-adjusted model draws on multiple years of data, but it cannot incorporate the most recent year (because one cannot determine who quit teaching). More crucially, there appears to be little gain from adopting this methodology. The benefits of this technique do not appear worth the cost in lost data.

The Pooled Index and the Teacher-Fixed-Effects Index both rely on the full four years of available data. However, a comparison between the Pooled index and the Teacher-Fixed-Effects index suggests that the index values are sensitive to the choice of multi-year modeling strategy. Relying on the Teacher Fixed-Effects index rather than the Pooled

Index largely addresses concerns about omitted teacher characteristics, and ensures that the index does not misinterpret high spending districts as high cost districts. It also most closely corresponds with the charge to estimate uncontrollable variations in cost. As such, the Teacher-Fixed-Effects index is the one that will be incorporated into the simulations to determine the costs of adequacy.

The Characteristics of the Geographic Cost Index

Exhibit 3-7 illustrates the average values of the geographic cost index for school personnel across districts classified according to the *Need to Resource Capacity* (NRC) as defined by the NYSED. As the exhibit indicates, the index implies that it would cost approximately 4 percent more than the state average to hire a teacher in New York City. Conversely, hiring instructors in high need rural districts requires offering salaries that are lower than the state average by about 10 percent.

Exhibit 3-7 - Geographic Cost of Education Index, Weighted Averages by Need to Resource Capacity of the Districts

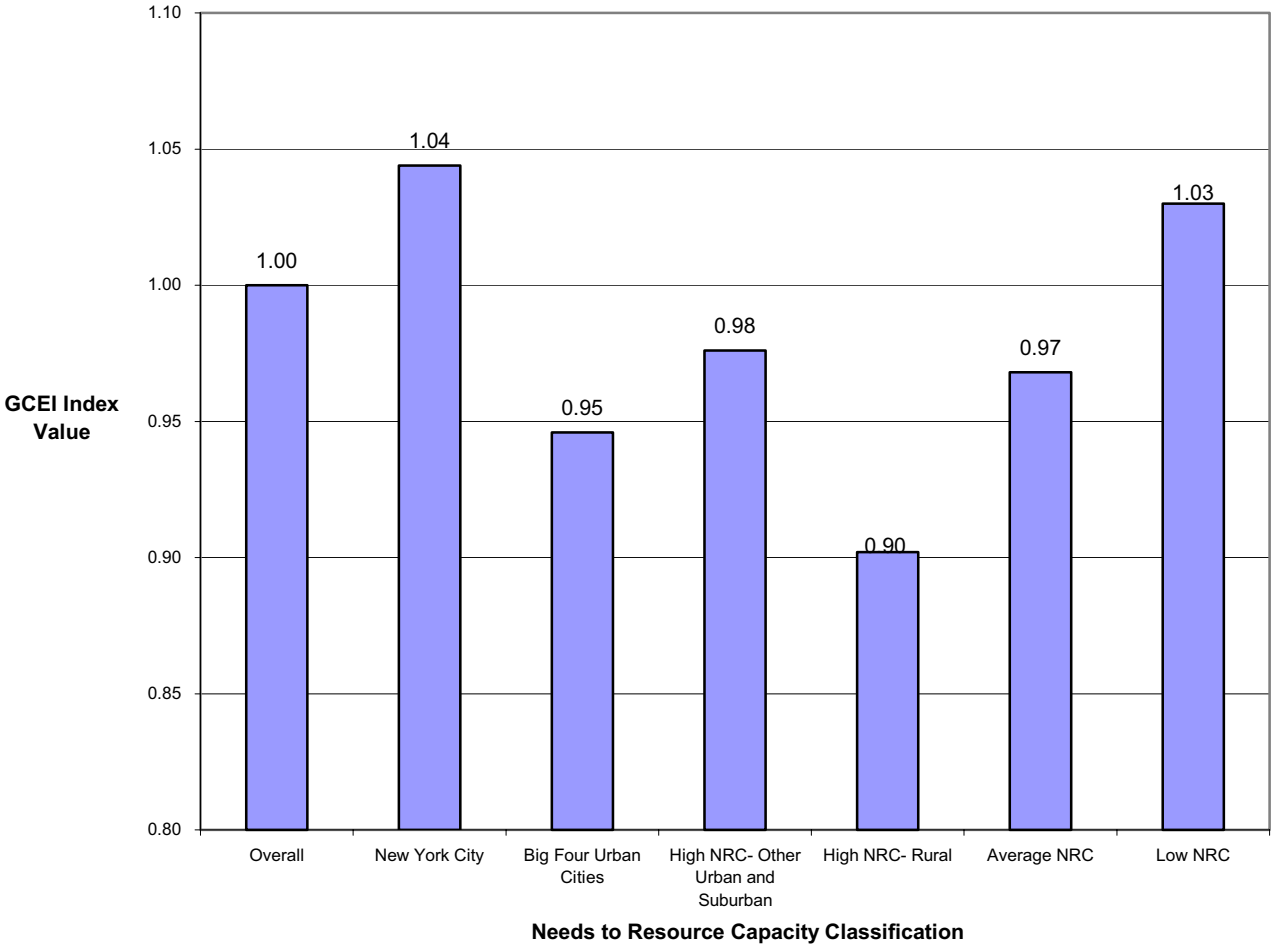
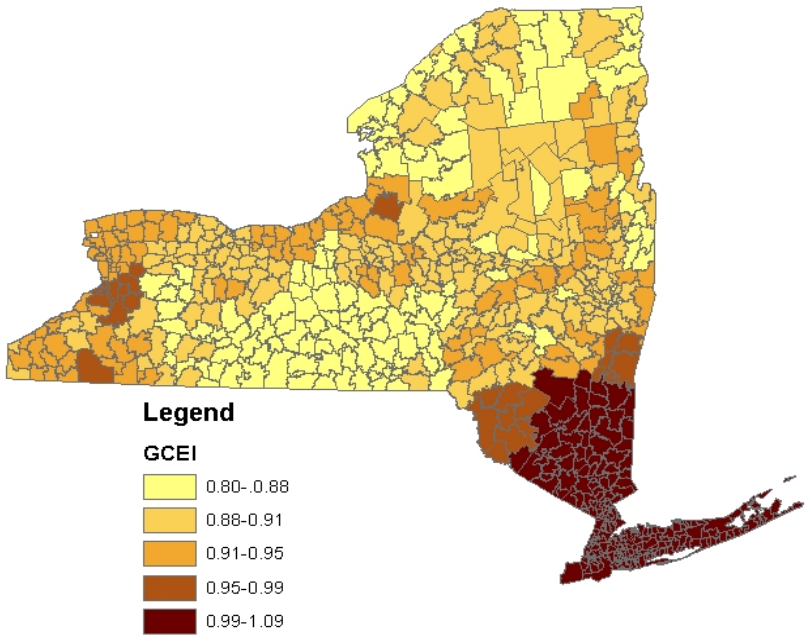


Exhibit reads: The estimated cost of hiring a qualified teacher in New York City is four percent higher than it is to hire a comparable instructor teaching the average student in the state. It is ten percent less costly than the state aveage to retain a comparable instructor in high NRC rural areas.

Not surprisingly, there is a strong, geographic pattern to the GCEI. As Exhibit 3-8 illustrates, index values are highest in New York City and tend to decline as one moves further away from the state's largest market. Index values are also relatively high along the southern shore of Lake Ontario and in the Buffalo area, perhaps reflecting the need to compensate teachers for the relatively more severe climate.

Exhibit 3-8
Fixed-Effects Geographic Cost of Education Index (GCEI)



The geographic pattern in the GCEI is consistent with other estimates of labor market differentials. For example, the National Low Income Housing Coalition (NLIHC) estimates the minimum hourly wage needed to be able to pay the fair market rent on a two-bedroom apartment in each metropolitan area or county. As with the GCEI, they find that this "living wage" is highest in NYC and falls as one moves upstate. However, their exclusive focus on housing costs tends to exaggerate differences across communities. The NLIHC estimates that the living wage in the most expensive New York market (Nassau-Suffolk) is more than 2.5 times the living wage in the least-cost New York market (Utica-Rome).

Using their estimate of the statewide living wage, a Housing Cost Index can be constructed from the NLIHC data. The housing cost index ranges from .53 to 1.34 across the state as a whole, and from 0.87 to 1.34 within the New York City CMSA. A pupil-

weighted average index value for the New York City CMSA as a whole is 1.10. The index value for the New York City PMSA is 1.09.

The correlation between the housing cost index for each district and the GCEI is 0.90, which is remarkably high considering that the GCEI varies within labor markets while the housing cost Index does not. The two indexes diverge most strikingly in Ulster and Orange counties, where predicted teacher wages are higher than one would expect given the housing cost index, and in Ithaca (which has been newly designated a metropolitan area on the basis of the 2000 Census) where predicted teacher wages are lower than one would expect, given the Housing Cost Index.

The much wider range of the housing cost Index is not surprising. The housing cost Index rests on a single dimension of cost-of-living and therefore almost invariably, will show a greater range than total costs of living. In addition, the differential in range is driven almost exclusively by the sharply higher housing costs in the New York City CMSA. Unusually high housing costs signal either the presence of attractive locational amenities or the presence of productivity enhancing factors.[62] People bid up the price of a house in attractive places, and tolerate higher housing costs because they are offset by cultural and natural amenities. Thus, in amenity-rich communities, the wage workers will accept is lower than you would predict given the price of housing. New York City is well recognized as an amenity-rich community. Furthermore, Brown and Taylor (2003) suggest that New York City has among the most productive urban real estate in the country. Firms are willing to pay high wages and high rents in New York City because it is the center of global economic activity. The productivity effect bids up rents and wages in industries that benefit from the effect, leading to higher land and housing costs than you would expect given the wage level in industries—like education—that do not benefit from the productivity differential.

The 2000 Census tells a similar story. The Individual Public Use Microdata Sample (IPUMS 5-Percent) provides data on the earnings, occupation, place of work and demographic characteristics for New York residents. These Census data are used to estimate a hedonic wage model for non-educators. Provided that the non-educators are similar to teachers in terms of age, educational background and tastes for local amenities, an index based on the non-educator model should yield index values that are similar to the GCEI.

A regression model was estimated that specified annual wage and salary earnings as a function of the individual's age, gender, ethnicity, educational attainment, amount of time worked, occupation and place of work. To ensure that the individuals represented in the Census index are comparable to teachers, the analysis excluded from the estimation self-employed workers, workers without a college degree and those who work less than half time or for less than $5,000 per year.[63] To ensure that the Census-based wage estimate is based completely on factors outside of school district control, the model also excluded anyone who has a teaching occupation or who is employed in the elementary and

[62] For further discussion, see Brown and Taylor (2003).
[63] Individuals who work in one state but live in another are also excluded.

secondary education industry. After these exclusions, the sample retains 78,540 employed, college-educated New Yorkers drawn from 434 occupations.

Unfortunately, in the interests of privacy, the Census provides limited geographic detail. The most appropriate locational information on the individual files is a "place-of-work area." Most metropolitan areas contain multiple place-of-work areas, but rural counties tend to be clustered together. Once the data are aggregated within each metropolitan area, there are only 26 estimable place-of-work markets in New York State.

Like the models of teacher compensation, the Census model conforms to reasonable expectations about labor markets. Wage and salary earnings increase with the amount of time worked and the age of the worker (a rough proxy for experience). Individuals with advanced degrees earn systematically more than those with a bachelor's degree. Women of comparable age and educational attainment earn less than men, probably reflecting the tendency of women to have less experience than men because women often spending extended periods out of the labor force during child-rearing years while men do not. Whites earn systematically more than apparently comparable individuals from most other ethnic groups. Appendix J presents the estimated coefficients from the Census model.

The estimated wage level in each place of work captures systematic variations in average labor earnings while controlling for demographics, occupations and amount of time worked.[64] Dividing the local wage level by the state average wage level yields a Census-based wage index that is directly comparable to the teacher-based GCEI.[65]

Not surprisingly, the Census confirms that New York City has the highest wage level in the state. The Census-based wage index suggests that wages are between 10 percent below and 11 percent above the state average in the New York City CMSA. The wage level for the New York City CMSA as a whole is 8 percent above the state average. All areas outside of the New York City CMSA have wage levels below the state average. Wages are 28 percent below the state average in the least-cost parts of the state (Sullivan and Wyoming Counties).

The correlation between the teacher-based GCEI and the Census-based index is 0.84. Again, the indexes diverge most dramatically in Ulster County, where predicted teacher compensation is well above average and the wage level for non-educators is well below average.

The GCEI is oddly inconsistent with the teacher salary indexes for New York that were developed by William Duncombe (Duncombe, 2002). Duncombe also estimated a hedonic salary model using data on New York teachers. His estimation is similar in spirit

[64] Formally, the estimated wage level in each market is the least-squares mean for the market fixed effect. The least-squares mean (or population marginal mean) is defined as the expected value of the mean for each effect (in this context, each market) that you would expect for a balanced design holding all covariates at their mean values.

[65] The state average wage level is a weighted average of the local least squares means, where the weights are the population shares from the regression sample.

to this analysis but diverges significantly in the specifics. For example, Duncombe uses salaries as the dependent variable rather than salaries and benefits. Where the analysis contained in this report uses the Herfindahl index to measure market concentration, Duncombe uses employment shares to measure market power. Duncombe's index incorporates student characteristics as uncontrollable cost factors; the GCEI does not. Where Duncombe uses the population density of the district as a locational amenity, the GCEI uses the population density of the labor market.

The major modeling differences, however, arise from the use of multiple years of data, Duncombe's inclusion of a number of efficiency measures, and differences in the treatment of school district size. Because the AIR/MAP team had access to multiple years of data, it was possible to estimate the teacher fixed-effects model. This model largely addresses concerns about bias arising from omitted teacher characteristics, and ensures that the index reflects only systematic variations in compensation that are independent of school district choices about whom to hire. As such, there was less need to make the adjustments that Duncombe did to address the inefficiencies in the teacher market that might lead the model to confuse high spending districts with high cost districts. Absent those concerns, it is difficult to justify including Duncombe's efficiency measures in a model of teacher compensation.

The other major point of divergence in the modeling is the treatment of school district size. Both models treat enrollment as a potential source of uncontrollable cost variations. However, where the AIR/MAP team focuses on the fact that small districts can be obliged to offer unusually attractive working conditions, Duncombe presumes that size uncontrollably impacts salaries in large as well as small districts. For small districts, the estimated cost differentials are similar. Where Duncombe's model predicts that increasing enrollment from 250 to 500 students implies a 1.27 percent increase in salary, the AIR/MAP model finds an increase of 1.20 percent. However, Duncombe's specification also implies that size alone leads wages in the New York City school district to be 6 percent higher than wages in the Buffalo school district (the next largest district) and 13 percent higher than wages in any district with 1,000 students. In the AIR/MAP model, differences in district size do not drive uncontrollable differences in teacher compensation for districts with more than 1,000 students.

Exhibit 3-9 illustrates the average values of the various indexes according to the *Need to Resource Capacity* classifications. The dissonance between Duncombe's index and the others is readily apparent.

Exhibit 3-9 - Four Alternative Cost Indices

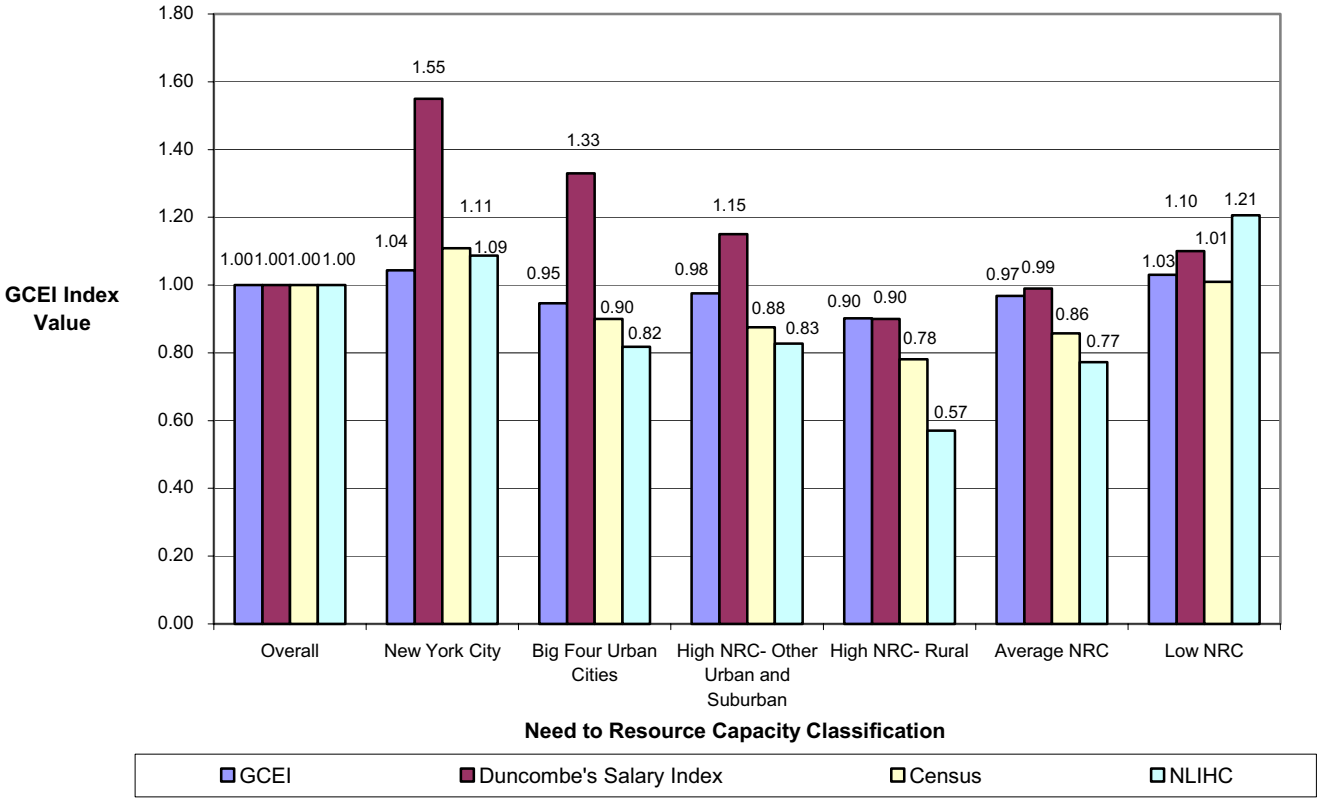


Exhibit reads: The estimated cost of hiring a qualified teacher in New York City relative to a comparable instructor teaching the average student in the state is 4, 55, 11, and 9 percent higher using the Geographic Cost of Education, Duncombe Salary, Census, and National Low Income Housing Coalition indices, respectively.

The Hedonic Model and Highly Qualified Teachers

The provisions of the federal No Child Left Behind Act (NCLB) create strong incentives for school districts to hire highly qualified teachers. However, each state will develop its own definition of "highly qualified" and it is not possible from the existing personnel data files to determine which New York school teachers will be deemed highly qualified.

It appears clear that at a minimum, teachers will be expected to hold advanced degrees and to be certified in the subject matter to which they have been assigned. The coefficients from the teacher compensation models allow one to estimate the differential cost of hiring such personnel.

The impact of hiring individuals with advanced degrees is clear. The teacher fixed-effects model indicates that teachers with a master's degree earn 8.7 percent more than teachers with a bachelor's degree, all other things being equal.

The impact of teacher certification is more complex. The model indicates that all other things being equal, a teacher with a permanent teaching certificate earns more than a

teacher with a 5-year provisional certificate, and substantially more than a teacher with a temporary teaching certificate. However, the model also strongly indicates that teachers require a premium to teach outside of their field. The salaries that teachers are willing to accept fall as the share of their time spent teaching in their field of certification rises. Certified teachers who are asked to teach outside of their field earn a substantial premium over other teachers. All other things being equal, a teacher who is certified in subjects other than mathematics earns 19 percent more for teaching this subject than for teaching in her field of certification, and 14 percent more than an uncertified teacher who is teaching math. Somewhat surprisingly, the least expensive person to put in a mathematics classroom is someone who is certified in this subject. Arguably, this is simply because they prefer teaching math; it is their field. A certified math teacher earns 4 percent less than an otherwise equal but completely uncertified math teacher.

The analysis does not imply that math and science teachers are easily retained at relatively low wage levels. A certified math teacher who is teaching math earns nearly one percent more than a certified English teacher who is teaching English, and a certified science teacher who is teaching science earns even more. Rather, the model is consistent with the notion that teaching mathematics and science is challenging work, and that those not trained in the field require additional compensation to accept the challenge.

Taken at face value, the model's implications for the costs of compliance with NCLB are striking. If a teacher must hold a master's degree to be considered highly qualified, then the price of teachers will be substantially higher. On the other hand, if there were sufficient supply, a requirement that teachers be fully certified should require no additional revenues and could even lead to a reduction in average salaries.

Of course, the observation that districts must pay a premium to fill the classroom with non-certified teachers begs the question—why are districts hiring such individuals? Most likely, this is because there are more openings for math and science teachers than there are certified math and science teachers willing to fill them. New York districts responding to the Schools and Staffing Survey were more than twice as likely to report difficulties hiring in mathematics and science as in English or social studies. (See Exhibit 3-8.) Apparently, districts are more willing, or able, to respond to vacancies by paying a premium to staff the classroom on a temporary basis, than by instituting a more substantial pay differential for math and science teachers. A requirement that districts hire only certified teachers may force their hands, leading to differential pay but no increase in average district cost.

Exhibit 3-10 - Much Greater Difficulties Hiring Math & Science Teachers (Percent of Districts Reporting Very Difficult or Unable to Fill Vacancy)

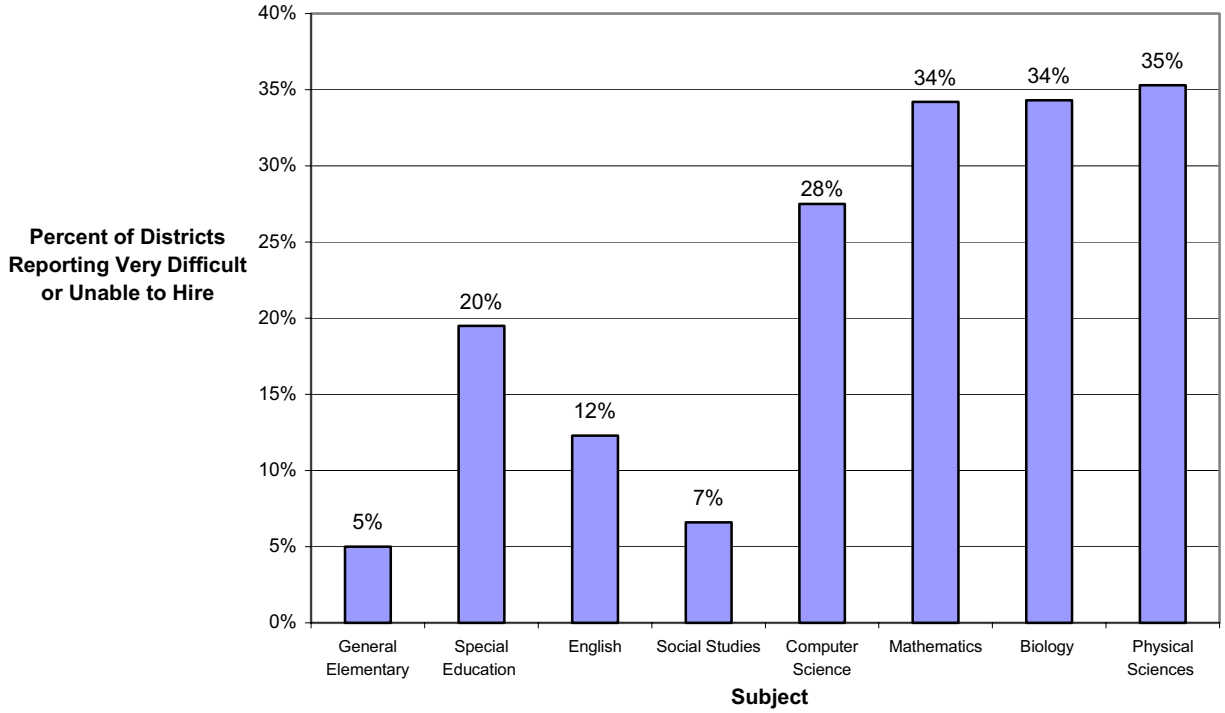


Exhibit reads: The percent of districts reported it was very difficult or they were unable to hiring teachers for mathematics, biology and the physical sciences is 34, 34 and 35 percent, respectively.

Source: Schools and Staffing Survey

Teacher Turnover

Teacher turnover is an issue of considerable concern in New York State. On average over the three-year period from 1999-2001, 14 percent of New York teachers quit their jobs. Across NRC categories, the turnover rate was highest in New York City (at 18 percent) and lowest in the low NRC, average NRC and rural NRC categories (at 11.2, 11.5 and 11.5 percent, respectively).

By the standards of other states, the teacher turnover rates for New York are not unusual. For example, teacher turnover in Texas averaged 15.5 percent during 1999-2001 (1.5 percentage points above the New York State average). At 18 percent, the average turnover rate in the Houston Independent School District (the eighth largest school district in the U.S.) was directly comparable to the rate for the New York City school district.

The New York turnover rates are also not unusual by the standards of other industries. The Bureau of Labor Statistics maintains a survey of Job Openings and Labor Turnover (JOLTS). According to JOLTS, 26 percent of private sector workers quit their jobs in 2001. Twenty-six percent of workers in business and professional services quit

nationwide, as did 20 percent of education and health services workers. Twenty-three percent of total non-farm workers quit. The rate of voluntary separations was somewhat lower than the national average in the Northeast quadrant, but still almost 20 percent of non-farm workers in the Northeast quit their jobs.

The analysis conducted for the present study reveals little evidence that teacher turnover is a function of labor market conditions outside of school district control. Adjusting for turnover in the hedonic salary estimation had little systematic effect on the index values, suggesting that turnover is not a function of compensation factors outside of school district control.

To more thoroughly explore this, the direct relationship between turnover and compensation was estimated. The dependent variable in the logistic analysis takes on only two values—quit or no quit. The explanatory factors are drawn from the teacher and job characteristics used in the hedonic wage model, together with an estimate of the beginning teacher salary scale in the district and the GCEI (see Appendix J).

If turnover is driven by inadequate salaries, then one would expect to see more quits in districts where the pay scale is low given the GCEI. Indeed, such is the case. The analysis suggests that the probability that a teacher quits is significantly higher when the pay scale is lower than predicted by the GCEI.

The magnitude of the effect is small, however. Large changes in pay scale are needed to induce small changes in turnover rates. For example, the model predicts that a female teacher with less than 5 years teaching experience and no teaching certificate has a 20 percent chance of quitting in a district that pays the exact salary predicted by the GCEI. To lower her chance of quitting to 19 percent, the district must pay 7 percent more than predicted by the GCEI; to lower her chance of quitting to 15 percent, the district must pay 40 percent above the GCEI. Even larger changes in relative salary are needed to reduce the turnover rates of more experienced teachers. Evaluated at the mean, each percentage point decrease in teacher turnover requires a 9 percent increase in compensation (holding the GCEI constant). Thus, while the model suggests that turnover is responsive to salaries and that equalizing district purchasing power could reduce teacher turnover, it also suggests that turnover is largely driven by individual choices and by factors within school district control.

Summary

This chapter has presented the analysis conducted for the purpose of accounting for variations in the cost of recruiting and employing comparable school personnel across the districts in New York State. The analysis above focuses, for the most part, on modeling the compensation of public school teachers. Previous work by Chambers (1981b, 1997) in this field has shown there to be a very high correlation between the geographic cost adjustments for teachers and other school personnel. Because of the quantity and quality of the data on teachers available for the New York analysis, it was decided to use the geographic cost adjustments for teachers to adjust the salaries for all school personnel.

A number of alternative models are used to estimate the patterns of teacher compensation, and the advantages and disadvantages of each are evaluated. However, each of these models suggests highly similar patterns of variations (with correlations above 0.97) in geographic costs across the state. Depending on the model, the highest to lowest cost districts pay anywhere from 40 to almost 60 percent more for comparable teachers. The preferred model selected for the adequacy simulations (i.e., with teacher fixed effects) is the most conservative in terms of the range of cost differences. The preference for this model was based on the fact that it controls more effectively than the others for differences across districts in the qualifications of the teacher workforce.

The results of the analysis of teacher cost differences was compared to two other analyses: one on the costs of housing in New York State and one using Census data on non-education wage earners with qualifications and background characteristics similar to the teaching population. For the most part, these two analyses exhibit patterns of variation in costs that were similar to those observed for public school teachers. Correlations between the teacher cost indices and the cost indices derived from these alternative models strategies were well above 0.80.

In thinking about the costs of recruiting highly qualified teachers, the compensation models for teachers used in this analysis indicated that teacher qualifications and job assignments interact with one another. On one hand, there are wage premiums associated with attracting fully certified teachers, while at the same time, teachers appear to accept lower wages to spend more time teaching in subjects for which they are fully qualified.

Chapter 4 - "Costing Out" Adequacy: The Results

Introduction

This chapter presents the AIR/MAP projections of expenditures necessary to achieve "adequacy" in New York State public schools, and compares them to actual levels of expenditure. All data correspond to the 2001-02 school year. As indicated previously, the expenditure figures in this chapter, both the actual and those projected from the PJP models, exclude spending on transportation services and debt service for school facilities.

The AIR/MAP projected expenditures displayed in the following exhibits are derived from the professional judgment process as described in Chapter 2. They reflect allocations of staff and non-personnel expenditures for school operations developed by the professional judgment panels combined with the overhead rates that reflect expenditures on centralized district administration plus maintenance and operations services.

All of these projected expenditures incorporate the following factors:

- **Cost of central administration and maintenance** – estimates of the costs of carrying out central administrative and support functions and the costs of maintenance and operations
- **Resource cost differences** – geographic differences in the costs of school personnel
- **Pupil needs** reflected by the composition of enrollment
    - ***Across grade levels*** (i.e., elementary, middle and high schools)
    - ***By poverty*** (represented by the percent of students eligible for free and reduced price lunches)
    - ***By English language skills*** (represented by the percent of students who are classified as English language learners)
    - ***By special education eligibility*** (i.e., the percent of students with disabilities who have an individual education program (IEP))

For comparative purposes, the data on actual total current expenditure on public school children in New York State are based on information provided by the NYSED for the 2001-02 school year.[66] Total current expenditure in this context means total expenditure less transportation and debt service (i.e., for school facilities).[67] These figures reflect spending on the kindergarten through 12th grade (K-12) instructional program and

[66] Specifically, we make use of the ST3 and an aggregated form of this data known as the School District Fiscal Profiles. The year 2001-02 is the latest available version of the fiscal data. The School District Fiscal Profile data and reference material is publicly available at http://www.oms.nysed.gov/faru/.

[67] More precisely, the following items are excluded from the calculation of total current expenditure used here: home-to-school transport, district debt service, and facility construction costs. Inter-district tuition payments are also excluded since expenditures to serve transfer students are already reflected in the district of service. This exclusion avoids double counting of expenditures.

expenditures on pre-kindergarten programs provided by public schools in the state during the 2001-02 school year.[68]

Current statewide spending figures for New York are compared with PJP estimates of the costs of resources necessary *to provide a full opportunity to achieve the Regents Learning Standards*. These expenditures include projected spending on the K-12 instructional program plus expenditures on preschool programs, including both pre-kindergarten and early childhood development, that the PJPs deemed necessary to achieve adequacy in New York public schools. The term *projected expenditure* or *cost* is subsequently used to refer to the estimates derived from the deliberations of the PJPs by the AIR/MAP team. In addition to presenting aggregate figures for all districts in the state, each exhibit presents data for collections of public school districts classified by the NYSED Need to Resource Capacity (NRC) categories.

The Foundation for Alternative Cost Estimates for Achieving Adequacy

As with any type of cost analysis, estimating the costs of achieving adequacy in education is not a precise science. Any cost analysis, whether it is focused on education, health issues, environmental policy or some other area of public policy, requires the development of a set of assumptions combined with analytical and statistical techniques. In our case, variation in the PJP-specified resources required to provide an opportunity to achieve the Regents Learning Standards may arise from three sources. First, as explained in Chapter 2, the prototypical schools provided in the PJP exercises varied greatly with respect to size, poverty, and need for special education and English language learner services.

Second, variation in the specified resources may stem from the fact that panel opinions differed, even those from the same type of district (PJP). That is, panels from the same PJP category are likely to arrive at somewhat different program designs and specifications even when faced with identical exercises. In order to account for these sources of variation, the process designed by AIR/MAP for this study engaged multiple panels to obtain alternative resource specifications across different levels of school need. In addition, the methodology made use of a Stakeholder Panel to review the procedures and resource specifications resulting from the PJP process.

Third, AIR/MAP introduced various stages into the professional judgment process, each providing an alternative from which cost estimates could be derived. As described in Chapter 2, the study included three stages in the professional judgment process. These are reiterated below:

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[68] It is worth noting that not all of the spending on preschool programs in New York State for the 2001-02 school year is included in the NYSED fiscal figures reported above. For example, Head Start had enrollments of approximately 49,000 and federal HHS allocations amounted to over $398 million in 2001-02 according to the *Digest of Education Statistics* published by the National Center for Education Statistics, 2001. Another $21 million was spent on Even Start programs in 2001-02 according to the New York State Alliance for Family Literacy.

Stage 1. Initial Specifications – meetings in July/August 2003. This stage reflects the synthesis of the initial specifications presented to the AIR/MAP team by the original ten general and special education PJPs following the summer meetings.

Stage 2. Summary PJP Revisions #1 – December 10th, 2003 meeting. This stage reflects revised specifications from the December meetings of the *Summary PJP Team.*

Stage 3. Summary PJP Revisions #2 – January 14th, 2004 meeting. This stage reflects further revisions from the January meetings of the *Summary PJP Team* that were held, in part, to respond to comments of the full Stakeholder Panel meeting of December 11th, 2003.

The following provides further details on what transpired at each stage of this process and what changes were made that might affect the estimates.

Stage 1. The Summer Meetings

Deriving a final result for this study required the AIR/MAP research team to synthesize several prototype specifications of service delivery systems developed by the initial ten PJPs (Stage 1). That is, it required aggregation of the results into some meaningful representative resource profiles across various levels of need that did not precisely reflect the judgment of any single panel. For this reason, AIR/MAP asked members of the original professional judgment panels (i.e., the *Summary PJP Team*) to meet on subsequent occasions to review the final staffing and resource allocation patterns that underlie the cost estimates in this report. As indicated above, one of those meetings occurred in mid-December of 2003 and another one in mid-January of 2004.

Stage 2. The December Meeting of the Summary PJP Team

The December meeting was focused on a review of the estimated resource levels that were derived from the synthesis of the Stage 1 specifications. The following is a summary of the changes in resource specifications that were made by the Summary PJP Team as a result of this meeting.

- **Preschool enrollments** – Greater specificity was necessary to refine the patterns of enrollment in preschool programs following the initial summer meetings of the PJPs. Not all panels had specified preschool programs in the first stage of the PJP meetings. Seven out of eight of the original general education PJPs specified some level of resources for pre-kindergarten programs, and five of the eight panels specified some level of resources devoted to early childhood development (ECD) programs. The Summary PJP Team provided greater specificity and precision as to the percentage of potential enrollments to which the pre-kindergarten and ECD programs should be targeted. These enrollment levels were associated with the poverty level of the students served in the school to

reflect the greater need for early intervention programs of children from poorer families.

- **Extended year and extended day programs** – Similarly, the Summary PJP Team provided greater specificity and precision to the percent of potential enrollments for whom the summer school and the before- and after-school programs should be targeted. As with preschool programs, these enrollment levels were associated with the poverty level of the students served in the school to reflect the greater need for extended time programs for children from higher poverty schools. During Stage 1 of the PJP meetings, six out of eight panels specified resources devoted to extended day programs, and seven of the eight panels specified some resources for extended year programs.
- **Professional development** – The Summary PJP Team recommended that additional dollars be allocated to professional development expenditures in middle and high schools with higher proportions of ELL students.
- **Miscellaneous staffing changes** – The Summary PJP Team also recommended an increased allocation of full-time equivalent social workers, assistant principals and security personnel in those high schools with average and above-average poverty levels. For high schools with relatively large numbers of special education students and those with a large proportion of ELL, the team also increased the amount of personnel devoted to social work and security. In addition, extra guidance counselors were recommended for those high schools serving higher proportions of special education students.
- **Miscellaneous non-personnel expenditures** – Recommendations were made by the Summary PJP Team to increase (decrease) the amount of non-personnel expenditures earmarked for student activities for those middle schools at relatively high (low) levels of poverty. In addition, the team recommended an increase in expenditures devoted to professional development for schools with a high proportion of ELLs.

Stage 3. The January Meeting of the Summary PJP Team

Immediately following the Stage 2 meeting of the Summary PJP Team, AIR/MAP convened a meeting of the *Stakeholder Panel*. This Stakeholder Panel, which included members of the Summary PJP Team, had the opportunity to review all of the program specifications and the patterns of variation within the school prototypes. In addition to the members of the Summary PJP Team, the Stakeholder Panel consisted of representatives of the professional judgment panels along with representatives of various constituency groups, business leaders and policy makers involved with the reform of school finance. As indicated previously, these additional stakeholder panel members included representatives of parents, school board members, taxpayers, legislators, the New York State Education Department, the Governor, and the Commission appointed by the Governor to review school funding alternatives.

The stakeholder committee was provided with all of the data available to the AIR/MAP team to develop the final cost estimates. The non-educator members of the stakeholder panel had the opportunity to query the members of the Summary PJP Team about their

program designs and specifications and to provide input to the AIR/MAP team prior to the final processing and analysis of the data.

One of the issues discussed during the Stakeholder Panel meeting related to the patterns of variation in school program costs with respect to ELL students. The patterns that were reflected at that time suggested a very small impact of changes in the percent of ELL students on the school-level programmatic costs. Specifically, the question was put forth of whether this was a reasonable result given the perceived complexity of addressing the needs of additional ELL children, holding other need related factors (i.e., enrollment size, poverty and special education) constant. At the same time, at least one of the narratives developed by the PJPs in Stage 1 suggested that ELL students did not necessarily require additional teachers or other resources as much as the need for teachers and other personnel with different qualifications.[69]

The following provides a list of the accomplishments and changes in resource specifications that were made by the Summary PJP during the Stage 3 meeting in January 2004.

- **Review of program design and staff utilization** – The Stage 3 meeting of the Summary PJP Team held in January served as a final review of the school prototypes and an opportunity to help the AIR/MAP team understand the significant aspects of the programs designed by the professional judgment panels.
- **ELL staffing** – After reviewing the specifications and thinking about the assumptions under which the prototypes were developed, the Summary PJP Team recommended some changes in ELL staffing to address the concerns expressed during the Stakeholder Panel meeting in December. To provide some context on this issue, the Stage 1 panels did specify resources for ELL, but they were not statistically significant, and one PJP from New York City specifically stated that the nature of resources needed to be changed, but that the amount specified was adequate. It may be argued that, under this rationale, the specifications developed by Stage 3 may be perceived as an overstatement of the need for ELL services and should be viewed as an upper bound. However, one problem with this rationale observed by the ELL expert advisor for the project, Kenji Hakuta, and picked up by the Summary PJP in the Stage 3 meeting is that while this may be true for a school with high percentages of ELLs of the same language (e.g. those requiring teachers that only speak one other language than English), it does not pertain to high percentage ELL schools with a multitude of different languages being spoken, where some form of English as Second Language (ESL) approach will be needed. Overall, the notion that a high poverty school with high percentages of ELLs can make due with the same amount of resources as schools at the same levels of poverty and special education, but with no ELLs, was questioned by the stakeholders. Accordingly, the Summary PJP Team decided to increase the resource allocation of "other" teachers in addition to supplies and materials at all three schooling levels. Finally, in response to the increase of

[69] The reader is referred to the notes from the PJP deliberations, which are included in Appendix B.

ELLs, the team recommended raising non-personnel expenditures for the professional development of high school teachers.

- **Small school projections** – During the January meeting, the Summary PJP Team reviewed the projections of resources specified for very small schools that had been developed by AIR/MAP. Projections had been done using the multivariate regression analysis of the Stage 1 data points, and the Summary PJP Team was requested to review the projections and make any necessary changes that would be appropriate to achieve the desired results. However, only a very limited amount of time was available to review the resource specifications for these atypically small schools (i.e., schools well below the enrollment levels specified in the original PJP exercises). After subsequent discussions among the members of the AIR/MAP team, it was decided that estimating the effects of school size outside the original enrollment ranges had the potential of distorting cost estimates. It is for this reason that all of the cost simulations were done using estimated effects only within the original ranges of enrollment reflected across the PJP exercises.[70] Schools with enrollment below the minimum or above the maximum were assigned cost projections based on the corresponding extreme value for enrollment (i.e., those elementary schools below 414 and above 774 had projections based on 414 and 774, respectively). Actual enrollments were used to project costs for schools within the limits of the minimum and maximum enrollment levels provided during the original PJP exercises.
- **Properly identifying district-level functions** – As described in Chapter 2, the AIR/MAP team needed to divide current spending into items that were included versus excluded from the school prototypes specified by the PJP specifications. In the Stage 3 meeting the Summary PJP Team provided assistance to AIR/MAP in appropriately dividing current spending into that which was already included in the school prototypes versus that which was excluded.[71]

Estimating District-Level Functions

Finally, as described in Chapter 2, AIR/MAP used two alternative methods of accounting for expenditures on district-level functions: the lump-sum approach and an approach that combined lump-sum amounts with an overhead ratio for certain district-level functions. The first of these does not account for any possible growth in expenditures on district-level functions to support changes that might occur in instructional program expenditures and therefore represents a lower bound. Conversely, the second approach allows for the possibility that a change in instructional program expenditures could be associated with an increase in expenditures on district-level functions. In turn, this second approach can be viewed as an upper bound on the potential change in expenditures on district-level functions. Reality probably lies somewhere in between these two estimates.

[70] The enrollment ranges are 414 to 774, 543 to 951 and 576 to 1,184 for the elementary, middle and high school levels, respectively.

[71] A more detailed discussion of this can be found in Chapter 2.

The Geographic Cost of Education Index

It is important to point out that modeling a teacher labor market is an incredibly complex endeavor to undertake. To this end, the geographic cost of education index itself is based on a statistical model that intends to greatly simplify the underlying mechanism that makes up the labor market for school personnel. In reality the teacher labor market is far more complex than can easily be represented in econometric models of the type used in this analysis. Therefore, it must be noted that such models provide a best estimate of the major differences in the costs of recruiting and employing comparable personnel across local jurisdictions, but as with all estimates, they are subject to some degree of error. Moreover, while variations in teacher costs are likely to be highly correlated with variations in costs for other types of personnel (in addition to non-personnel costs), the fact is that there are some possible differences in the factors that affect these different markets.

Glossary of Terms

Before proceeding to the estimates, it is useful to establish a few terms that will be used in the subsequent narrative about the results.

Lump-sum model – This refers to the first method used to add on the expenditures for district-level functions. The lump-sum model simply adds on what was previously spent on district-level functions.

Combined lump-sum/ratio model – This refers to the alternative method of adding on expenditures for district-level functions that involves adjusting expenditures to reflect some growth in spending on these functions in response to a change in the size of the instructional program.

Geographic cost of education index (GCEI) – This term refers to the direct measure of the school personnel cost differences derived from the statistical models in discussed in Chapter 3.

Standardized projected expenditures – This term refers to the expenditures estimated by AIR/MAP through the PJP process that are necessary to achieve adequacy (i.e., expenditures deemed necessary to achieve the goal put forth to the PJPs – see Exhibit 1 in Chapter 2) unadjusted for geographic cost variations. Personnel compensation levels used to estimate total costs are set to statewide pupil-weighted averages. To accomplish this, the GCEI based on the analysis described in Chapter 3 is set to 1.00 for all districts. Again, it is important to note that the expenditures derived from this simulation reflect only the variations in pupil needs and the scale of school and district operations. No differences in the geographic cost differences are reflected in these numbers.

Implicit geographic cost of education index (IGCEI)[72] **–** This term refers to the ratio of GCEI-adjusted projected expenditures to standardized (unadjusted) projected expenditures for a given district. The only difference between the GCEI and IGCEI is the variation in the geographic costs of school personnel weighted by the projected budget share attributed to personnel. That is, the difference between the implicit cost index and the geographic personnel cost index introduced in Chapter 3 is that the IGCEI reflects the impact of the GCEI with the appropriate budgetary weights applied for the share of total expenditures attributable to personnel within each district, where the weights are based on the prototype models.

Need/scale index – This term refers to the ratio of standardized projected expenditures in any given district to the pupil-weighted average of the standardized projected expenditures across all districts. This index reflects both variations in the degree to which districts must provide educational services to students with special needs (i.e., those in poverty, classified as ELLs, and/or in special education) as well as in the scale of school and district operations.

> **Need index –** This term refers to the relative variation in projected standardized expenditures associated only with variations in pupil needs.
>
> **Scale index –** This term refers to the relative variation in projected standardized expenditures associated only with variations in the scale of school and district operations.

Need to resource capacity (NRC) – This is simply a method devised by NYSED to classify districts according to the ratio of pupil needs to the capacity of the district to generate resources. NRC will be used to abbreviate this in the titles of tables.

Preschool programs – Preschool refers to pre-kindergarten and ECD programs.

Projected expenditures/spending/costs – This refers to the expenditures developed by AIR/MAP through the PJP process that are necessary to achieve adequacy (i.e., expenditures deemed necessary to achieve the goal put forth to the PJPs – see Exhibit 1 in Chapter 2). This figure reflects variations in pupil needs, the scale of school and district operations, and geographic cost differences for the school personnel based on the analysis in Chapter 3.

Stages 1, 2, 3 – This indicates the PJP stage on which the projected expenditures are based. Stage 1 refers to the estimates based on the PJP specifications immediately following the Summer 2003 meetings. Stage 2 refers to the estimates immediately following the December 2003 meetings of the Summary

[72] Formal definitions of how the IGCEI and Needs/Scale index are calculated can be found in the section "Understanding the Components of Educational Cost Differences", below.

PJP Team. Stage 3 refers to the estimates obtained immediately following the January 2004 meetings of the Summary PJP Team.

The Cost of an Adequate Education

The initial adequacy cost estimates presented below reflect the resource specifications at Stage 3 of the PJP process as described above. These cost projections use what was referred to above as the *lump-sum* approach to estimating the costs of district-level functions.

Stage 3 of the PJP process represents the culmination of the professional judgment process as applied in this study. This process encompasses a series of meetings with the original PJPs, the Summary PJP Team, and the Stakeholder Panel.

However, the cost projections developed at Stage 3 represent only one possible basis from which to derive an estimate of the cost of adequacy. To understand the basis for this Stage 3 cost estimate, it is important to note how the cost projections changed during each phase of the process. As will be shown later in this chapter, there is in fact a range of reasonable estimates developed at the different stages of this professional judgment process, and there are also estimates derived using differing assumptions about various components of the simulation model (e.g., how district-level costs are treated and how school size is represented).[73]

Stage 3 Cost Estimates

Exhibit 4-1 compares the AIR/MAP projected expenditures per pupil derived from the program specifications designed by the PJPs at Stage 3 to the actual current per pupil expenditures reported in the NYSED fiscal files.[74] These figures represent per pupil expenditures for the district attended by an average student within each district category (e.g., the overall average reflects the average student in the state while the figure for the Big 4 Urban Cities reflects the average student attending one of those districts). It is important to note that these per pupil figures correspond to the average projected spending assuming every district spent no more and no less than what was necessary to achieve adequacy as defined by the resource specifications derived from Stage 3 of the professional judgment process.

[73] This first set of estimates presented here are based on a similar set of assumptions on which the estimates presented in the Preliminary Report released in January 2004 were based. As was indicated in the Preliminary Report, these original numbers were subject to change and indeed have changed somewhat since the release of that report.

[74] It is understood that both projected and "current" expenditures refer to 2001-02 dollars, which corresponds to the year of the most recent data available for use in this study.

Exhibit 4-1 - Comparison of Adequate Versus Actual Per Pupil Expenditures by Need to Resource Category (Including Preschool Programs)

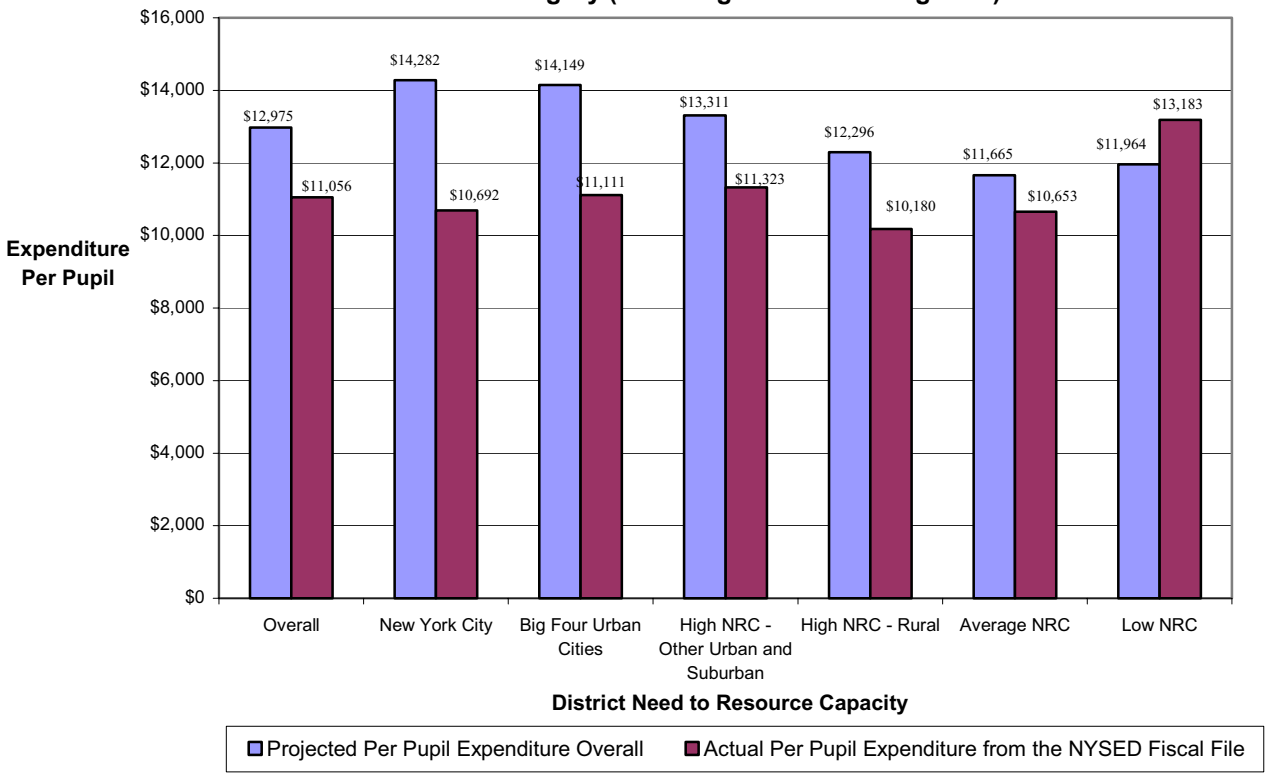

Exhibit reads: Average per pupil expenditure in New York State for 2001-02 was $11,056. AIR/MAP projects that an average per pupil expenditure of $12,975 would have been necessary to achieve adequacy statewide. Note, figures assume all districts spend exactly at their projected levels.

It is important to note that the students counted under the "adequacy"-based model are substantially higher than current state enrollments.[75] This is because the "adequacy"-based expenditures include wider preschool enrollments than the current statewide practice within New York State public schools. As noted earlier, approximately $399 million in Head Start Programs serving about 49,000 students and $21 million of Even Start programs are not included in the NYSED fiscal data.

Exhibit 4-2 presents a stacked bar chart that shows how actual total current expenditures in New York State compare to total projected expenditures, based on the AIR/MAP analysis, necessary to raise all districts to "adequate" levels of spending. The bottom portion of each bar displays the actual total current spending by New York public school districts. The top portion of the bar displays the incremental expenditure necessary to achieve adequacy in districts not currently spending at levels deemed adequate as defined

[75] Total actual enrollment in New York State across the NRC categories are as follows (in parentheses): New York City (1,049,831), Big Four Urban (130,327), High NRC-Other Urban and Suburban (221,250), High NRC-Rural (179,001), Average NRC (872,785), and Low NRC (392,762). Total enrollment necessary to achieve adequacy predicted by AIR/MAP across the NRC categories are: New York City (1,111,498), Big Four Urban (135,658), High NRC-Other Urban and Suburban (230,293), High NRC-Rural (185,793), Average NRC (888,113), and Low NRC (394,669).

by the resource specifications derived from Stage 3 of the professional judgment process. The total of these two figures provides an estimate of total expenditures from all sources (federal, state and local) necessary to bring those districts to "adequate" levels of spending, with no change in current levels of spending for those districts at or above "adequate".

Exhibit 4-2 - Total Expenditure Required to Bring All Districts to "Adequate" Spending Levels (Total Expenditure in Bold)

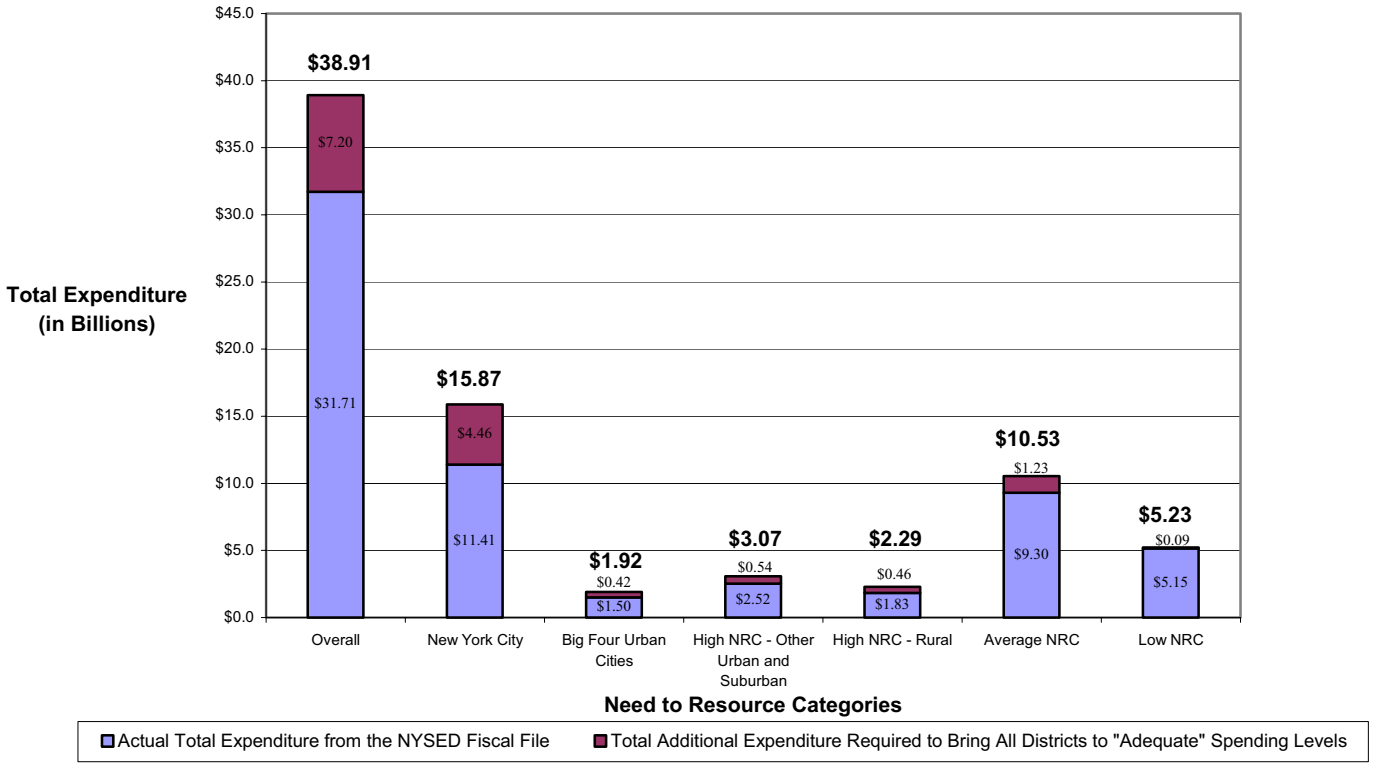

Exhibit reads: Total expenditure in 2001-02 was $31.71 billion. An additional $7.20 billion would have been necessary to bring all districts spending at less than adequate levels up to adequacy. Note, actual and additional expenditures may not add up exactly to totals (in bold) due to rounding errors.

While the figures in Exhibit 4-1 compare projected to actual expenditures for all students, Exhibit 4-2 presents data from a slightly different perspective. The figures in Exhibit 4-1 reflect what would happen if each public school district in New York State spent the Stage 3 projected levels on every student, while figures in Exhibit 4-2 emphasize the incremental expenditures necessary to achieve adequacy only for those students enrolled in districts not currently spending at an adequate level. Exhibit 4-2 maintains current spending for districts spending at or above adequate levels.

New York State

The AIR/MAP analysis projects that an average per pupil expenditure of $12,975 would be required to provide adequate resources to each and every student in New York State (Exhibit 4-1). Actual current spending on public school students in New York State amounts to $11,056.

Exhibit 4-2 shows total current spending in New York State for the 2001-02 school year to be $31.71 billion. However, the investment necessary to bring those districts that are currently spending less than adequate amounts up to adequate levels without reducing the spending in those districts at or above adequate spending levels would require a total expenditure of $38.91 billion, a 22.7 percent increase in total spending.[76] These statewide estimates have varying implications across divergent types of districts.

New York City

The AIR/MAP projections for New York City public schools show "adequate" spending at $14,282 per child, compared to an actual current expenditure of $10,692. This would require a total budget of $15.87 billion, a 39.1 percent increase over the current spending level of $11.41 billion.

The Big Four Urban Cities

The AIR/MAP projections for the other urban districts show an average of $14,149 per child, versus a current expenditure of $11,111. This would require a total budget of $1.92 billion, a 27.8 percent increase over the current spending level of $1.50 billion.[77]

Other Categories of Districts

Comparing the AIR/MAP projections to actual spending (Exhibit 4-1) for students attending districts classified as *High NRC–Other Urban and Suburban* implies an increase on a per pupil basis of 17.6 percent (i.e., $13,311 versus $11,323 per pupil) to achieve adequacy, while those attending districts classified as *High NRC–Rural* require an increase of 20.8 percent (i.e., $12,296 versus $10,180 per pupil). The incremental total expenditure necessary to ensure all students in the high need districts, *High NRC–Other Urban* and *Suburban* and *High NRC–Rural*, have access to "adequate" resources would require additional investments of $0.54 and $0.46 billion representing increases of 21.4 and 24.9 percent, respectively.

Actual expenditures for students in the *Average NRC* districts are also below the AIR/MAP projections. The projection for average per pupil expenditure is $11,665, while the current expenditure per pupil is $10,653. To raise funding levels for these students to "adequate", an additional $1.23 billion is necessary, 13.3 percent above current spending of $9.30 billion in this category.

On the other hand, for students enrolled in districts classified as *Low NRC,* the AIR/MAP average per pupil projection is lower than actual per pupil spending. The AIR/MAP projections reveal an average per pupil expenditure for low-need districts (Exhibit 4-1) of $11,964, while the actual average per pupil expenditure is $13,183. However, some

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[76] The findings show 517 districts currently spending below the adequacy standard estimated by this study, with 163 districts spending at or above this level. If every district were to spend exactly what was necessary to achieve "adequacy" as estimated by the AIR/MAP model, total spending in New York State would amount to $38.23 billion. It is important to point out that all of these spending figures are intended to reflect a combination of all federal, state and local resources.

[77] Due to rounding of the reported expenditures, calculation of percent changes using the dollar figures in the text will not always be precise. The percent changes reported are, however, correct.

within the *Low NRC* category are spending below "adequate". Exhibit 4-2 shows that an additional $0.09 billion would be necessary to provide "adequate" resources for students enrolled in *Low NRC* districts currently spending below "adequate" levels.

What Adjustment Is Required to Ensure All Districts Have Adequate Resources?

As seen in the exhibits above, the Stage 3 spending projections suggest that not all New York districts need additional revenues to reach "adequate" levels of spending. This does not necessarily suggest that these districts are spending too much. They may reflect community determinations of local needs or preferences beyond the "adequacy" standard specified for this study.

The 517 New York school districts that presently spend less than the AIR/MAP projections include all of the Big Five districts, 29 of the *Low NRC* districts, and over 480 of the remaining districts in the state. To bring these districts up to the projected spending levels, without redistributing revenues from other districts would require an additional $7.20 billion (see Exhibit 4-2) in federal, state, and/or local revenues.

As indicated previously, these projections reflect an increase in the number of students receiving preschool services. Currently (2001-02 school year), 37,868 students are served in state pre-kindergarten programs. The AIR/MAP projections based on the specifications of the PJPs allow preschool enrollments of 137,936 (i.e., that include both ECD and pre-kindergarten for three- and four-year-old students, respectively). Note that the Head Start and Even Start programs serve at least another 49,000 children in early education programs outside of the state's public schools.

Alternative Cost Estimates

As suggested above, different assumptions as to the types and quantities of resources necessary to achieve "adequacy" will lead to different cost estimates. This section shows how these cost projections changed at different stages of the analysis and how they differ with alternative assumptions. The importance of these alternative estimates is that it makes the professional judgment process more transparent to the reader and leaves some of the judgment about the final numbers in the hands of policy makers.[78]

Exhibit 4-3 below presents overall differences in the estimated cost of adequacy at the different stages (1, 2, and 3) of the professional judgment process. In addition, it also displays the impact of using the combined lump-sum/ratio approach to account for

[78] In addition to the alternative cost analyses contained in this section, AIR/MAP has also done some sensitivity analysis of the impact of alternative resource configurations (e.g., such as differences in class size specifications) to show the cost impact of these differences in resource utilization. This analysis is presented in Appendix L.

district-level functions applied to the Stage 3 estimates.[79] For the sake of simplicity, this last alternative is referred to as the *Modified Stage 3* estimate. Note that the modified approach to estimating the cost of district-level functions could easily have been applied to the cost estimates at any of the stages. The proportionate impact would have been similar to the impact at Stage 3.

All of the figures presented in Exhibit 4-3 are based on the total expenditure required to bring those districts currently spending below the AIR/MAP projections up to adequate levels of spending. That is, the figures in Exhibit 4-3 are directly comparable to those in Exhibit 4-2 above.

Exhibit 4-3 - Total Actual and Projected Expenditures by Simulation Model

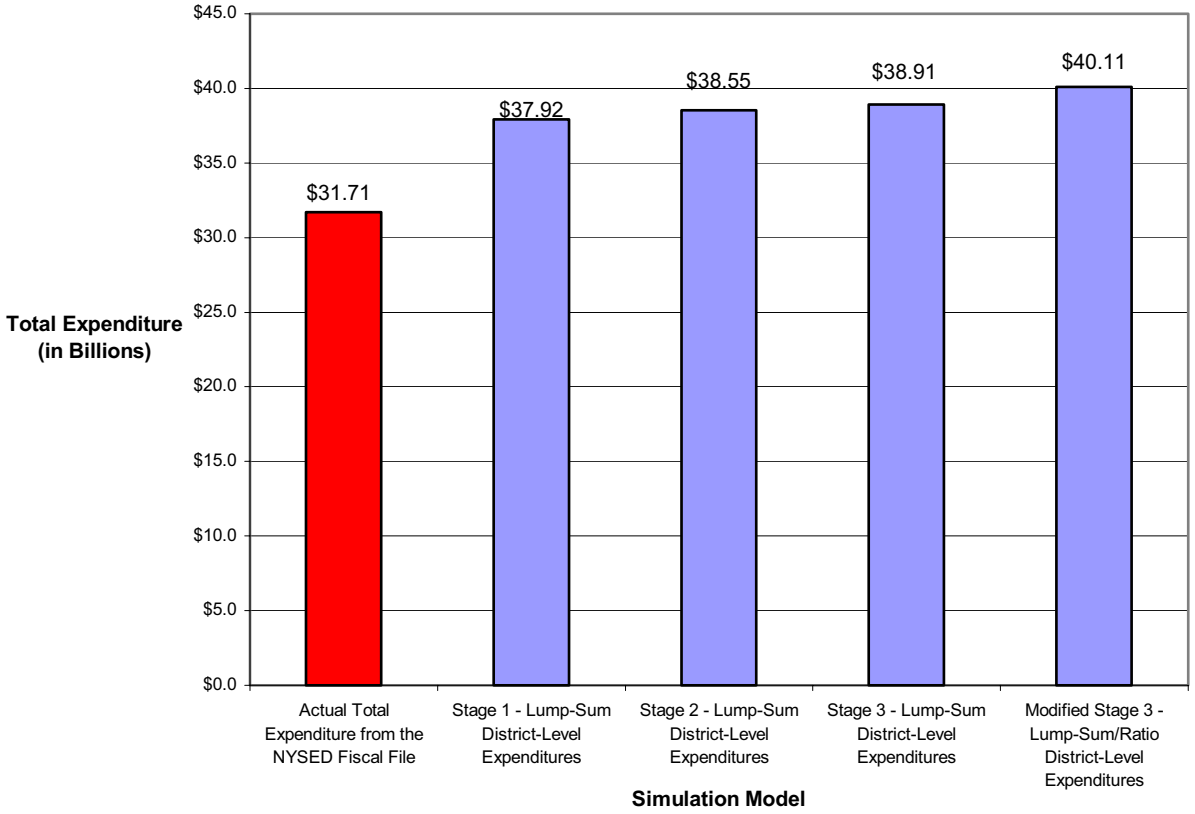

Exhibit reads: Total expenditure in 2001-02 was $31.71 billion. Using the Stage 1 resource specifications an additional $6.21 billion would have been necessary to bring all districts spending at less than adequate levels up to adequacy, making a total expenditure of $37.92 billion.

Stage 1 exhibits the lowest cost estimate to achieve adequacy. Based on the Stage 1 specifications, an additional $6.21 billion would be necessary to achieve adequacy. At Stage 2, which reflects a revised estimate of the projections of targeted enrollments in the

[79] Appendix K of this report presents district level projections of the per pupil costs of achieving adequacy at each of the stages 1, 2, and 3 as well as the modified stage 3, which uses the lump-sum/ratio calculation of district-level expenditures. In addition, actual spending levels for the 2001-02 school year are presented for each district along side the projected expenditures from the adequacy model. All figures correspond to total current expenditures and therefore exclude any spending on transportation and debt service (see footnote 57, above).

preschool and extended time programs, in addition to modest changes in the middle and high school configurations, the estimate increases to $6.84 billion.[80] The Stage 3 estimates (i.e., $38.91 billion total, $7.20 billion additional) are the same as those presented in Exhibit 4-2 and reflect an increase in the resources specified for ELL students that were considered during the January meeting of the Summary PJP Team. The resource adjustments with respect to ELL were carried out in response to comments made at the end of the December 2003 meeting of the Stakeholder Panel.

Finally, the Modified Stage 3 estimate of $40.11 billion, necessitating an additional $8.40 billion, is the highest estimate of the cost of adequacy and simply reflects alternative assumptions about how AIR/MAP estimated the district-level functions. This alternative estimate is based on the combined lump-sum/ratio approach, which allows for part of the expenditures on district-level functions to change proportionately with changes in spending on the instructional program as specified by the professional judgment panels.

Thus, the adequacy estimates range from a low of $37.92 billion to a high of $40.11 billion. Using current (i.e., 2001-02) spending as a base, these estimates suggest that the additional investment required to achieve "adequacy" in New York State public schools ranges 19.6 to 26.5 percent.

Exhibit 4-4 shows how differences in resource specifications at the various stages of the professional judgment process affect different types of districts. For the purposes of simplicity, New York City is combined with the other urban districts (from the four next largest cities) with the remaining districts forming the second group. Since poverty and the percent of ELL students are primary drivers of the differences in costs between the stages, it appears as though the urban districts would benefit most from the changes that have occurred between Stages 1 to 3 of the process. The additional expenditures to bring all districts up to adequate spending without any impact on those districts at or above adequate spending levels increase from $4.02 to $5.67 billion in the most urban districts (i.e., New York City plus those in the other four largest cities), which represents over a 40 percent increase in total projected spending. For all other districts combined, the additional expenditures increase from $2.19 to $2.74 billion, which represents about a 25 percent increase.

[80] There were no changes in the resource configurations in the preschool and elementary extended time programs. The only change was in the projected number of students who would be enrolled in the preschool programs and the extended time programs.

Exhibit 4-4 - Additional Expenditures Required to Achieve Adequacy for New York City/Big Four Versus Other Districts by Simulation Model

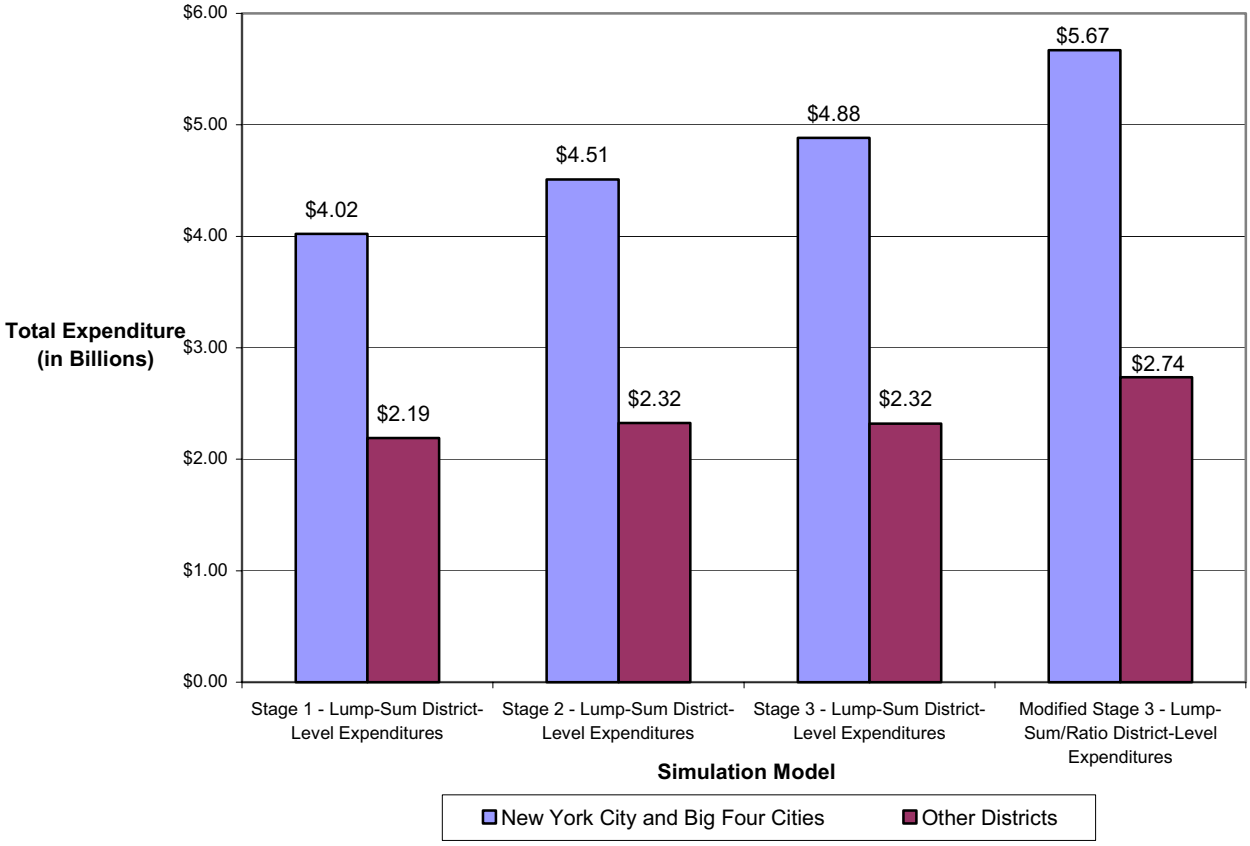

Exhibit reads: Using the Stage 1 resource specifications and lump-sum district-level expenditures an additional $4.02 billion would have been necessary to bring all districts in the largest five cities up to adequate spending levels. The correpsonding additional expenditure to bring all other districts not spending at adequate levels up to adequacy would have been $2.19 billion.

While the dollar increases are substantial across the three stages, Exhibit 4-5 shows that the number of districts spending less than their projected expenditure is not all that different. The number of districts spending less than the projected expenditures ranges from a low of 516 at Stage 1 to a high of 520 for the modified Stage 3.

Exhibit 4-5 - Numbers of Districts Spending at Below-Adequate Levels by Simulation Model

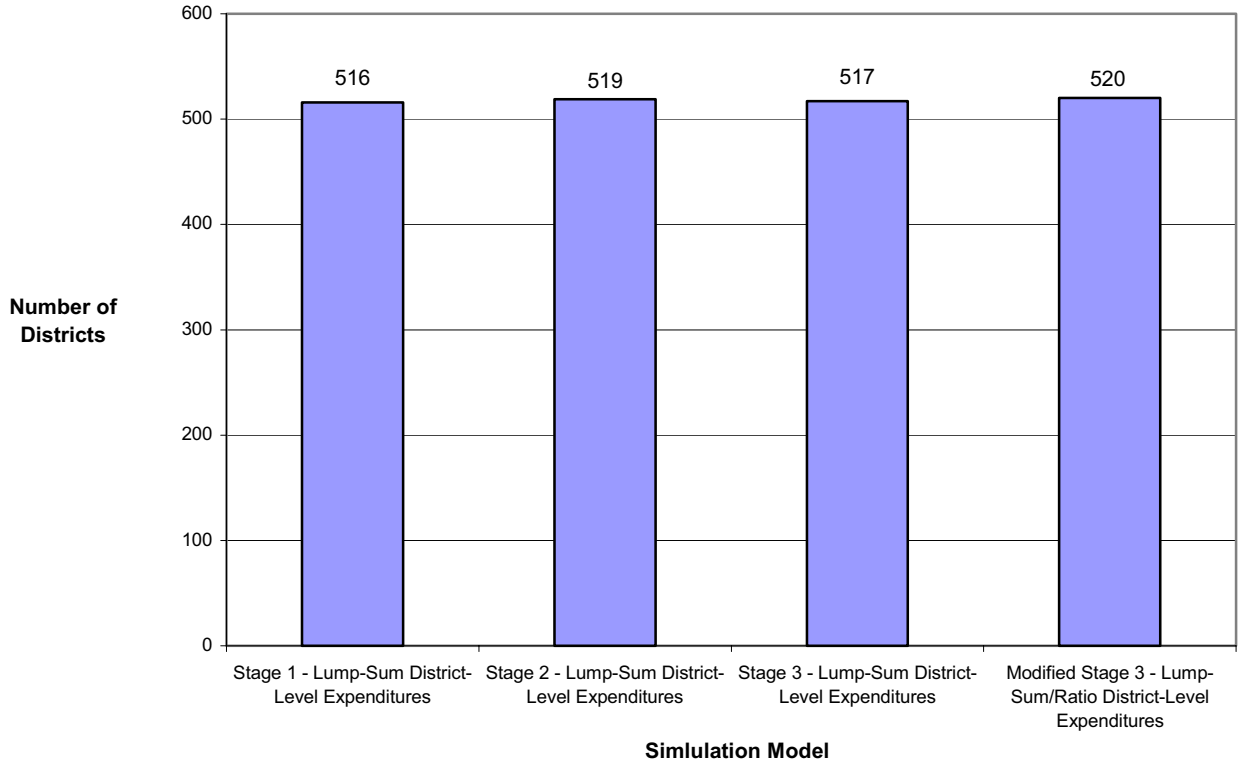

Exhibit reads: Using the Stage 1 resource specifications and lump-sum district-level expenditures 516 districts were deemed as spending at less than adequate levels.

The Role of Preschool

As previously indicated, preschool programs consisting of both pre-kindergarten for four year olds and ECD programs for three year olds, are included in the estimates for the total costs of adequacy. Exhibit 4-6 shows the total expenditure projected for preschool programs at each of the stages of the professional judgment process. The total expenditure on preschool ranges from a low of $1.01 billion to a high of $1.17 billion, which indicates relatively small proportionate changes across the four models. Because there were significant changes in the program specified for school aged students (i.e., those in kindergarten through the 12th grade), preschool projections are a smaller percentage of total expenditures at the later stages, ranging from a high of 16.3 percent at Stage 1 to 13.9 percent at the Modified Stage 3 (see Exhibit 4.7)

Exhibit 4-6 - Total Preschool Expenditures Required to Achieve Adequacy

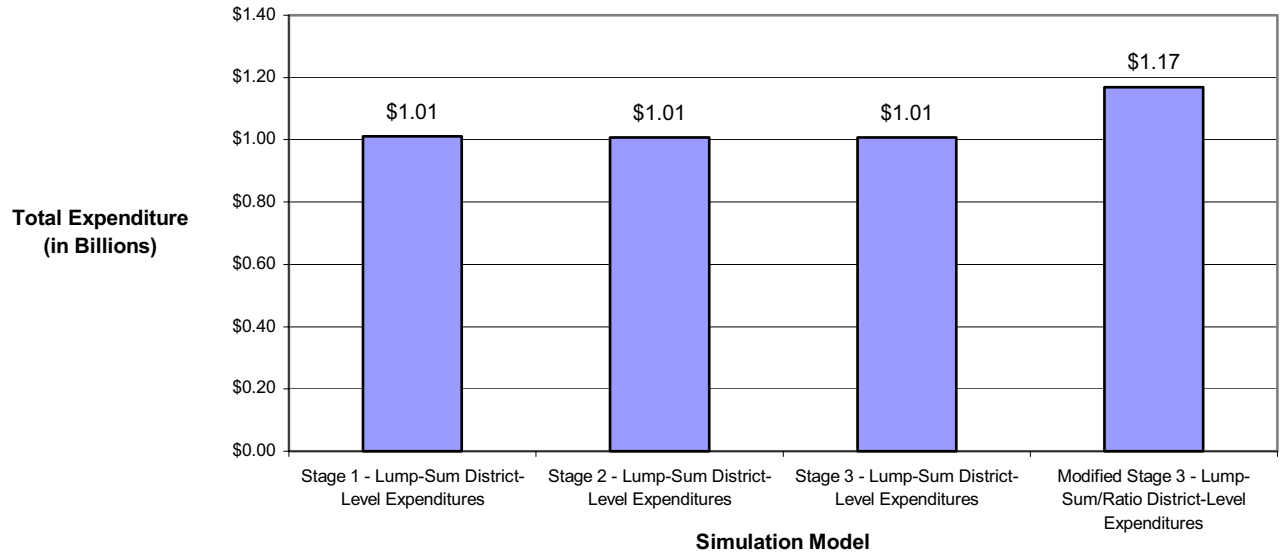

Exhibit reads: Using the Stage 1 resource specifications and lump-sum district-level expenditures an additional $1.01 for preschool education would be necessary achieve "adequacy".

Exhibit 4-7 - Total Preschool Expenditures as Percent of Additional Required Expenditure by Simulation Model

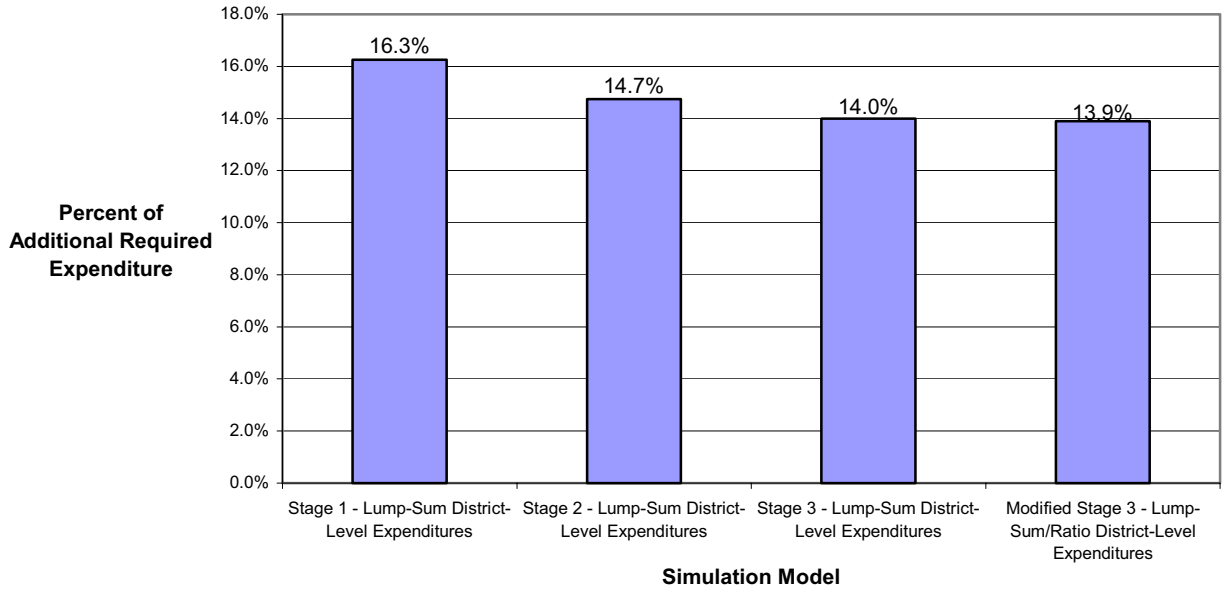

Exhibit reads: Using the Stage 1 resource specifications and lump-sum district-level expenditures 16.3 percent of the additional spending necessary to achieve adequacy was attributable to expenditures on preschool education.

Understanding the Components of Educational Costs

Underlying the total cost projections presented in the exhibits above are specific dollar amounts assigned to each district. These dollar amounts reflect variations in geographic

cost differences, pupil need, and in the scale of district operations. The following discussion shows how these pieces of the puzzle may be separated out to illustrate the role that each component plays for different kinds of districts.

Developing the Need-Scale Index

The analysis carried out in this report was primarily designed to develop "adequate" expenditure estimates by district given the configurations of schools, pupil needs, and teacher markets within which they operate.

Four critical pieces of data are used to separate these cost components:

(1) Implicit geographic cost of education index (IGCEI)
(2) Base expenditure level (BASE_EXP)
(3) Need index (NEED)
(4) Scale index (SCALE)

To calculate each of these components, one needs two numbers: the AIR/MAP projected expenditure levels (PROJ_EXP) and the standardized projected expenditure levels (STD_EXP) from one of the stages described above. The following formulas are used to calculate each of the four critical numbers:

(*eq. 1)* $\text{IGCEI}(i) = \text{PROJ\_EXP}(i) / \text{STD\_EXP}(i).$

The *implicit geographic cost index* (IGCEI) for district *i* is defined as the ratio of the projected expenditures for district *i* to the standardized projected expenditures for district *i*.[81] The reader is reminded that projected expenditures reflect variations in the cost of providing adequate educational services across districts in New York State, and it includes the variations in scale, pupil needs, and the costs of comparable school personnel. The standardized projected expenditures include variations for scale and pupil need, but do not reflect any geographic variations in personnel costs. Thus, the only difference in costs between the numerator and denominator are the geographic variations in costs of school personnel. Equation (1) extracts that component in the form of the IGCEI.

The base expenditure level is calculated by taking the pupil-weighted average of the projected expenditures.

(eq. 2) $$\text{BASE\_EXP} = \sum_{i=1}^{I} w(i) \times \text{PROJ\_EXP}(i)$$

where $w(i)$ is the pupil-weight (i.e., the proportion of New York State enrollment in district *i*).[82]

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[81] Remember that the average compensation rates in the standardized model reflect the compensation paid to school personnel in the districts attended by the average student (i.e., they are pupil-weighted average compensation rates).

[82] If ENR = district enrollment, $w(i) = \text{ENR}(i) \Big/ \sum_{i=1}^{I} \text{ENR}(i)$.

Finally, the need-scale index for district *i* is calculated as follows:

(eq. 3) $\text{NEEDSCALE}(i) = \text{STD\_EXP}(i) / \text{BASE\_EXP}$

That is, the need-scale index is simply the ratio of the standardized projected expenditures to the pupil-weighted average expenditures. It reflects variations in projected costs associated with scale of school and district operations and the composition of pupil needs.

Based on this collection of formulas, it can be shown that, for any given district *i*, the projected expenditure can be calculated as the product of the base expenditure (i.e., the pupil-weighted average of the standardized projected expenditure for all districts), the district-specific IGCEI, and need-scale index.

(eq. 4) $\text{PROJ\_EXP}(i) = \text{BASE\_EXP} \times \text{IGCEI}(i) \times \text{NEEDSCALE}(i)$

It is important to recognize that one of the components implicit in the need-scale index above is the inclusion of actual data on spending to reflect district-level functions.[83] Thus, using the need-scale index could potentially create incentives for districts to inflate spending on district-level functions since actual data are used in one form or another. Avoiding this incentive would require a multivariate regression approach that includes factors reflecting the components of the need-scale index and generates a predicted value. To understand these patterns of variation, the AIR/MAP team has used multivariate regression analysis to sort out the variations in the need-scale index using the following independent variables to estimate a model capable of yielding a predicted need-scale index:[84]

Need

- District type to capture the composition of enrollments and schools by grade level which affects the types of schools included in the projected costs for each district
- Percent of students eligible for free and reduced lunch
- Percent of students identified as ELL
- Percent of students identified as special education

Scale

- District size in various functional forms and sparsity of district population.[85]

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[83] Whether the projections use the lump-sum or combined lump-sum/ratio approach to calculate spending on district-level functions, these figures still represent values that vary by district.

[84] See Appendix C for details of the regression analysis on the need-scale index. The analysis presented in the text reflects a model that divided the sample into different enrollment groupings from the smallest districts (i.e., less than one thousand pupils enrolled) to the largest districts (i.e., greater than 10,000 students enrolled).

[85] Often linear and squared terms are used for enrollment to reflect the curvilinear relationship between spending and district size. AIR/MAP initially followed that convention. Moreover, because there are complex patterns of spending with respect to some of the district-level functions across the state, AIR/MAP also experimented with higher powers of enrollment and other variables such as sparsity of population to pick up the effects of school and district size on both instructional and non-instructional spending. However, rather than relying solely on the results where a functional form is imposed via estimation of a quadratic or some higher order polynomial, the relationship between the need/scale index and district enrollment was ultimately estimated with separate enrollment category-specific equations.

Separating the Need and Scale Components

With this formulation, it is informative to break the need/scale index into its two components: one reflecting just pupil need and the other reflecting the impact of scale of operations. That is, while the need/scale index reflects both components, each may show different patterns of variation across districts.

Exhibit 4-8 - Relative Scale and Need Indices and Implicit GCEI by Need to Resource Capacity Category Based on Model Using Actual School Enrollment

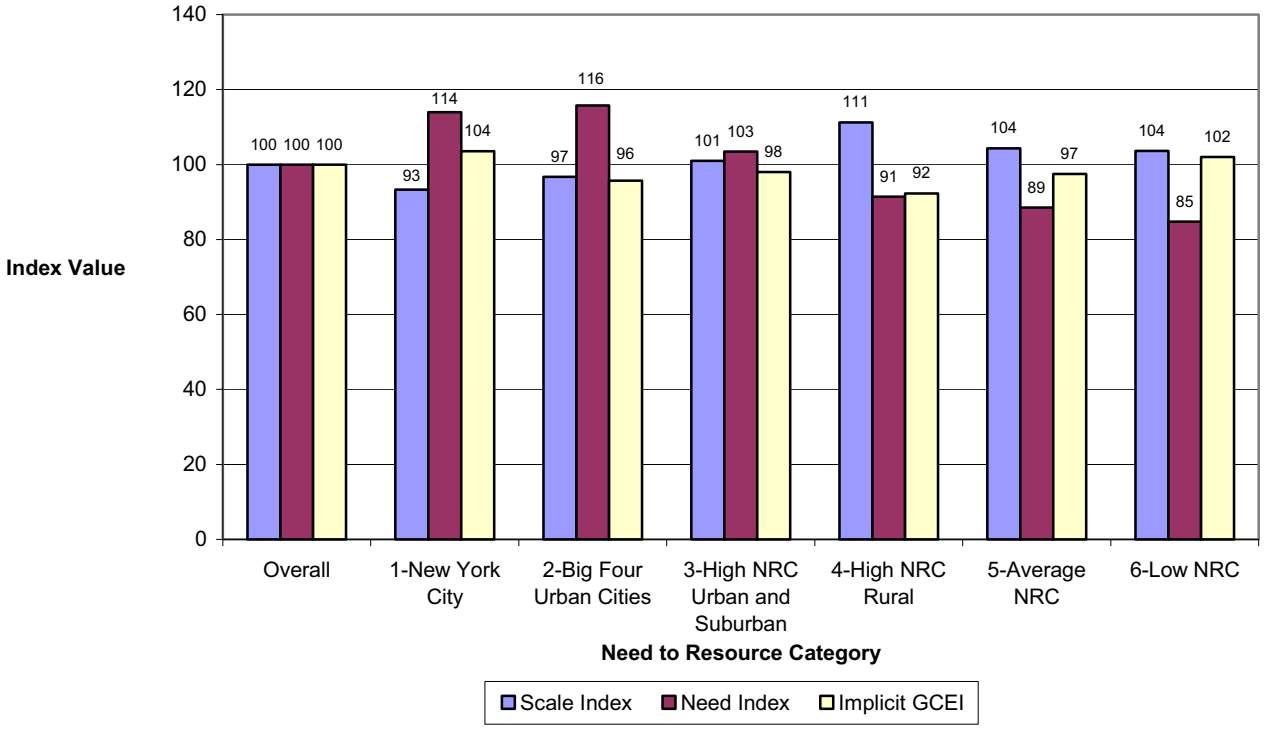

Exhibit reads: It costs approximately 4 percent more to hire a qualified teacher in New York City relative to a comparable teacher that instructs the average student in the state. Pupil needs in New York City are 14 percent higher that the statewide pupil-weighted average.

Exhibit 4-8 breaks up the pattern of variation in projected expenditures into three separate components: a scale index (i.e., reflecting district size), a need index (i.e., an index of pupil need), and the IGCEI (i.e., reflecting the impact of personnel cost differences on the projected expenditures). The mean value for each of these indices (i.e., the IGCEI, the scale index, and the need index) is scaled so that the value 100 represents the pupil-weighted average value of the index. An index value of 110 reflects a district that is 10% above the statewide (pupil-weighted) average, while a value of 90 represents a district that is 10% below the statewide (pupil-weighted) average on the respective index.

One pattern clearly seen when looking across the averages by NRC is that New York City shows similar pupil needs to the other large urban districts, while at the same time exhibiting a significant difference in the scale index. The scale index for New York City is low relative to the scale indices for districts in most of the other NRCs. The needs

component of the index is comparable to the value for the other four large urban districts. All exhibit high need indices relative to districts in the other NRC categories.

These patterns result from a combination of factors. One relates to the variations in overhead ratios. The proportion of total actual spending in New York City devoted to district-level functions and maintenance and operations services is among the smallest in the state. The percentage of total spending devoted to these categories is approximately 14.7 percent. Some of this difference reflects "economies of scale".

However, there is another significant dimension to this that is derived from the work of the PJPs. That is, in reviewing the relationship between school program costs and school size (see Exhibit 2-6 in chapter 2), one observes that the panels specified resources in such a way that there were somewhat lower per pupil costs associated with larger schools. To some degree, these lower costs result from the fixed costs of school administration being spread over a larger population of students. This negative relationship between projected expenditure and school size is observed at each school level, elementary, middle, and high school.

It turns out that New York City maintains elementary, middle and high schools that are, on average, larger than schools in any of the other NRC groupings of districts. For example, if one compares the average school sizes by PJP category, the average elementary school in New York City (PJP 1) enrolls 774 students, while the average school at the same level in PJP 2 (the other urban districts) enrolls 504 students. Average elementary schools in the other two PJP categories are both well below 500 students. Similarly, the average middle school in New York City is about 950 students compared to 798, 774, and 593 for districts in PJP categories 2 (other urban districts), 3 (suburban communities) and 4 (rural communities). High schools in New York City enroll about 1,180 students, while high schools in the PJPs 2, 3, and 4 enroll 1,156, 992, and 576, respectively. These patterns follow those found nationwide in which school size tends to be positively correlated with district size (see, for example, Chambers (1981) for a discussion of this issue).

Thus, the larger than average schools in New York City combined with the low overhead ratio has the effect of reducing the projected costs of implementing the models specified by the PJPs.

On the other end of that spectrum are the small rural school districts that tend to have relatively smaller schools at each level and somewhat higher overhead ratios associated with the costs of district administrative, maintenance, and operations functions. These two factors tend to have the impact of raising the costs for implementing adequate programs.

Do these patterns simply reflect economies of scale in schools and districts? The answer to this question is complex. There is likely some element of scale economies at both levels. However, to measure scale economies, one really needs to control for overall quality of educational outcomes. One could argue on this point that quality is controlled

for by the goals established for the PJP exercises. While this argument may hold for schools, to some degree, it does not necessarily hold for the spending on district-level functions since they were derived based on actual spending levels. But even at the school level, it would be difficult to argue that the work of the PJPs fully controls for "quality" of services.

Moreover, the issue of choice must be considered as part of the analysis. Small rural school districts in remote regions of the state may be operating very small schools and incurring diseconomies associated with small scale out of necessity. School consolidation may simply not a viable option. However, due to the nature of the exercises provided to the original PJPs, the diseconomies of very small schools may not be fully reflected in the data shown in Exhibit 4-8.

However, in most districts, school size is more of a choice in the long run. School districts make decisions about the size of the schools they operate at each level. These decisions may have implications for the quality of the school environment and, ultimately, implications for student achievement, participation in extra curricular activities, and safety.[86] Indeed, discussions with some officials from New York City during the course of this project suggest that the district is moving toward policies to reduce school size.

While there has been some research on school size, there is nothing definitive on what optimal school sizes are at each level. As a result, the costs of adequacy shown in this report are based on average school sizes.[87] What this does is remove the impact of variations in school size from the adequacy cost estimates and leaves only the scale effects based on the overhead costs used to account for central district administrative functions. The resulting cost estimates provide greater resources to districts operating larger than average size schools than they would otherwise need, and it provides fewer resources to districts operating smaller than average size schools.

Exhibit 4-9 compares the Stage 3 model with the lump-sum/ratio approach to estimating district-level costs with actual school enrollment levels to the same model using mean

[86] Several studies assert that the optimum size for elementary schools is 300-600 and for secondary schools is 600-900 (Andrews, Duncombe & Yinger, 2002; Lee & Smith, 1997; Raywid, 1997/1998). School size differences may be achieved through introduction of new school sites and separate school buildings, or it may mean creating several independent "schools" within existing buildings, each with a separate student body, separate principal, etc. (Murphy, Beck, Crawford, Hodges & McGaughy, 2001). For secondary schools, research also finds that curriculum offerings should emphasize a large core of academic classes for all students (Bryk, Lee & Holland, 1993; Lee, Smith & Croninger, 1997; Newman, 1997).

[87] Average school sizes for elementary, middle, and high schools were 558, 792, 943, respectively. This simulation also uses the model that incorporates the combined lump-sum/ratio approach to estimating district administrative and maintenance costs. The appendix presents the same simulation using only the lump-sum approach for estimating the cost of these district level functions. As the reader will see, there is virtually no difference in the patterns.

enrollment levels for the each school.[88] That is, Exhibits 4-8 and 4-9 are based on identical simulations with the exception of one aspect: 4-7 is based on actual school enrollments (within the limits of the school sizes from the PJP exercises), while 4-9 is based on mean school enrollments by level.

Exhibit 4-9 - Relative Scale and Need Indices and Implicit GCEI by Need to Resource Capacity Category Based on Model Using Mean School Enrollment

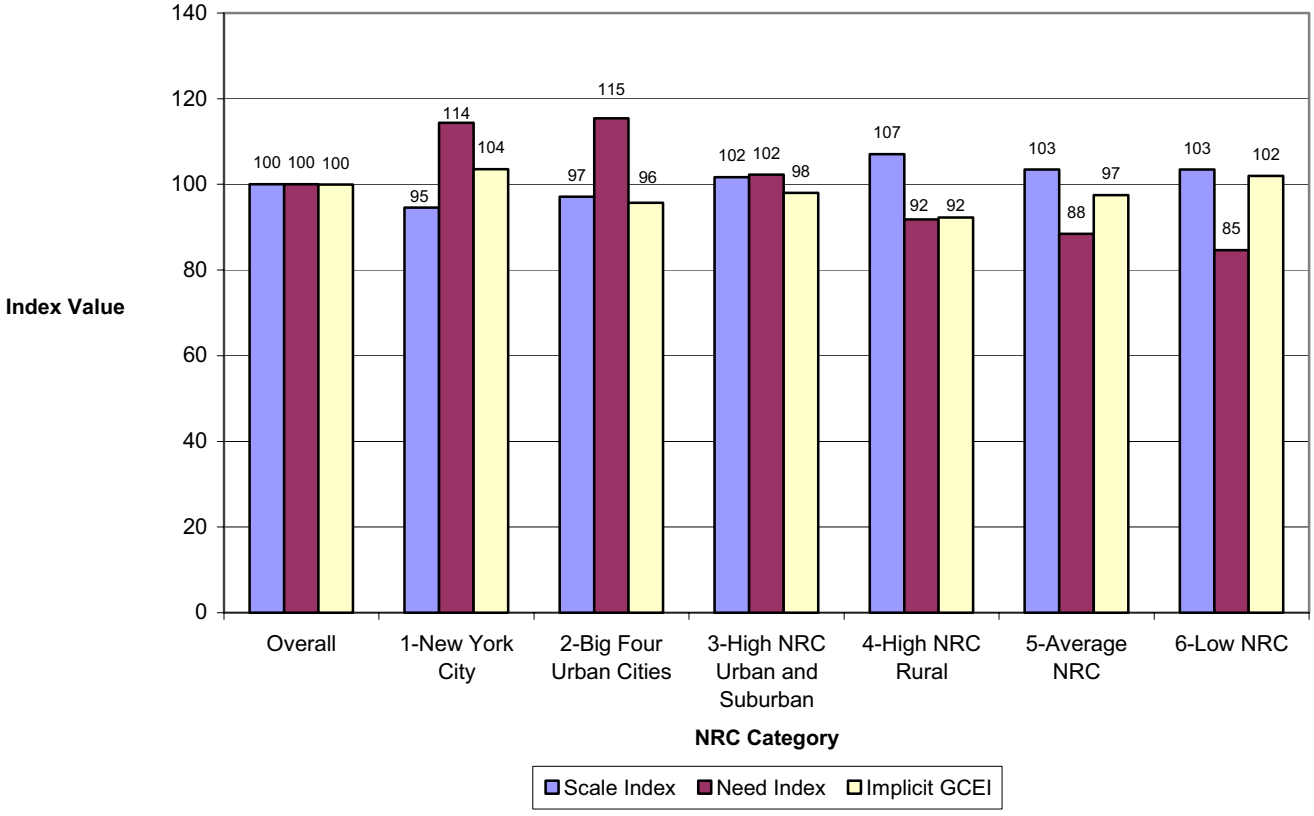

Exhibit reads: It costs approximately 4 percent more to hire a qualified teacher in New York City relative to a comparable teacher that instructs the average student in the state. Pupil needs in New York City are 14 percent higher that the statewide pupil-weighted average.

One can see that the scale indices tend to even out across the NRCs suggesting that at least some of the scale effects in 4-8 are attributable to the lower costs projected for operating schools with adequate resources. The differences in the need indices between the two exhibits are negligible. For example, New York City exhibits no change in the

[88] AIR/MAP established limits on the range of school enrollments for the purposes of the simulation. Schools with enrollment levels within the original range of the Stage 1 exercises were assigned the corresponding projected expenditure levels, while schools with enrollment levels outside the lower and upper limits of this range were constrained to be at the minimum or maximum enrollment levels, respectively. In other words, an elementary school with an enrollment of less than 414 students, which was the minimum enrollment level specified in the original PJP exercises, was assigned the projected cost for a school of 414 students. Similarly, an elementary school with an enrollment greater than 774 (the maximum elementary school size specified in the PJP exercises) was assigned a projected cost corresponding to the 774 cost estimate. Elementary schools with enrollment between 414 and 774 were assigned cost projections based on their actual enrollments. The middle and high schools were treated in the same way, but using the appropriate enrollment ranges for these grade levels.

relative need index between exhibit 4-8 and 4-9, while the next largest four urban districts move from 116 to 115.

Exhibit 4-10 - Relative Scale and Need Indices and Implicit GCEI by Enrollment Category Based on Model Using Actual School Enrollment

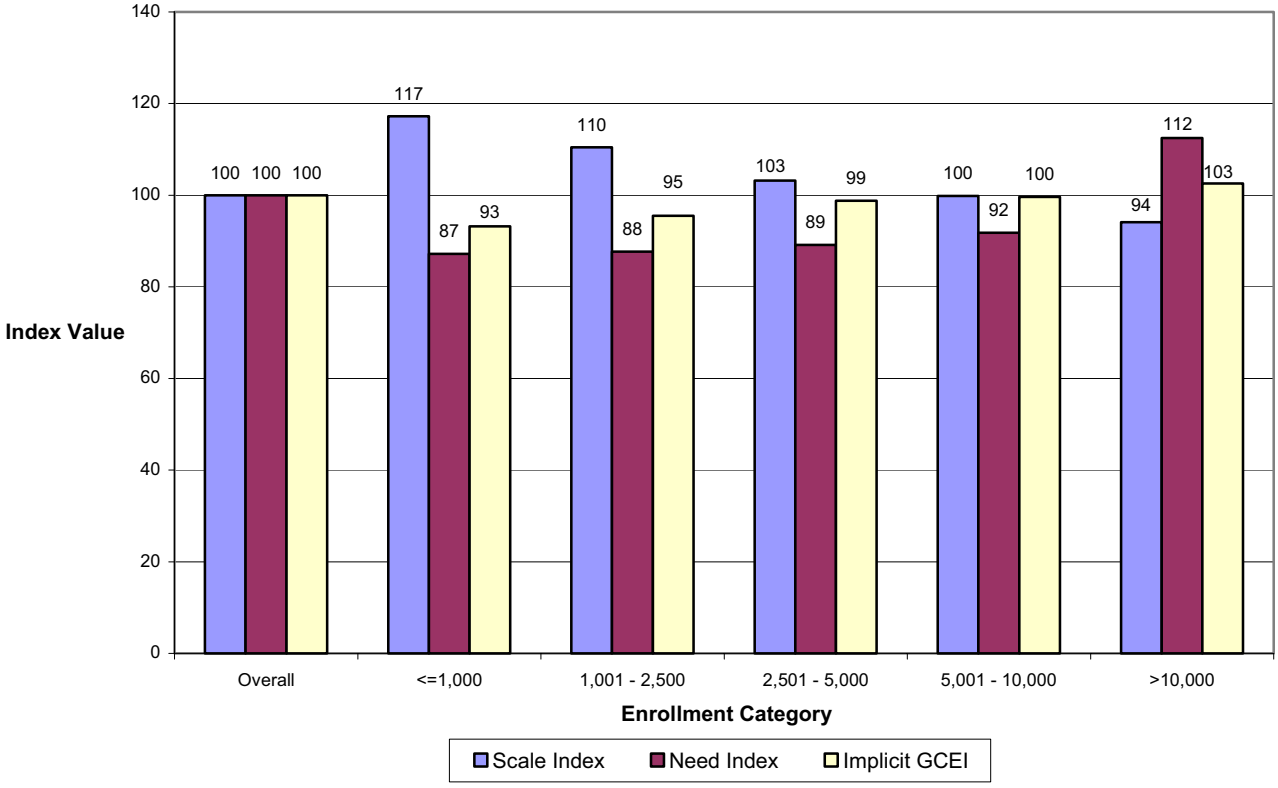

Exhibit reads: It costs approximately 7 percent less to hire a qualified teacher in districts with less than 1,000 students relative to a comparable teacher that instructs the average student in the state. Scale effects in these small districts are 17 percent higher that the statewide pupil-weighted average.

Exhibit 4-10 offers another way of looking at the same collection of indices displayed in Exhibit 4-8. It arrays the pupil-weighted average index values from the smallest to largest categories of districts in New York State. The smallest districts (i.e., those under 1,000 enrollment) have the highest relative costs associated with the scale of operations (117), while having the lowest relative pupil need (87) and geographic cost differences (93). The largest districts (i.e., with enrollments larger than 10,000) have the lowest relative costs associated with the scale of operations (94), while having the highest relative pupil need (112) and geographic cost differences (103).

The total projected expenditure for the state tends to be higher using the simulation that applies the mean as opposed to the actual school size. One can see (in Exhibit 4-11) that using the mean enrollment levels increases the total estimated costs of adequacy over the model using actual enrollments by $0.15 billion. It increases the cost estimates for New York City by eliminating the lower cost estimates associated with the larger schools in the city. In contrast, it reduces to some degree the cost estimates for the districts in the smaller rural communities.

Exhibit 4-11 - Total Expenditure Required to Bring All Disricts to "Adequate" Spending Levels for Actual and Mean Enrollment Simulation Models by Need to Resource Capacity Category

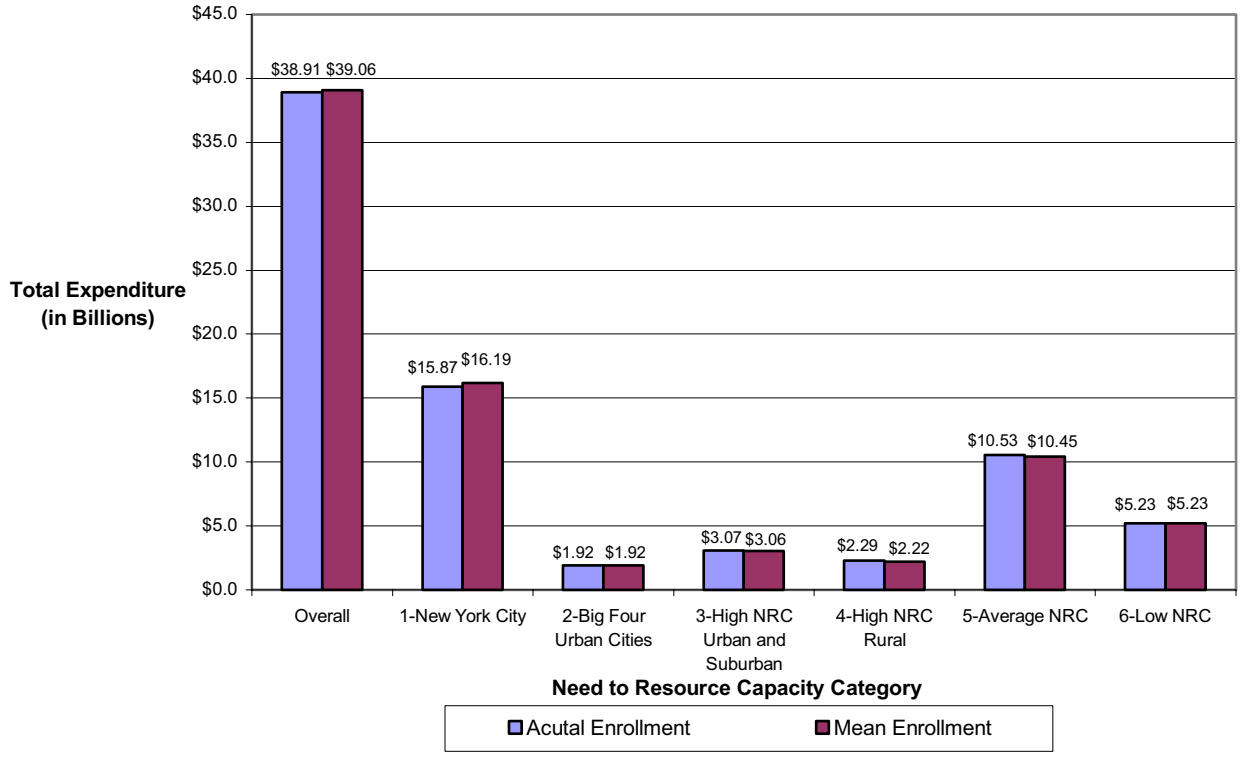

Exhibit reads: Using the Stage 3 resource specifications with lump-sum district-level expenditures and actual enrollment the total projected expenditure necessary to achieve adequacy is $38.91 billion. Assuming that all schools face scale effects identical to those with mean enrollment, the total projected expenditure increases to $39.06 billion.

The key question that one has to address in deciding how to use these models is to determine what is an optimal school size. If it is believed that school size adversely affects student outcomes, then it may be necessary to use some combination of the alternative simulation models presented in this report to provide an appropriate representation of pupil needs and scale of school and district operations.

Adjustments in the Numbers Over Time

As indicated previously, all of the above estimates are based on data for the 2001-02 school year. Use of the predicted need index in future years would require adjusting the base expenditure figure (BASE_EXP) for each district by a statewide index to reflect the appropriately reflect inflation. The need and implicit geographic cost indices are not likely to change dramatically over time. The current numbers used to estimate geographic costs for this study use four years of data, with the correlations from one year to the next being well above 0.9. Moreover, previous research on this topic has shown remarkable stability in these indices over time (see, for example, Chambers, 1981, 1997b, and Taylor, Chambers, and Robinson, forthcoming).

For the most part, the need/scale index reflects variations in district size, the percentage of students in poverty, ELL and special education. Major changes from one year to the next in these characteristics are unusual. Moreover, the need/scale index as calculated in this study is not a precise calculation. Rather, it is intended to reflect major differences across districts in the relative needs of the students served and the effects of district size.

With this in mind, one could consider simply using the predicted need/scale index itself as a constant for the immediate future. That is, one could simply assign a value of the need/scale index to each district and retain that value for a period of three to five years. Changes in allocations to the district over time would be impacted only by inflation and a measure of inflation would be applied to the base expenditure level.

Every three to five years, the adequacy study should be updated with new need index numbers. Subsequent studies could include updated analyses of teacher costs and meetings of a select group of educators to review the standards and resource specifications upon which the current estimates are built.

An advantage to using the need/scale index rather than a pupil-weighted system is that it is simpler in concept and reduces the incentives for districts to increase enrollments of selected populations (e.g., special education or ELL) in order to increase funding. Moreover, marginal changes in these categories of students are not likely to have a significant impact on the actual costs of serving the students.

Summary

This chapter has presented an overview of the results of this study and an examination of the disaggregated components of the cost projections: geographic cost variations, pupil need, and scale of operations. Alternative estimates of the investment required to achieve educational adequacy were presented based on the PJP specifications derived from Stages 1, 2, and 3 of the process, which correspond to the various meetings of the professional judgment panels. In addition, AIR/MAP presented an estimate that used Stage 3 specifications in combination with an alternative method for estimating the expenditure on district-level functions. This alternative method reflected the likelihood that spending on some district-level functions would grow in proportion to projected changes in spending on instructional programs. However, there are no data at present showing how much these central administrative and maintenance expenditures are likely to change. Therefore, the alternative projection produced by the Modified Stage 3 simulation probably represents an upper bound expenditure estimate.

The projected additional dollars necessary to realize "adequate" spending throughout the state range from $6.21 to $8.40 billion. These figures represent the additional investment to bring all districts that, in 2001-02, were spending less than projected levels up to a spending level that would achieve adequacy. While the absolute values of the overall investment vary under different assumptions or at different stages, the patterns of variation across the state as reflected by the distribution of projected versus actual spending do not vary significantly.

Preschool programs, including pre-kindergarten and early childhood education programs, play a significant role in the additional expenditures required to achieve adequacy, amounting to more than one billion dollars.

Scale of district operations and pupil need also play roles in accounting for variations in the bottom-line expenditures required to achieve adequacy. Analysis of the variations in the patterns of scale and need revealed that the five large urban districts tended to exhibit relatively high projected expenditures based on pupil needs and geographic cost differences, and relatively lower projected expenditures associated with scale of operations, all else equal.

Chapter 5 – Conclusion

This chapter offers reflections resulting from fifteen months of wrestling with defining issues and affixing dollars to dimensions of educational adequacy. AIR/MAP has organized a cadre of more than 50 highly qualified educators to develop the design and resource specifications necessary to deliver an "adequate" program of educational services. In this context, "adequacy" was defined in terms of a set of desired outcome goals and learning standards for the public school students in New York State. The process involved a series of meetings with ten professional judgment panels with follow-up meetings of a subset of the original panel members to review the AIR/MAP synthesis of the specifications. The details of the professional judgment process and the results of their deliberations are presented in Chapter 2 of this report.

During the course of this process, AIR/MAP introduced a review of the educational research and analyses of "successful schools," and the geographic variations in the costs of school personnel. Chapter 3 presents the detailed analysis of the costs of school personnel and the resulting geographic cost of education index.

For the sake of transparency, this report has presented "adequacy" cost estimates at the various stages of the process so individuals reviewing this work would be able to track each component and what was changed over the course of the analysis. The additional dollars required to bring those districts currently spending below "adequate" levels up to "adequacy" required anywhere from $6.21 to $8.40 billion depending on the stage in the process and assumptions made pertaining to district-level expenditures. Each of these cost estimates is presented and compared in Chapter 4.

The remainder of this chapter focuses on four areas: (1) a discussion of some implementation issues, (2) additional research that would further refine these cost estimates of "adequate" educational services, (3) suggestions for using these data as a basis for education finance distribution formulas, (4) comments regarding the role of analysis in relation to the ultimate responsibility of policymakers, and (5) a concluding set of caveats.

Implementation Issues

Implementation of the "adequacy" models presented in this report implies a significant expansion of the instructional program for both school-aged as well as preschool children. In addition to bolstered K-12 programs, the "adequacy" cost model includes preschool programs for 3 and 4 year olds. While there are a number of programs already in existence within the state, the model projects a significant increase in the number of participating children. In many districts, full implementation of the model will require hiring more school personnel. As a surplus of all these categories of needed personnel is unlikely, successful implementation will require significant planning. For example, more university students will need to be encouraged to become teachers, and the teacher training capacity of the state will need to be enhanced. In the short run, increased salaries

may be needed to attract those already holding credentials but working elsewhere back into the teaching profession and to reduce turnover among those already employed as teachers. In addition, additional funding will be needed for facilities, which are not currently accounted for in the AIR/MAP projections.

The state needs to work in concert with local school district decision makers to make this process as smooth as possible. New York does not want to replicate the California experience with the Class Size Reduction Program (see Bohrnstedt and Stecher, 2002). School districts were not able to recruit and employ enough qualified teachers in the short period of time they were given. In turn, the quality of teachers suffered and the program failed to deliver hoped for improvements in student outcomes.

At the same time, the additional education resources included in these "adequacy" models may make education a more attractive field in which to work. More resources will mean more professional development, better instructional materials, and smaller class sizes. If hiring is done in a deliberate way and teachers are assigned to positions for which they are certified, the resulting jobs will be more attractive making it easier to attract and retain teachers. The results of the present study of teacher labor markets, as described in Chapter 3, support this conclusion.

Remaining Research

Central administration and facility maintenance account for approximately 20 percent of total current spending in New York schools.[89] While it is possible to make informed estimates of these costs, they remain unverified, partially undermining the precision of any estimate of "adequacy."

School and Central Office Administrative Costs

While the direct costs of educational programs specified through the PJP process can be derived with reasonable accuracy, consideration of their impact on central administrative services was not included in this study. For example, at what juncture does the addition of new school buildings or an increase in the size of instructional staff at existing schools create a burden necessitating additional central office staff?

Maintenance and Operations

Maintenance typically accounts for 10 to 15 percent of a school or district budget. When projected for a state the size of New York, the amount of money involved is in the billions. This is another area of inquiry requiring further investigation within an adequacy framework.

[89] Additional expenditures are allocated to transportation services and debt service for facilities acquisition and construction, but these items were excluded from the analysis in this report. Total spending less transportation and debt service is referred to as total current expenditure.

Summary

AIR/MAP has had to rely on assumptions regarding the impact of central administration and maintenance on the cost of adequacy for the state. In the future, both areas could benefit from further research and the development of more detailed bases for deriving adequacy expenditure estimates.

Converting "Costs" of Adequacy to Funding Formulas

The purpose of this study was to determine cost estimates of "adequate" education services for the state. It does not attempt to determine sources of revenues to meet these costs, or formulas by which those revenues should be distributed. However, further consideration of this question may benefit by distinguishing between pupil and district characteristics.

Pupil Characteristics

The professional judgment process used for this study delineated several "at risk" conditions that seem reasonably associated with a need for added resources. These included poverty, special education, and English language learners. Measures of the percentage of students in these conditions seem reasonable components of a distribution formula.

School and District Characteristics

Funding formulas also generally recognize conditions with cost implications that are beyond the immediate control of school districts. Among these are distances involved in transporting students, the necessity for operating small schools, and regional differences in purchasing goods and services related to schooling.

Indices of Pupil Needs and Scale of Operations

Chapter 4 illustrates methods for developing indices of differences in costs associated with pupil need and the scale of district operations. As an alternative to developing individual weights for various categories of pupils, AIR/MAP suggested that policy makers might consider simply employing the overall indices or the bottom line expenditure estimates to provide a foundation for a distribution formula. Using this type of approach as the basis for a "foundation" school funding formula requires calculation of the implicit geographic cost of education index, an index of pupil needs, an index of scale, and a basic per pupil dollar amount necessary to purchase the designated resources. This use of an overall set of indices reduces incentives for districts to identify more pupils at the margin for special education or English language learner services. These kind of need-scale indices could be applied for some period of time, say three to five years, after which a new study could be commissioned to update the "adequacy" specifications and to review the factors underlying the foundation formula. In the interim, the only adjustments necessary to fund education annually would be an

appropriate estimate of inflation to be applied to the basic per pupil dollar amount necessary to achieve "adequacy."

In the process of dividing the overall adequacy cost estimates into the pupil need and scale components, some interesting patterns were revealed. The initial adequacy cost estimates developed by AIR/MAP used actual school enrollments to apply the school program prototypes developed by the PJPs. As an alternative to using actual school enrollments, AIR/MAP ran another simulation that was based on an assumption of operating all schools at the state mean size for each school type. This analysis suggested a slightly higher total cost of achieving adequacy and resulted in another $0.15 billion being added to the original estimates.

While, in reality, nobody expects all schools to be operated at the same size, there is a body of research suggesting that school size may be an important dimension of school success. With this in mind, New York State may or may not choose to build incentives into the foundation formula that would encourage districts currently operating relatively large schools to move toward operating smaller schools and vice versa for districts currently operating very small schools. What may be necessary is some kind of hybrid that reflects the reality that small school sizes may not be a choice, but a necessity, in some small remote rural districts in the state.

"Costing Out" Analytic and Policy Roles

Results presented in this report are in the form of a range of dollar figures, each based upon a specific set of procedures or assumptions. The report has concentrated on providing information regarding the analytic components of each "adequacy" determination. If policy makers in the state are dissatisfied with an assumption, then they can substitute others and determine the resulting costs. This striving for transparency is a crucial component of a "costing out" process.

"Costing out" adequate opportunity is not an exact science, but rather an ongoing process of estimation. To be sure, sophisticated analytic tools can be brought to bear upon the process, but the estimation of the costs of an "adequate" opportunity is more of a quest than an end point. Thus, it is inappropriate for courts or policy makers to seize upon any particular estimate as the only one that is worthy of being "adequate." Instead, those who formulate policies should use discretion and take into account the range of estimates and the underlying assumptions upon which they are based before deciding on what policy action might be best.

Concluding Recommendations

Scale of operations and the distribution of special student needs (poverty, ELL, and special education) are the two major factors underlying the cost variations shown in this study. Policy makers should consider the relative weights they choose to place on each of these factors. Due to the highly integrated fashion by which each of them was treated

within the model, however, they may be best suited to block grant, as opposed to categorical, funding approaches. For example, categorical funding mechanisms such as special education funding weights will not be easily derived from this approach.

Also, although the Professional Judgment Panels derived instructional designs by which schools could construct an adequate opportunity to meet the Regents Learning Standards, this theoretical design does not include, or recommend, that the specific components of these models become mandates for local practice. However insightful the instructional designs created by Professional Judgment Panels or persuasive the case for their effectiveness, education continues to be more of an art than a science. Harnessing creativity and commitment, and taking advantage of the experience of local educators, necessitates providing them with discretion to determine exactly how funds should be used.

Bibliography

Alexander, C.D., T. Gronberg, D. Jansen, H. Keller, L. Taylor and P.U. Treisman (November 1, 2000). *A Study of Uncontrollable Variations in the Costs of Texas Public Education.* Prepared for the 77th Texas Legislature.

Andrews, M., W. Duncombe and J. Yinger (2002). Revisiting Economies of Size in American Education: Are We Any Closer to a Consensus. *Economics of Education Review*, **21**, pp. 245-262.

Angrist, J.D. and V. Lavy (2001). Does Teacher Training Affect Pupil Learning? Evidence from Matched Comparisons in Jerusalem Public Schools. *Journal of Labor Economics*, **19**, pp. 343-369.

Angrist, J.D. and V. Lavy (2002). New Evidence on Classroom Computers and Pupil Learning. *The Economic Journal*, **112**, pp. 735-765.

Augenblick, J. (1997). *Determining Base Cost for State School Funding Systems.* Denver, CO: Education Commission of the States Issuegram.

Augenblick, J. (September, 2001). *Calculation Of The Cost Of An Adequate Education In Maryland In 1999-2000 Using Two Different Analytic Approaches.* Prepared for the Maryland Commission On Education Finance, Equity, And Excellence (Thornton Commission). Denver, CO: Augenblick & Myers.

Augenblick, J and J. Myers (2003) *Calculation of the Cost of an Adequate Education in Missouri Using the Professional Judgment and the Successful School District Approaches.* Prepared for the Missouri Education Coalition for Adequacy. Denver, CO: Augenblick & Myers.

Augenblick, J. and K. Adams (1979). *An Analysis of the Impact of Changes in the Funding of Elementary/Secondary Education in Texas: 1974/75 to 1977/78*. Denver, CO: Education Commission of the States.

Barnett, W.S. (1995). Long-Term Effects of Early Childhood Programs on Cognitive and School Outcomes. The Future of Children: Long-Term Outcomes of Early Childhood Programs, **5**, pp. 25-50.

Barnett, W.S. (1996). Lives in the Balance: Age-27 Benefit-Cost Analysis of the High/Scope Perry Preschool Program. Yspilanti, MI: High/Scope Press.

Barnett, W.S. (2000). Economics of Early Childhood Intervention. In Jack Shonkoff and Samuel Meisels, Eds. *Handbook of Early Childhood Intervention*, 2nd edition. Cambridge, MA: Cambridge University Press.

Barro, S.M. (1974). *The Impact of Intergovernmental Aid on Public School Spending*. Unpublished doctoral dissertation, Stanford University, Department of Economics, Stanford, CA.

Berne, R. and L. Stiefel (1994). Measuring Equity at the School Level: The Finance Perspective. *Educational Evaluation and Policy Analysis.* **16(4)**: 59–76.

Birman, B.F., L. Desimone, A. Porter and M.S. Garet (2000). Designing Professional Development That Works. *Educational Leadership*, **57**, pp. 28-33.

Bohrnstedt, G.W. and B.M. Stecher (Eds.) (September, 2002) *What We Have Learned About Class Size Reduction in California* (CSR Research Consortium)Palo Alto, CA: American Institutes for Research

Borland, M. V. and R.M. Hasten (1992). Student academic achievement and the degree of market concentration in education. *Economics of Education Review,* **11(1)**: 31-39.

Brazer, H.E. (1974). Adjusting for Differences Among School Districts in the Costs of Educational Inputs: A Feasibility Report. In *Selected Papers in School Finance 1974*. Washington, DC: U.S. Department of Health, Education, and Welfare, Office of Education.

Brown, S.P.A. and L.L. Taylor (1992). What Wages and Property Values Say About Texas. *Southwest Economy*, **2** (March/April): 1-4.

Bryk, A., V.E. Lee and P. Holland. (1993). Catholic Schools and the Common Good. Cambridge, MA: Harvard University Press.

Calvo, N.A., L.O. Picus, J.R. Smith and J.W. Guthrie (2000). *A Review of the Oregon Quality Education Model*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

CEO Forum on Education and Technology (2001). *Key Building Blocks to Student Achievement in the 21st Century*, Washington, DC.

Chambers, J.G. (1978). *Educational cost differentials across school districts in California.* Report prepared under subcontract to the Education Finance Center of the Education Commission of the States for the School Finance Equalization Project of the California State Department of Education.

Chambers, J.G. (March, 1980). *The development of a cost-of-education index for the State of California. Final Report, Parts 1 and 2* (Program Report No. 81-B3, prepared for the California State Department of education, December 1980). Stanford, CA: Stanford University, Institute for Research on Educational Finance and Governance.

Chambers, J.G. (1981a). Cost and price level adjustments to state aid for education: A theoretical and empirical review. In K. Forbis Jordan (Ed.), *Perspectives in State School Support Programs* (2nd annual yearbook of the American Educational Finance Association). Cambridge, MA: Ballinger Publishing Co.

Chambers, J.G. (Winter, 1981b). The hedonic wage technique as a tool for estimating the costs of school personnel: A theoretical exposition with implications for empirical analysis. *Journal of Education Finance*.

Chambers, J.G. (Fall, 1981c). The impact of bargaining and bargaining statutes on the earnings of public school teachers: A comparison in California and Missouri. *Review of Economics of Education*.

Chambers, J. G. (1994). Career oriented high schools. In S. Barnett and H. Walberg (Eds.), *Cost Analysis for Educational Decision Making.* Greenwich, CT: JAI Press.

Chambers, J.G. (1995). *Public School Teacher Cost Differences Across the U.S.: the Development of a Teacher Cost Index* (Final report to the National Center for Education Statistics, Task 2 of the Elementary Secondary Education Statistics Project, NCES Report #95–758). Palo Alto, CA: American Institutes for Research.

Chambers, J.G. (October, 1997). *Geographic Variations in Public School Costs.* Palo Alto, CA: American Institutes for Research.

Chambers, J.G. (working paper, 1997a). *Measuring Geographic Differences in Public School Costs*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Chambers, J.G. (1997b). *Volume III - The Measurement of School Input Price Differences: A Technical Report on Geographic and Inflationary Differences in the Prices of Public School Inputs*. Washington DC: U.S. Department of Education, National Center for Education Statistics.

Chambers, J.G. (1997c). *A Technical Report on the development of a Geographic and Inflationary Differences in Public School Costs.* Washington, D.C.: U.S. Department of Education, National Center for Education Statistics.

Chambers, J.G. (1999). *Measuring resources in education: From accounting models to the resource cost model approach.* Washington, DC: National Center for Education Statistics.

Chambers, J.G. and J.M. Wolman (1998). *What Can We Learn from State Data Systems about the Cost of Special Education? A Case Study of Ohio*. Palo Alto, CA: American Institutes for Research, Center for Special Education Finance.

Chambers, J.G., L.L. Taylor and J.P. Robinson (January, 2003). *Alaska School District Cost Study: Volume II—The Technical Report*. Palo Alto, CA: American Institutes for Research.

Chambers, J.G. and P.E. Vincent (1980). *Interim development and progress report on alternative cost-of-education models and indices* (SRI International Report Number 3). Prepared for the Florida Department of Education.

Chambers, J.G., S. Stullich, J. Lieberman, T. Parrish, D. Kaleba and J. Van Campen (1999). *Study of Education Resources and Federal Funding: Preliminary Report*. Washington, DC: U.S. Department of Education, Office of the Under Secretary.

Chambers, J.G. and T.B. Parrish (December, 1982). *The development of a resource cost model funding base for education finance in Illinois, Volume I—executive summary, and Volume II—technical report* (Prepared for the Illinois State Board of Education). Stanford, CA: Associates for Education Finance and Planning.

Chambers, J.G. and T.B. Parrish (1984). *The Development of a Program Cost Model and a Cost-of-Education Index for the State of Alaska: Final Report, Volumes I-IV*. Stanford, CA: Associates for Education Finance and Planning, Inc.

Chambers, J.G. and T.B. Parrish (1994a). Modeling resource costs. In S. Barnett and H. Walberg (Eds.), *Cost Analysis for Educational Decision Making.* Greenwich, CT: JAI Press.

Chambers, J.G. and T.B. Parrish (1994b). Developing a resource cost database. In S. Barnett and H. Walberg (Eds.), *Cost Analysis for Educational Decision Making.* Greenwich, CT: JAI Press.

Chambers, J.G. and T.B. Parrish (1994c). Cost-based state-level funding. In S. Barnett and H. Walberg (Eds.), *Cost Analysis for Educational Decision Making.* Greenwich, CT: JAI Press.

Chambers, J.G., T.B. Parrish and J. Harr (2002). *What Are We Spending on Special Education Services in the United States, 1999-2000?* Submitted by the American Institutes for Research to the Office Of Special Education Programs, U.S. Department of Education.

Cohen, D. and Hill, H. (2002). When Education Policy Works. New Haven, CT: Yale University Press.

Bruce Cooper and Associates, J. Samuels and S. Heinbuch. (1994). Making Money Matter in Education: A Micro-Financial Model for Determining School-level Allocations, Efficiency, and Productivity. *Journal of Education Finance,* **20** (Summer 1994): 66–87.

Coopers and Lybrand (1994). *Resource allocations in the New York City Public Schools.* Report to Mayor Rudolph W. Giuliani.

Cuban, L. (1993). Computers Meet Classroom: Classroom Wins. *Teacher's College Record*, **95**, pp. 185-210.

Desimone, L., A. Porter, B. Birman, M. Garet and K.S. Yoon (2002a). Effects of Professional Development on Teachers' Instruction: Results from a Three-year Longitudinal Study. *Educational Evaluation and Policy Analysis*, **24**, pp.81-112.

Desimone, L., A. Porter, B. Birman, M. Garet and K.S. Yoon (2002b). How Do District Management and Implementation Strategies Relate to the Quality of Professional Development That Districts Provide to Teachers? *Teacher College Record*, **104**, pp. 1265-1312.

Duncombe, W. (2002). *Estimating the Cost of an Adequate Education in New York - Appendix B.* CPR Working Paper No. 44, Syracuse NY: Syracuse University.

Finn, J.D. and Achilles, C.M. (1990). Answers and Questions About Class Size: A Statewide Experiment. *American Educational Research Journal*, **27**, pp. 557-577.

Garet, M., B. Birman, A. Porter, L. Desimone and R. Herman. (1999). Designing Effective Professional Development: Lessons from the Eisenhower Program. Washington, DC: United States Department of Education.

Gerber, S., J. Finn, C. Achilles and J. Boyd-Zaharias (2001). Teacher Aides and Students' Academic Achievement. *Educational Evaluation and Policy Analysis*, **23**, pp. 123-143.

Goldhaber, D.D. (1999). An Alternative Measure of Inflation in Teacher Salaries. *Selected Papers in School Finance, 1997*. William J. Fowler, Jr., editor. Washington, D.C.: U.S. Department of Education, National Center for Education Statistics.

Grissmer, D. (1999). Class Size Effects: Assessing the Evidence, Its Policy Implications, and Future Research Agenda. *Educational Evaluation and Policy Analysis*, **21**, pp. 231-248.

Grubb, W.N. and J. Hyman (1975). Construction Teacher Cost Indices: Methodological Explorations with California Unified School Districts. In *Selected Papers in School Finance 1975*. Washington, DC: U.S. Department of Health, Education, and Welfare, Office of Education.

Guthrie, J. and R. Rothstein (1999). Enabling 'Adequacy' to Achieve Reality: Translating Adequacy into State School Finance Distribution Arrangements. In Helen F.

Ladd, Rosemary Chalk and Janet S. Hansen (Eds.), *Equity and Adequacy in Education Finance.* Washington, DC: National Academy Press.

Guthrie, J.W., G.C. Hayward, J.R. Smith, R. Rothstein, R.W. Bennett, J.E. Koppich, E. Bowman, L. DeLapp, B. Brandes and S. Clark (1997). *A Proposed Cost-Based Block Grant Model for Wyoming School Finance*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

Hanushek, E.A. (1986). The Economics of Schooling: Production and Efficiency in Public Schools. *Journal of Economic Literature*, **24**, pp. 1141-1177.

Hanushek, E.A. (1997). Assessing the effects of school resources on student performance: Fan update. *Educational Evaluation and Policy Analysis*, **19(2)**: 141–164.

Henderson, A.T. (1998) Parents Are a School's Best Friends. *Phi Delta Kappan*, **70**, pp. 148-153.

Herrera, C., C. Sipe and W. McClanahan (2000). Mentoring school-age children: Relationship development in community-based and school-based programs. Philadelphia: Public/ Private Ventures.

Hertert, L. (1993). *Resource Allocation patterns in Public Education: An Analysis of School Level Equity in California.* Unpublished Ph.D. dissertation, University of Southern California.

Hirsch, E., J. Koppich and M. Knapp. (2001). Revisiting What States are Doing to Improve the Quality of Teaching: An Update on Patterns and Trends. Working Paper, Center for the Study of Teaching and Policy, University of Washington.

Jacob, B. and L. Lefgren (2002)**.** The Impact of Teacher Training on Student Achievement: Quasi-Experimental Evidence From School Reform Efforts in Chicago**.** NBER Working Paper No. 8916.

Jekielek, S., K.A. Moore and E.C. Hair (2002). Mentoring Programs and Youth Development: A Synthesis. Washington, DC: Child Trends.

Karoly, L, P. Greenwood, S. Everingham, J. Hoube, M.R. Kilburn, C.P. Rydell, M. Sanders and J. Chiesa (1998). Investing in Our Children: What We Know and Don't Know About the Costs and Benefits of Early Childhood Interventions. Santa Monica, CA: RAND Corporation.

Krueger, A.B. and D.M. Whitmore (2001). The Effect of Attending a Small Class in the Early Grades on College Test Taking and Middle School Test Results: Evidence from Project STAR, *The Economic Journal*, **111**, pp. 1–28.

Lee, V.E. and J. Smith (1997). High School Size: Which Works Best, and for Whom? *Educational Evaluation and Policy Analysis*, **19**, pp. 205-228.

Lee, V.E., J.B. Smith and R.G. Croninger (1997). How high school organization influences the equitable distribution of learning in mathematics and science. *Sociology of Education*, **70**, pp. 128-150.

Levittown Union Free Sch. Dist. v. Nyquist, 57 N.Y.2d 27 (N.Y. 1982).

MAP, Inc. (1997). *A Proposed Cost-based Block Grant Model for Wyoming School Finance*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

MAP, Inc. (2001). *A Professional Judgment Approach to Determining Adequate Education Funding in Maryland: Final Report*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

Martin, S. (1988). *Industrial Economics.* New York: MacMillan Publishing Co.

McMahon, W.W. (1994). Interstate Cost Adjustments. In William J. Fowler, Jr. (Ed.), *Selected Papers in School Finance*. Washington, DC: U.S. Department of Education, National Center for Educational Statistics.

Midstate School Finance Consortium (2002). *The Midstate Proposal to Fund New York State Public Schools: District-by-District Data*.

Miles, K.H., A. Odden, S. Archibald and M. Fermanich. (2002). An Analysis of Professional Development Spending in Four Districts Using a New Cost Framework., Working Paper, Wisconsin Center for Education Research, Consortium for Policy Research in Education, University of Wisconsin.

Mishel, L. and R. Rothstein, Eds. (2002). The Class Size Debate. Washington, DC: Economic Policy Institute.

Murphy, J., L. Beck, M. Crawford, A. Hodges and C. McGaughy. (2001). The Productive High School: Creating Personalized Academic Communities. Thousand Oaks, CA: Corwin Press.

Newmann, F. (1997). How Secondary Schools Contribute to Academic Success. In K. Borman and B. Schneider, Eds. Youth Experiences and Development: Social Influences and Educational Challenges. Berkeley, CA: McCutchan.

Odden, A., S. Archibald, M. Fermanich and H.A. Gallagher (2002). A Cost Framework for Professional Development. *Journal of Education Finance*, **28**, pp. 51-74.

Odden, A. and S. Archibald (2001). Reallocating Resources: How to Boost Student Achievement Without Asking For More. Thousand Oaks, CA: Corwin Press.

Odden, A., M. Fermanich and L. Picus (2003). *The State-of-the-Art Approach to School Finance Adequacy in Kentucky.* Report for Kentucky Department of Education. Lawrence O. Picus and Associates.

Oppenheimer, T. (July, 1997). The Computer Delusion, *Atlantic Monthly*, pp. 45-63.

Parrish, T.B. (1996). *Special Education: Past, Present, and Future—Policy Paper No. 8*. Palo Alto, CA: Center for Special Education Finance, American Institutes for Research.

Raywid, M.A. (1997/1998). Synthesis of Research: Small Schools: A Reform That Works. *Educational Leadership*, **55**, pp. 34-39.

Rich, D. (1985). The Forgotten Factor in School Success: The Family. Washington, DC: Home and School Institute.

Rothstein, R. and J.R. Smith (1997). *Adjusting Oregon Education Expenditures for Regional Cost Differences: A Feasibility Study*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

Seder, R.C., L.O. Picus and J.R. Smith (2002). *Wyoming Education Finance: Estimating the Costs of Services for "At-Risk" Students*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

Shanahan, T. (1998). On the Effectiveness and Limitations of Tutoring in Reading. *Review of Research in Education*, **23**, pp. 217-234.

Sherman, J. and C. Best (1996). Assessment and Analysis of School-level Expenditures. *Unpublished report prepared for the National Center for Education Statistics, January 1996.*

Slavin, R., N. Karwiet and B. Wasik. (1994). Preventing Early School Failure: Research Policy and Practice. Boston, MA: Allyn and Bacon.

Smith, J.R. (2002). *Proposed Revisions to the Cost Based Block Grant*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

Stiefel, L., R. Rubenstein and A.E. Schwartz (1999). Using Adjusted Performance Measures for Evaluating Resource Use. *Public Budgeting and Finance*, Fall 1999, **19(3)**, pp. 67-87.

Taylor, L.L. (2004) Updating the Texas CEI. Manuscript.

Taylor, L.L., J.G. Chambers and J.P. Robinson (forthcoming). A New Geographic Cost of Education Index for Alaska: Old Approaches with Some New Twists. *Journal of Education Finance*.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs (2002). *24th Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act*. Washington, DC: Author.

Wasik, B.A. and R. Slavin (1993). Preventing Early Reading Failure with One-to-One Tutoring: A Review of Five Programs. *Reading Research Quarterly*, **28**, pp. 178-200.

Wehlage, G.G. and C.R. Stone (1996). School-Based Student Support Services: Community and Bureaucracy. *Journal of Education for Students Placed at Risk*, **1**, pp. 299-317.

Wendling, W. (1979). *Cost-of-Education Indices for New York State School Districts*. Denver, CO: Education Commission of the States.

Wenglinsky, H. (1998). Does It Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics. Policy Information Center, Research Division, Educational Testing Service, Princeton, New Jersey.

Wenglinsky, H. (2000). How Teaching Matters: Bringing the Classroom Back Into Discussions of Teacher Quality, Policy Information Center Report, Educational Testing Service, Princeton, NJ.

Wolkoff, M.J. and M. Podgursky (2002). *Wyoming Education Finance: Wyoming School District Employee Compensation*. Sacramento, CA: Management Analysis and Planning Associates, L.L.C.

Word, E., J. Johnston, H. Pate Bain, B. DeWayne Fulton, J. Boyd Zaharies, M. Lintz, C.M. Achilles, J. Folger and C. Breda (1990). *Student/teacher achievement ratio (STAR), Tennessee's K-3 class size study: Final summary report, 1985-1990.* Nashville, TN: Tennessee State Department of Education.

Wynne, M. and F. Sigalla (2nd quarter, 1994). The Consumer Price Index. *Federal Reserve Bank of Dallas Economic Review*.