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Contributing Factors: Disparities In 2005 Classroom Spending

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New Funding Formula Seeks to Alter School Budget Disparities

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SUMMARY

WITH THE START OF THE 2008 SCHOOL YEAR, the city's Department of Education has introduced a new formula for making basic allocations of city tax-levy funds to schools. In taking this step the education department has contended that there were significant—though unintended—disparities in the way basic funding for classroom instruction has been distributed in the past. Using data on actual school expenditures during the 2005 school year (the education department reviewed budgeted funds), IBO has evaluated the education department's contention and used statistical tests to determine what factors could have contributed to the disparities in actual per student expenditures by the schools.

IBO's analysis found considerable variation in per student spending for general education classroom instruction. In 2005, the basic classroom instruction expenditures we examined totaled $4.0 billion out of the $15.8 billion spent by the education department. The classroom spending averaged $4,642 per student, ranging from a low of $2,511 to a high of $8,569. Many education analysts have in the past chalked up such disparities to differences in average teacher salaries, with some schools having a larger number of more experienced, and therefore higher earning, teachers. But IBO has found that per student spending is more closely related to the number of students per teacher than to average teacher salary.

Among our other findings:

- As expected, elementary and middle schools with higher student spending generally had fewer students per teacher, higher teacher salaries, smaller class size, and lower enrollments.
- Surprisingly, high schools with the greatest per student spending had *lower* average teacher salaries.
- School size is a factor in spending disparities, particularly among high schools, with larger schools spending less per student.
- There was little evidence that student needs, such as the share of students who were English Language Learners, were major factors in predicting basic per student spending when we controlled for teacher staffing, school size, and the mix of grades in a school.

The education department's new formula for distributing funds to the city's schools, Fair Student Funding, is designed to address past disparities as well as take into account student needs. IBO's *New Funding Formula Seeks to Alter School Budget Disparities* takes a detailed look at the new formula in its first year of implementation.

INTRODUCTION

In theory, New York City schools with a similar mix of grade levels should receive similar sums of "basic general education funding" for each student. But education analysts, and even education department officials, were well aware that the theory did not hold. In order to better understand what was causing the disparity, IBO examined the distribution of basic general education funding throughout the school system for the 2005 school year, which ended in June 2005.

Basic general education funding, in budget parlance, consists of city tax-levy dollars and unrestricted operating aid from the state for classroom instruction of general education students (hereafter called city tax-levy dollars). This basic funding excludes categorical aid such as federal Title I dollars targeted to schools with a high proportion of students from low-income families or state aid aimed at reducing class size. The majority of the basic general education funding was allocated through a formula based on enrollment and the grades taught in the school. The allocation of these core resources did not take student needs such as limited English proficiency or learning disabilities into account and therefore should not have varied much among schools with the same mix of grades.

IBO's study was based on actual per student spending at each school rather than the allocated or budgeted amounts. The biggest factor in the Department of Education's (DOE) allocation of tax-levy resources was the calculation of the number of classes in a school based on the expected enrollment. The calculation varied depending on grade, but otherwise should have yielded little school-to-school variation. As a first step, allocations to schools were based on citywide average teacher salaries, but if a school had a teaching staff with above average salaries, the school's budget was supplemented to account for the difference. Thus, average teacher salary should have contributed to differences in per student spending. Indeed, it had long been assumed by observers of New York City schools that this was the key variable in explaining differences in per student spending of city tax-levy dollars for general education instructional purposes.

Broader measures of per student spending should—and do—reflect policy choices to direct more resources towards particular types of schools, such as schools with large concentrations of low-income students. Our study excluded those specially targeted funds as much as possible to concentrate on core general education instructional dollars. A portion of basic general education resources were allocated based on student need through the Special Needs/Academic Intervention Services allocation, but they represented a limited part of the core funds.[1]

Our paper proceeds as follows. First, we briefly review school budgeting in New York City since the switch to mayoral control of schools in June 2002. In the next section, we explain the methodology employed, including a discussion of the schools used in the analysis, data sources, and variables. The third section presents our findings on the variability of per student expenditures overall. We report our more detailed results for elementary and middle schools in the fourth section, followed by discussion of the results for high schools.

BRIEF REVIEW OF SCHOOL BUDGETING

Centralization of school budgeting has grown with the shift to mayoral control of the school system under state law enacted in June 2002. Previously, school funding was distributed to the superintendents of the 32 community schools districts and the high school superintendencies, based on the number of students in the district. The superintendents in turn distributed funds to the schools within their districts. When Mayor Michael Bloomberg was given control of the school system, budgeting gradually became centralized at the Department of Education, with funds allocated to schools rather than districts through a series of School Allocation Memorandums.[2]

As part of its campaign to build support for its Fair Student Funding proposal, which begins taking effect this year (see *New Funding Formula Seeks to Alter School Budget Disparities* for details), the DOE argued that even with more centralized budgeting, there is extensive variation and inequity in funding for individual schools. Education officials cite the example of two schools with approximately 800 students that have budgets that differ by about $1 million (with tax levy general education funding of $3 million in one school and $4 million in the other). Historical inequities, which have been carried forward through various hold-harmless provisions in the allocation formulas, coupled with differences in average teacher salary, staffing, and services offered are some of the possible reasons that have been put forth to explain these funding disparities.

The Bloomberg Administration made an initial attempt to reduce the differences in school budgets for 2004 through the implementation of a so-called funding corridor. The corridor calculation was supposed to set an upper and lower bound on a school's 2004 budget based on an adjusted budget from the preceding year.[3] Each school's 2004 budget was to be no less than 2.5 percent below the prior year's adjusted budget, and no more than 2.25 percent above the prior year's adjusted budget, with increases or decreases capped at $300,000.

There was significant opposition to the corridor allocation,

especially among schools above the corridor ceiling that were facing budget cuts, and the Bloomberg Administration ended up "restoring cuts that had been made as part of the equalization effort."[4] The education department noted at that time that without additional funding to devote to equalization, the effort would be unsuccessful because it would require redistributing existing funds within the system.

New resources are now available from the state to resolve the Campaign for Fiscal Equity lawsuit—supplemented with new city resources. Therefore, with the 2008 school budgets, DOE is once again attempting to equalize disparities between schools with the implementation of Fair Student Funding.

STUDY METHODOLOGY, DATA SOURCES, AND VARIABLES

Schools in the Study. Our unit of analysis was the school. School, as used in this study, does not necessarily refer to a building, which may house more than one school. Our definition of a school is a separate, independent academic program or organization, which may or may not be in a free-standing building. We excluded about 100 schools from the study, as described below, leaving a final sample of 1,276 schools.[5]

First, we excluded 59 schools in the citywide special education district because their funding would not be allocated under Fair Student Funding. The per student expenditures in the citywide special education district are much higher and are driven by the specific disabilities and needs of the students rather than by broader education policy.

Second, the 34 schools and alternative programs in the citywide alternative schools district were dropped. Alternative programs are academic programs in nontraditional settings for students who have lagged in earning credits towards graduation. The district includes programs serving populations with special needs, such as pupils detained in the juvenile justice system. The per student expenditures of these programs are higher due to the additional services and are not representative of schools in general. After some uncertainty, the education department decided to fund schools in the alternative district under Fair Student Funding, while excluding alternative programs in that district from the new allocation formula.

Lastly, because our analysis is very sensitive to extreme values, we dropped five schools that were outliers in per student expenditures. These schools' per student tax levy classroom spending on general education students was more than $8,700 per student (4.9 standard deviations above the citywide average of $4,642).[6]

Data Sources. We selected our data sources with an eye to making an independent assessment of assertions and findings presented by the DOE. Rather than use school budgets like the DOE, IBO's analysis relied on a rich dataset based on actual school spending. Budgets and actual spending at the school should not differ greatly or with any systematic bias for particular schools.[7]

In creating the database, we relied on four data sources:

- The *School Based Expenditure Report* includes all expenditures, classified by function, funding source, student type, and resource code. These data have been collected since 1996 and are released with about a one-year lag. We used the most recent expenditure report data available, covering the 2005 school year.
- The "register file" is a count of the number of students registered in every class in all schools on a given date, generally October 31. We used the audited register for the 2005 school year, which was compiled on October 31, 2004.
- The DOE uses a series of School Allocation Memorandums to allocate school budgets each school year. The allocation memorandums include information on school characteristics, such as the poverty rate among students.
- The last major data source was the 2005 school report cards database. While the State Education Department makes some school report card data available in a downloadable database, we used a separate database from the city's Department of Education that contains more data fields. We used the report cards for additional information on school features and students.

School Expenditure Measure. Our study was concerned with *per student tax-levy funds for general education students for classroom instruction spent at the school.* This variable was constructed to approximate the pool of dollars that will be reallocated under Fair Student Funding: tax levy instructional funds.

IBO estimated the tax-levy dollars spent at the school on classroom instruction for general education students. To account for differences in school size, we divided the total dollars by the number of general education students in grades K-12. Classroom instruction included the following: teachers, educational paraprofessionals, other classroom staff, text books, librarians and library books, instructional supplies and equipment, professional development, contracted instructional services, and summer and evening school.

Hence, the following funds are *excluded* from our measure:

- Funds for state and federal categorical programs that target a particular group of students, such as those from low-income

families (federal Title I) and four-year olds in universal prekindergarten classes.

- Funds spent at the district and central office on behalf of schools for costs such as pupil transportation or food that are allocated to schools in the *School Based Expenditure Report* (SBER) database. IBO only included funds spent at the school.
- Funds for full-time special education students, both self-contained and integrated. Full-time special education students receive special education services for most or all of the day from special education teachers and paraprofessionals. Full-time special education students can be either in self-contained classes with only other special education students or in an integrated class with general education students. The latter are called Collaborative Team Teaching classes because they are staffed with both a general education and special education teacher. In other words, IBO did not include the costs of special education services in self-contained special education classes or the portion of integrated class expenses attributable to special education students. Expenses for students who receive special education services on a part-time basis, such as speech therapy are included.
- Funds spent for services and functions other than classroom instruction, such as school leadership or support services.

Total DOE spending in 2005 was $15.8 billion. Total spending on classroom instruction was $7.5 billion, of which $5.7 billion (76 percent) was city tax levy and unrestricted state aid. In our study, which was limited to spending for general education students in schools in the sample, total classroom instruction spending was $4.0 billion. Of that, 65 percent represented teacher salaries and 26 percent fringe costs for teachers. The remaining 9 percent consisted of salaries and fringe benefits for other instructional personnel, such as librarians, and nonpersonnel costs such as text books or professional development.

Measures of School Characteristics. The school characteristic variables used by IBO were based largely on those that DOE is targeting for need-based weights under Fair Student Funding. We also included other characteristics such as size and staffing that have been suggested to increase or decrease per student costs. Brief definitions and descriptive statistics for the various measures are shown in tables on pages 4 and 5.

The average teacher salary measure calculated by IBO is slightly different from the average teacher salary figure used by DOE in the allocation memos. Our measure is the total dollars spent on salaries throughout the year per teacher. In contrast, the DOE measure is an average of the annual salaries in a given week. For example, if a school had a vacancy for half the year, our measure would have included 50 percent of the total annual salary while the DOE measure would have either included or excluded the full amount, depending on whether the position was vacant or filled in the given week.

The pupil to teacher ratio used in this study was calculated by IBO based on general education K-12 enrollment and the number of teachers funded with tax-levy dollars for general education students. IBO subtracted the number of prekindergarten students at each school from the enrollment figures in *School Based Expenditure Report* using the audited register file. Since the teacher count in the expenditure report did not distinguish between special education teachers and general education teachers, IBO estimated the number of general education teachers based on their share of total tax levy teacher salaries.[8]

The analysis also used the average class size calculated for three groups of grades: kindergarten to third grade, kindergarten to fifth grade, and sixth to eighth grades. Average class size and students per teacher measure different things. The average class size is based on the number of students in a given classroom and only includes teachers with classes. Where

Names, Definitions, and Descriptive Statistics for School Indicators

Variable	Description	Number of Schools	Percent
Elementary Grades Present	From register. Coded 1 if grades kindergarten to fifth are present, 0 otherwise.	754	59%
Middle School Grades Present	From register. Coded 1 if grades sixth to eighth are present, 0 otherwise.	497	39%
Elementary or Middle Grades Present	From register. Coded 1 if grades kindergarten to eighth are present, 0 otherwise.	997	78%
High School Grades Present	From School Report Card. Coded 1 if grade range includes ninth to twelfth grade, 0 otherwise.	333	26%
Small School	From SBER. Coded 1 if school has 250 students or fewer, 0 otherwise.	174	14%

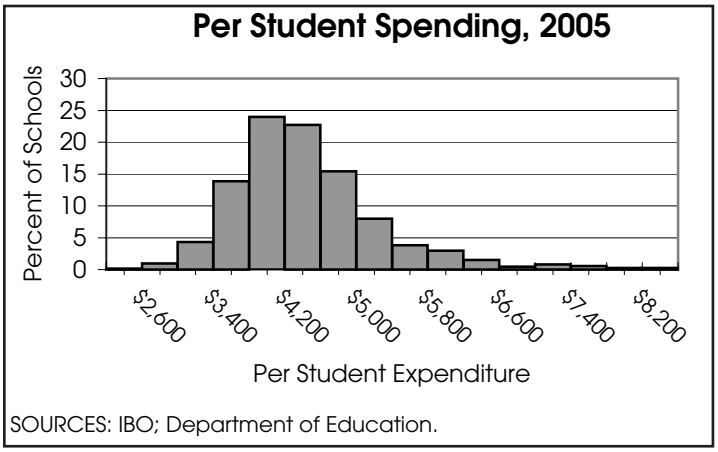
SOURCE: IBO.

Names, Definitions, and Descriptive Statistics for School Characteristics

Variable	Description	Mean	Standard Deviation	Median
Average Teacher Salary	Calculated from SBER. Sum of all expenditures on teachers classified as Personal Service (excluding fringe) divided by the total teachers at the school.	$56,317	$5,713	$56,197
Pupils Per Teacher	Calculated from SBER. General Education K-12 students divided by teachers paid through general education student tax levy funds.	19.4	3.3	19.5
Enrollment	From SBER and Register. Number of students minus pre-kindergarten students.	725	629	559
Percent Utilization	From School Report Card. Percent of building capacity utilized.	86.8	24.9	86.4
Percent Special Education	Calculated from SBER. Percent of students who are full-time special education students. Full-time includes self-contained and integrated special education students.	6.0	4.8	5.6
Poverty Rate	From School Allocation Memorandum, Part R, for Title 1. Percent of students in poverty. For new schools in 2004-2005 where the exact make-up of the student body was not available when the allocation memo was released, the poverty rate is updated with the memorandum from 2005-2006 school year.	69.2	23.9	76.3
Limited English Proficiency Rate	From School Report Card. Percent of students who are limited English proficient.	11.9	12.3	8.3
Percent Low Academic Achievement	From School Allocation Memorandum 1, Part U. Percent of students who are low academic achievers by DOE definition.	27.5	15.5	28.5
Class Size, K-3	Calculated from register. Average class size in kindergarten to third grade.	21.1	2.5	20.9
Class Size, K-5	Calculated from register. Average class size in kindergarten to fifth grade.	22.3	2.7	22.3
Class Size, 6-8	Calculated from Register. Average class size in sixth to eighth grade.	26.4	4.2	26.9
Percent White	From School Report Card. Percent of students who are white, non-Hispanic.	13.0	20.1	2.4
Percent Black	From School Report Card. Percent of students who are black.	35.8	29.0	28.1
Percent Hispanic	From School Report Card. Percent of students who are Hispanic.	40.1	25.7	37.2
Percent Asian	From School Report Card. Percent of students who are Asian or other.	11.1	15.6	3.8

SOURCE: IBO.

classroom space is limited, schools use "push-in" teachers to provide additional contact with students, increasing the number of teachers and reducing the pupil-teacher ratio *without affecting average class size*. Similarly, teachers in specialized subjects or lead teachers not assigned to a single class reduce a school's student-teacher ratio without changing average class size.



SOURCES: IBO; Department of Education.

Beginning with this school year, the Fair Student Funding formula will include four categories of need to drive funding allocations. IBO used the same four categories— the percent of students with limited English proficiency, living in poverty, having low academic achievement or in full-time special education—to assess if they had an effect on basic allocations in 2005. While the share of students in full-time special education should have little relationship to spending on general education students (beyond the higher per student cost for general education students in a Collaborative Team Teaching classes because of the lower number of students), IBO used the measure because of its inclusion in the new funding formula.

DISTRIBUTION OF PER STUDENT EXPENDITURES

Variability of Per Student Spending. Per student classroom instruction expenditures in New York City varied greatly across schools. The range between the highest and lowest per student expenditure for the schools in our study was over $6,000, from a low of $2,511 to a high of $8,569. The average per student classroom instruction expenditure was $4,642, while the median was $4,529.

A school at the 20th percentile spent $4,014 or 86 percent of the citywide average, with 80 percent of schools spending more. At the 80th percentile, where one-fifth of schools spent more, the per student classroom instruction expenditure was $5,434, or 117 percent of the citywide average. The difference between a school at the 20th percentile and one at the 80th percentile was $1,420 per student (about 31 percent of the average per student tax levy classroom instruction expenditure). In other words, the 60 percent of the schools in the middle of the distribution were within $1,420 of each other in per student classroom instruction expenditures.

ANALYSIS OF PER STUDENT SPENDING IN ELEMENTARY AND MIDDLE SCHOOLS

Given that elementary and middle schools differed from high schools on factors that were expected to alter per student spending patterns, such as teacher staffing patterns, we separated the schools into two groups for the balance of the report. This section presents the results of our analysis of primary schools.[9] Results for the high schools are presented in the following section.

For primary schools, our main findings were that schools in the top 20 percent of per student spending had higher average teacher salary, fewer students per teacher, lower average class size, and smaller enrollment than schools in the bottom 20 percent. IBO found that the pupil-teacher ratio was more closely related to per student spending than average teacher salary. Measures of student need, such as the percent of students with limited English proficiency, were not related to per student expenditures once we controlled for teacher staffing and school characteristics.

Per Student Expenditure Quintiles. To examine how schools differed based on their spending, we divided primary schools into quintiles based on per student expenditures. The average

School Characteristics by Quintiles of Per Student Spending Elementary and Middle Schools, 2005

School Measure	Average Bottom Quintile	Average Top Quintile
Per Student Spending	$3,742	$5,614
Teacher Salary	$53,914	$58,777
Pupils per Teacher	22.2	16.6
Enrollment	963	531
Percent Special Education	6.2%	6.8%
Percent Poverty	80.4%	65.7%
Percent Limited English Proficient	16.1%	10.3%
Percent Low Academic Achievement	28.4%	27.7%
Percent Building Capacity Utilization	93.4%	74.7%
Class Size, K-3	22.2	20.1
Class Size, K-5	23.8	21.0
Class Size, 6-8	27.6	24.5
Percent White	6.0%	18.6%
Percent Black	31.3%	34.9%
Percent Hispanic	52.3%	34.8%
Percent Asian	10.4%	11.8%

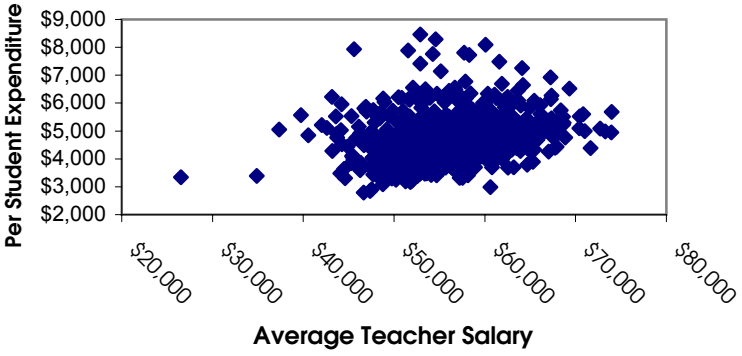
SOURCES: IBO; Department of Education.
NOTES: Averages weighted by school enrollment. Pupils per teacher is defined as the number of general education students in kindergarten to twelfth grade per general education teacher funded with tax-levy dollars.

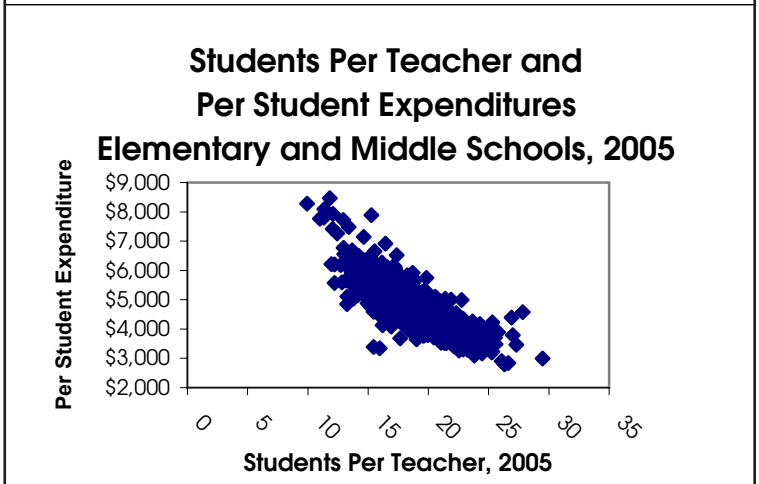
per student expenditure in the bottom quintile (the lowest 20 percent of schools ranked by spending) was $3,742 compared to $5,614 in the top quintile.

IBO found significant differences in teacher staffing between elementary and middle schools in the top and bottom quintiles. As could be expected, the average teacher salary was higher in the top quintile than the bottom, by about $4,900. Similarly, schools with higher per student expenditures averaged far fewer general education students per teacher. The difference between the top and bottom quintiles was 5.6 students per teacher. The average class sizes for kindergarten to third, kindergarten to fifth, and sixth to eighth grades were smaller in the top quintile. Furthermore, the average utilization of school building capacity in the top quintile was 19 percentage points lower.

Schools in the top and bottom quintiles also differed on characteristics of their student bodies, with some evidence that schools in the bottom spending quintile had larger shares of students with higher needs. Schools in the bottom quintile were larger and had higher average rates of poverty and of limited English proficiency. The difference between the top and bottom quintile on the average share of students in special education or low academic achievement was small.

The average school in the bottom quintile was 6 percent white, 31 percent black, 52 percent Hispanic, and 10 percent Asian. In the top quintile, the average school had a considerably larger share of white students and a considerably smaller share of Hispanic students.





SOURCES: IBO; Department of Education.
NOTES: Students per teacher is defined as the number of general education students in kindergarten to twelfth grade per general education teacher funded with tax-levy dollars.

Are Teacher Salaries Driving Spending Differences? Many observers have long assumed that differences in per pupil spending are primarily a function of differences in average teacher salaries rather than the ratio of students to teachers. Our findings suggest, however, that the pupil-teacher ratio was far more important than average teacher salary in explaining the gap between schools in the top and bottom quintiles—3.5 times more important among elementary schools and six times more important among middle schools. In theory, the number of tax-levy funded teachers allocated to a school for general education classroom instruction should follow directly from the number of students in each grade, and therefore one would expect to see little variation in the pupil per teacher ratio among schools with the same mix of grades.[10] The fact that we found such big differences suggests that factors other than application of the allocation formulas have played a role in determining the size of individual schools' authorized teaching force and their per pupil spending.

Plots of per student spending with average teacher salary and pupils per teacher showed that in primary schools, the relationship between per student expenditure and average teacher salary was positive, but weaker than the very strong, negative relationship between per student expenditures and pupils per teacher.[11] This suggests that per student expenditures at a primary school were more strongly associated with the number of teachers than with average teacher salary.

As with disparities in funding, there may be some historical disparities in the allocation of teachers to schools that persisted over the years. Some of these differences in students per teacher may stem from how community school districts and superintendents assigned teachers to schools prior to mayoral control in 2002. If the allocation of teachers to school districts was based entirely on enrollment, while allocation to schools within districts was not, we would expect to see greater variation in the pupil-teacher ratio across schools within a district than

across districts. Our finding, in fact, shows just that—pupil-teacher ratios vary more across schools within a district than across districts. Within the 32 community schools districts, the average number of students per teacher ranged from 17.2 to 20.8 and the standard deviations (measures of the dispersion around the mean) ranged from 1.4 to 4.0. Across the districts, there was less variation in the districts' average pupils per tax-levy teacher. The average across the districts was 20.0 with a standard deviation of 1.1.

Fully understanding the distribution of teachers across schools and the processes that have led to the disparities we saw for 2005 is beyond the scope of this study. Our very preliminary analysis showed that there was a great deal of variation in the pupil-teacher ratio among schools in the same community school district, while there was less variation across the districts.

Poverty Rate Quintiles. IBO also separated primary schools into quintiles based on the percent of students in poverty, with the top quintile representing the 20 percent of primary schools with the highest poverty rates in the city. We found that the difference in average per student expenditure between the top and bottom quintiles was about $300 per student. The average pupil teacher-ratio is similar in the top and bottom quintiles, but average teacher salary is much higher in the lowest poverty quintile. Average class size is, in fact, lower, at the schools with the highest poverty rates than those with the lowest, probably a function of additional categorical funding for high-poverty schools, namely Title I. These findings suggest that the uneven distribution in the number of teachers across schools is not systematically linked to the prevalence of poverty, though high-poverty schools have, on average, less experienced teachers (as measured by average teacher salary).

Further, our results show that high-poverty schools averaged higher shares of special education students and far higher shares of students with limited English proficiency and low academic achievement than schools with the lowest poverty rates.

Modeling Per Student Expenditures among Primary Schools. IBO used regression analysis to examine more closely the finding that pupil-teacher ratio was more strongly related to per student expenditures than average teacher salary. We separately modeled per student expenditures as a function of average teacher salary and pupils per teacher. These regressions showed that the number of general education pupils per tax-levy teacher explained over three-fifths of the variation in per student expenditures among primary schools, while average teacher salary explained only about 6 percent.[12]

Despite the smaller effect from average teacher salary, it was an important explanatory factor. More highly paid teachers were associated with high per student expenditures, as were fewer students per teacher. The effect of these two teacher staffing variables was much stronger together than individually, though our results show that the pupils per teacher variable again contributed more to explaining the variation in spending.

In order to determine whether teacher salary and pupils per teacher were proxies for other variable, we expanded the regression model to include and control for other variables that could affect student spending. (The results are shown separately for elementary and middle schools in a supplemental table available online.) With these additional school measures included, the regression analysis explained about 85 percent of the variation in per student expenditures at the primary school level.

As before, average teacher salary was positively correlated with per student expenditures, while pupil to teacher ratio was negatively correlated, controlling for school and student characteristics. The estimates for average teacher salary and the students per teacher did not change much with the introduction of the additional

School Characteristics by Quintiles of Poverty, Elementary and Middle Schools, 2005

School Measure	Average Bottom Quintile (Lowest Poverty)	Average Top Quintile (Highest Poverty)
Per Student Spending	$4,674	$4,385
Teacher Salary	$59,699	$54,607
Pupils per Teacher	19.5	19.8
Enrollment	851	726
Percent Special Education	5.0%	7.1%
Percent Poverty	32.0%	94.7%
Percent Limited English Proficient	5.9%	20.4%
Percent Low Academic Achievement	13.7%	34.2%
Percent Building Capacity Utilization	90.9%	83.6%
Class Size, K-3	22.1	20.8
Class Size, K-5	23.7	21.9
Class Size, 6-8	29.2	25.4
Percent White	42.2%	1.5%
Percent Black	20.1%	34.6%
Percent Hispanic	19.2%	60.7%
Percent Asian	18.6%	3.2%

SOURCES: IBO; Department of Education.
NOTE: Averages weighted by school enrollment.

Coefficients for Regression Models, Primary Schools, 2005

Dependent Variable: Per Student Expenditure

School Measure	Average Teacher Salary	Pupils Per Teacher	Teacher Staffing
Average Teacher Salary	0.033***		0.059***
	(0.004)		(0.002)
Pupils per Teacher		-225.234***	-250.720***
		(5.435)	(4.058)
Intercept	2766	8952	6123
	(242)	(106)	(123)
N	997	997	997
Predictors	1	1	2
R^2	0.0557	0.6331	0.8049

Standard errors given in parentheses.
*, **, *** statistically significant at the .05, .01, and .001 levels, respectively.
SOURCES: IBO; Department of Education.

measures of school and student characteristics. This finding suggests that average teacher salary and students per teacher were not proxies for student need or school characteristics.

To sum up, the regression results confirm the findings from the descriptive statistics: the number of students per teachers was a more important driver of per student expenditures for primary schools than average teacher salary. Using the average school in the bottom and top quintile, we can estimate the share of the difference in per student expenditures that can be attributed to each of the different variables. We find that for elementary school, 21 percent of the difference is attributable to average teacher salary and 72 percent to pupil teacher ratio, suggesting that pupil teacher ratio is 3.5 times more important. For middle schools, pupil-teacher ratio is six times more important, with 13 percent of the difference attributable to average teacher salary and 78 percent attributable to pupils per teacher.

Other Regression Results. There is little evidence that per student spending was related to need. The percent of students in poverty was not statistically significant at either the elementary or middle school level.[13] While the percent of students in special education was negatively associated with expenditures among middle schools, it was not significant at the elementary school level. This finding is not surprising as we were studying expenditures for general education students and would not expect an effect for the relative size of the special education student body (but have retained the measure because under Fair Student Funding, some base special education funds will be allocated through the weighted formula).

In elementary schools, we found evidence of a significant positive relationship between the percent of students who are low academic achievers and per student expenditures, all else equal, but not in middle schools. The share of students who were English Language Learners was negatively associated with per student expenditures—controlling for other factors—in middle schools, but the relationship was not statistically significant in elementary schools.

These findings suggest that the distribution of tax levy classroom instruction dollars in primary schools was generally unrelated to student need once we controlled for staffing and school characteristics. There was evidence, however, that elementary schools with larger shares of students with low academic achievement were spending more per student while middle schools with more English Language Learners were spending less.

IBO found that as enrollment increased, per student expenditure decreased, also controlling for teacher staffing and student characteristics. Similarly, higher average class size was significantly correlated with lower per student expenditures; the impact of class size on per student spending was greater in elementary than in middle schools. The relationships between per student spending and both average class size and the pupil to teacher ratio are significant, but the larger coefficient for the pupil to teacher ratio suggests a stronger relationship. The school building utilization rate was only significant in the middle school model, suggesting that overcrowding may be associated with lower spending, possibly due to space limitations.

Finally, we found persuasive evidence that the racial profile of the school was not a factor when we controlled for staffing, school characteristics, and student need. Because our model controlled for school characteristics including staffing when considering both student need and race, it did not examine the relationships between student characteristics, such as need, and the type of school they attend, which in turn could be related to the per student expenditure.

ANALYSIS OF PER STUDENT SPENDING IN HIGH SCHOOLS

Per Student Expenditure Quintiles. As with our analysis of the primary schools, we began by dividing the high schools into quintiles based on per student expenditure and then considered the average of our independent variables for each quintile. Unlike in the primary schools, we found that the average teacher salary was lower in the top quintile of spending. The average teacher salary in the top quintile was $4,147 less than the average in the bottom quintile.

School Characteristics By Quintiles of Per Student Spending, High Schools, 2005

School Measure	Average Bottom Quintile	Average Top Quintile
Per Student Expenditure	$3,599	$6,339
Teacher Salary	$59,977	$55,830
Pupils per Teacher	25.6	14.6
Enrollment	2,647	394
Percent Special Education	7.6%	3.5%
Percent Poverty	53.1%	63.8%
Percent Limited English Proficient	14.1%	8.5%
Percent Low Academic Achievement	35.9%	32.1%
Percent Capacity Utilization	124.8%	79.4%
Percent White	12.7%	10.9%
Percent Black	38.3%	40.2%
Percent Hispanic	38.0%	41.5%
Percent Asian	10.9%	7.5%

SOURCES: IBO; Department of Education.
NOTE: Averages weighted by school enrollment.

The quintile analysis shows that high schools in the top spending quintile averaged far fewer students, and much lower pupil to teacher ratios (an average of almost 11 students more per teacher at the schools with the lowest spending). Looking at indicators of student need, we found that high schools with the highest spending on average had more students in poverty, while schools with lower spending had larger percentages of English Language Learners, low academic achievers, and special education students. The racial profile of the average high school in the top and bottom quintiles was similar, though the average school in the top quintile had slightly larger percentages of Hispanic and black students and smaller percentages of white, Asian, or other students.

School Characteristics by High School Size. The average per student expenditure among high schools was $4,744, although it varied with high school size. Among the small high schools—those with 250 or fewer students—the average per student was $5,528. Among the medium size high schools the average per student expenditure was $4,596; for large high schools with more than 1,250 students, the average was $3,963. There was a very strong, negative relationship between per student expenditures and school size at the high school level.

Average teacher salary also varied by school size, but the pattern was the inverse of that found for per student spending. As the charts showing distribution of average teacher salary among the small, medium, and large high schools indicate, we saw strong evidence that the small schools, which had higher per student expenditures, had lower average teacher salaries. Meanwhile, the largest schools, with smaller per student expenditures, had the higher average salaries.

As many of the small high schools are also new schools, this finding could be a function of the staffing of new schools with less experienced, hence lower salaried, teachers. Conversely, prior to the establishment of new schools in recent years, the majority of high schools were large and so more experienced teachers are probably clustered in those schools, leading to higher average teacher salaries at large high schools with lower per student expenditures. It appears that average teacher salary increases with school size, while expenditures decrease with school size.

We found that small high schools, many of which are new schools, also differed significantly from larger schools based on the school characteristics used in this study. In addition to having lower average teacher salary, we found that small high schools had, on average, more students in poverty, but fewer students who needed special education or services for English Language Learners. The average percent of students who were low academic achievers was similar in small and medium schools and slightly lower in the largest schools.

Poverty Rate Quintiles. As with the primary schools, we also divided high schools into quintiles based on the share of students in poverty, with the top quintile representing high schools with the highest poverty rates. Unlike the primary schools, among high schools, we find the average per student

School Characteristics by School Size, High Schools, 2005

School Measure	Average Small HS (≤250)	Average Medium HS (251-1,250)	Average Large HS (>1,250)
Per Student Expenditure	$5,528	$4,596	$3,963
Teacher Salary	$52,402	$56,704	$62,510
Pupils per Teacher	15.8	20	23.9
Enrollment	174	698	2967
Percent Capacity Utilization	79.1%	86.8%	126.3%
Percent Special Education	2.0%	5.6%	6.6%
Percent Poverty	70.4%	60.4%	45.9%
Percent Limited English Proficient	2.7%	11.4%	12.5%
Percent Low Academic Achievement	33.8%	32.8%	30.3%
Percent White	3.6%	12.3%	16.7%
Percent Black	46.7%	38.1%	31.7%
Percent Hispanic	45.6%	39.0%	34.3%
Percent Asian	4.1%	10.6%	17.4%

SOURCES: IBO; Department of Education.
NOTE: Averages weighted by school enrollment.

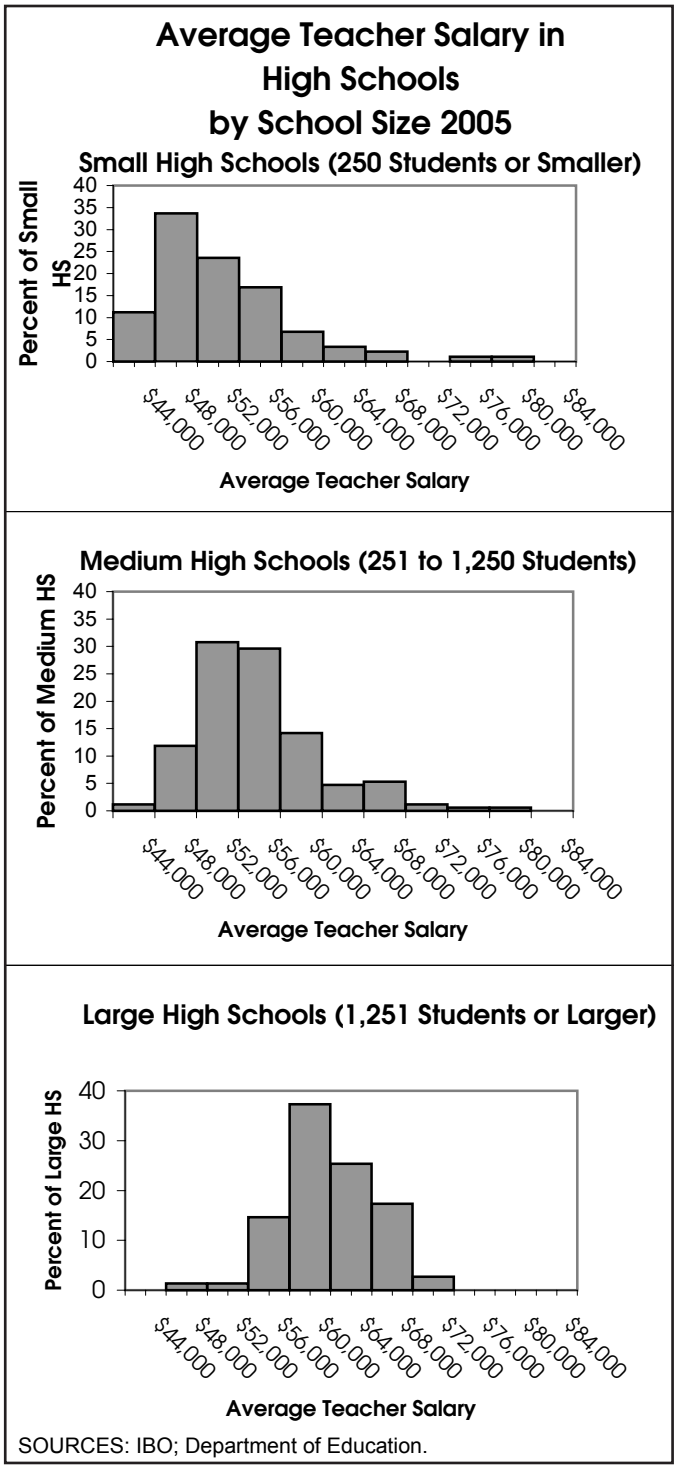
expenditure is higher among the top quintile in poverty, though the difference is a somewhat smaller $238 per student.

For teacher staffing, our results for high schools are similar to those for primary schools. High schools with high poverty rates have lower average teacher salary but slightly fewer students per teacher. It appears that high-poverty schools are not systematically allocated fewer teachers though the lower average teacher salary suggests a less experienced teaching staff.

High schools with large numbers of students from low-income families also have larger shares of students in special education, limited English proficiency, and low academic achievement than the 20 percent of high schools with the lowest poverty rates.

Regression Analysis of Per Student Expenditures among High Schools. As with the primary schools, we began with simple models using just the two teacher staffing variables: average teacher salary and pupils per teacher, first separately and then together. We found that average teacher salary was a poor predictor of per student expenditures among high schools. On the other hand, the number of pupils per teacher was an extremely strong predictor, explaining just over half of the variation in per student expenditures by itself. Using both variables together was superior to using them separately—combined, the number of students per teacher and average teacher salary explained about 65 percent of the variation in per student expenditures.

When we included all of our school and student characteristic variables, we improved our high school model's fit somewhat



SOURCES: IBO; Department of Education.

(see supplemental table online). The results for average teacher salary and pupils per teacher were consistent with the results from the regressions with only those variables. This finding suggests that, as with the primary school results, average teacher salary and pupil-teacher ratio were not proxies for other school characteristics.

Our analysis of the average bottom and top quintile high schools shows that average teacher salary does not contribute to the gap in per student expenditures between the top and bottom, but in fact, actually reverses the gap. In other words, if the average high school in the bottom quintile had the same average teacher salary as the average school in the top quintile (about $4,000 lower), the difference between the average per student expenditure would decrease by 13 percent.

We found that high school enrollment was negatively associated with per student expenditures, though our results show the relationship is not linear. The decline in per student expenditures associated with more students was larger at smaller enrollments and flattened out with higher enrollments.

Finally, after controlling for teacher staffing, school size, and the presence of middle school grades, we found that student need measures and the racial profile of the school were not significantly associated with the per student expenditure.

CONCLUSION

Our analysis of school expenditure data from 2005 supports the assertions by DOE that there are significant disparities in

School Characteristics By Quintiles of Poverty, High Schools, 2005

School Measure	Average Bottom Quintile (Lowest Poverty)	Average Top Quintile (Highest Poverty)
Per Student Expenditure	$4,222	$4,460
Teacher Salary	$63,082	$58,722
Pupils per Teacher	22.6	21.9
Enrollment	2,734	1,489
Percent Special Education	4.7%	7.8%
Percent Poverty	23.3%	88.5%
Percent Limited English Proficient	8.3%	18.8%
Percent Low Academic Achievement	22.7%	38.0%
Percent Capacity Utilization	116.0%	108.9%
Percent White	27.6%	2.3%
Percent Black	29.0%	31.1%
Percent Hispanic	20.7%	61.9%
Percent Asian	22.6%	4.7%

SOURCES: IBO; Department of Education.
NOTE: Averages weighted by school enrollment.

per student general education tax-levy spending across schools. We found that in 2005, the distribution of teachers to schools, measured by the ratio of general education students to tax-levy teachers, was one of the most important factors in explaining per student classroom instruction expenditures. The average teacher salary also contributed, with primary schools with higher average teacher salaries spending more, all else equal. Among primary schools, we saw a far stronger relationship between the pupil-teacher ratio and the per student expenditure than between average teacher salary and the per student expenditure. In our analysis, the number of students per teacher was 3.5 times more important than average teacher salary in explaining differences in per student spending between the top and bottom quintiles of elementary schools and six times more important among middle schools.

This is somewhat surprising given that the allocation process used by the Department of Education should result in schools with similar sizes and similar mixes of grades being allocated a similar number of teachers. That there were significant differences implies that factors other than the basic allocation process came into play in determining the size of a school's teaching roster. We also found evidence that disparities exist within school districts, suggesting that the historical patterns date from when community school district superintendents played a large role in allocating resources within districts.

We found evidence that school size was a factor, with larger schools spending less per student. Using the 2005 data, there was little evidence that student needs, such as the share of students who are English Language Learners, were major factors in predicting per student tax-levy expenditures for general education students once we controlled for teacher staff and school size and grade composition.

This report prepared by Ana Champeny

END NOTES

[1]While Special Needs/Academic Intervention Services are allocated under a weighted formula, their effect on the overall budget was limited. The DOE estimates that the implied poverty weight was 0.07 and the implied limited English proficiency weight was 0.04. Of the corridor allocations in 2005, SN/AIS represented 17 percent.
[2]School Allocation Memorandums replaced Numbered Memorandums, last used in 2002-2003.
[3]For more information on the corridor allocations, please see School Allocation Memorandum No.1, FY 2004, Section E.
[4] Herszenhorn, David, "Equalization of City Schools is Abandoned," *The New York Times,* May 12, 2005, B1.
[5]We did find one school that was reported as two schools in some data sets, but was really a school and a program. IBO combined the program, M287 Hudson Cliffs, with PS 187 Hudson Cliffs (M187).
[6]Closer inspection revealed that two of the five had sharp declines in enrollment because they were being phased out—IS 391 Mahalia Jackson (K391) and JHS 99 (M099). Two were small schools with high spending: Urban Academy (M565) and High School for Dual Language and Asian Studies (M545). The last was also a small school in its second year that had extended day programming—High School for Math Science and Engineering at City College (M692).
[7]Mid-year register adjustments and labor contract agreements are the most likely sources of differences. Allocations are determined using register projections (estimated student counts) for the upcoming school year. Mid-year, the DOE compares the actual register at the school with the projection and adjusts the schools budget, with additional allocations for schools with more students than projected and cuts for schools with fewer students than expected.

Coefficients for Regression Models, High Schools, 2005

Dependent Variable: Per Student Expenditure

School Measure	Average Teacher Salary	Pupils Per Teacher	Teacher Staffing
Average Teacher Salary	-0.018*		0.055***
	(0.008)		(0.006)
Pupils per Teacher		-155.862***	-195.708***
		(7.648)	(7.917)
Intercept	5766	7774	5453
	(464)	(153)	(276)
N	333	333	333
Predictors	1	1	2
R^2	0.0146	0.5565	0.6545

Standard errors given in parentheses.
*, **, *** statistically significant at the .05, .01, and .001 levels, respectively.
SOURCES: IBO; Department of Education.

[8]Our estimate of the number of general education tax-levy teachers has a correlation of 0.982 with the K-12 general education teacher count from the 2005 School Allocation Memo 1.

[9]Among the primary schools, we report by elementary and middle schools separately only when the findings warrant that distinction. With over 250 schools having both elementary and middle grades, the statistics for the two levels are often very similar. Separate tables for elementary and middle schools are available on request.

[10]Differences can result from so-called "breakage" when the number of students is not evenly divided by the base allocation factor for teachers. For example, if a school has 105 students in grades where the allocation factor is 20 students per teacher, the school might be allocated funding for five classes, therefore raising the pupil-teacher ratio above the target. If the school had 115 students, the school might be allocated funding for six classes, producing a ratio below the target.

[11]We find a correlation between per student expenditures and average teacher salary to be 0.208, compared to a correlation of -0.623 for pupils per teacher and per student expenditure, both significant at the .001 level.

[12]In models of elementary and middle schools alone, we saw similar results, though the explanatory power of average teacher salary was greater in elementary schools (R^2 of 0.11).

[13]When a coefficient is statistically significant, the estimated positive or negative relationship between variables is strong and certain enough not to be merely a random occurrence.