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ABSTRACT

This paper presents findings of a study that developed a classification system for 687 New York State public school districts. The system grouped similar districts and illustrated the relationship among student demographics, resources, and performance. The classification scheme was developed in three stages: (1) an examination of four unidimensional systems; (2) the derivation of a multidimensional system using cluster analysis; and (3) the development of a criterion-based multidimensional system that mimicked the system found in stage 2. The resulting school-district summary groups clearly differentiated districts on the basis of a variety of demographic, resource, and performance measures. The classification system identifies high performing schools in economically disadvantaged groupings. Students in rural schools achieve at higher levels than do students in urban and suburban environments. Data tabulated according to the scheme support numerous Board of Regents proposals, including those to distribute state aid to schools to achieve greater equity of fiscal resources; improve teacher recruitment for inner city schools; and provide staff development to allow teachers to better meet the diverse needs of students, particularly those from low income and minority families. Five tables are included. (Contains 14 references.) (Author/LMI)

Development of a Policy-Relevant Classification System for School Districts

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The objective of this research was to find a policy-relevant classification system for 687 New York State public school districts that would group similar districts and illustrate the relationship among student demographics, resources, and performance. This research consisted of three stages: (1) the examination of four unidimensional systems; (2) the derivation of a multidimensional system using cluster analysis; and (3) the development of a criterion-based multidimensional system that mimicked the system found in stage 2. The resulting school district summary groups clearly differentiate districts on the basis of a variety of demographic, resource, and performance measures. Data tabulated according to this scheme supports numerous Board of Regents proposals, including those to a) distribute state aid to schools to achieve greater equity of fiscal resources; b) improve teacher recruitment for inner city schools; and c) provide staff development to allow teachers to better meet the diverse needs of students, particularly those from low income and minority families.

DEVELOPMENT OF A POLICY-RELEVANT CLASSIFICATION SYSTEM FOR SCHOOL DISTRICTS

The objective of this research was to find a policy-relevant classification system for public school districts for use in the New York State Education Department's mandated annual report to the Governor and the Legislature on the educational status of the state's schools. While the law requires that the Department report data on both a statewide and district-by-district basis, the diversity of New York in terms of the demographic characteristics of students, the fiscal and human resources available to districts, and the performance of students is such that State averages frequently do not represent any large segment of State districts. Further, the wide variations in student achievement found among districts are associated with differences in the social and economic context within which districts operate.

The report presents three dimensions of elementary, middle, and secondary education in New York State: student demographics; resources; and student performance. Rather than showing causal relationships among these factors, the report demonstrates a pattern by which districts with the largest percentages of at-risk students tend to have the fewest resources and the poorest outcomes. Those districts with the fewest resources spend less money per pupil; pay teachers lower salaries; and employ teachers who are less experienced, less likely to be certified in the area of their teaching assignment, and less likely to return to teaching in that school in the subsequent year.

The report was mandated by the Legislature to inform their decisions about education law, many of which relate to the distribution of resources. To forcefully illustrate the relationship of resources with student demographics and performance, it is desirable to report summary data for groups of similarly situated districts.

Theoretical Framework

Results of the New York State assessment program indicate wide variations in student achievement among districts. School performance is demonstrably related to the percentage of students in the school who come from families in poverty or from a minority racial/ethnic background. These are two of the five indicators, each associated with poor performance that Pallas, Natriello, and McDill (1989) found useful for identifying students at risk of educational disadvantage. The remaining three were living in a single-parent family, having a poorly educated mother, and having a non-English language background.

The premise underlying school reform in New York State is that all children can learn if they are given appropriate programs and services and that the educational system should provide the means for all students to succeed. This premise assumes that schools make a real difference in the educational achievement of students and that the effect of schools is moderated by the material and human resources available to the school. The latter assertion has been the subject of much controversy among educational researchers and policy makers. The issue is whether schools can overcome the educational disadvantage of students placed at risk by family social, educational, and economic characteristics.

Coleman et al. (1966) asserted that socioeconomic factors are the most important determinants of student achievement and that the effect of variations in school quality on student achievement is negligible. Other researchers, having examined the effects of differential school inputs on student achievement, concluded that greater financial input would not improve school achievement (Jencks, 1972; Hanuschek, 1994).

These conclusions have not gone unchallenged. Rutter (1983) argued that while more variability among students in achievement may be attributable to socioeconomic status than to school effects, schools have an effect on the level of student achievement. An effective instructional technique may raise the overall level of reading achievement, for example, without eliminating variations among students related to socioeconomic status and individual differences. So the appropriate question is whether, holding socioeconomic status constant, variations in resources among schools can have an effect on the absolute level of student achievement in the curriculum taught by the school.

Numerous factors mitigate against finding a direct relationship between expenditures per pupil and student performance (Hedges, Laine, and Greenwald, 1994a; Hanushek, 1994; Hedges, Laine, and Greenwald, 1994b): regional cost differences that require some schools to pay more money for the same resources; teacher salaries that are determined by experience and education rather than performance; and outcomes measures that are not specific to the school curriculum. Further, variations in the quality and quantity of instruction among classrooms are obscured when the school is the unit of analysis.

Hanushek (1994) argued that there is no systematic, strong relationship between school resources and student performance. While he conceded that effective use of resources may lead to improved results, he maintained that simply providing additional resources will not ensure improvements in student achievement. In contrast, Hedges et al. (1994a, 1994b) argued from their meta-analysis that there is strong evidence of positive effects of school resources and little evidence of negative effects. Hedges et al. did not argue that increasing revenues invariably leads to improved student achievement; they contended that there is enough evidence that this is so that the emphasis of further research should be on identifying the circumstances under which increased revenues lead to improved achievement. Ultimately, greater expenditures can only produce better results if the expenditures buy more effective instructional programs.

A study by Wang, Haertel, and Walberg (1990) relates directly to the issue of the relative contribution of student socioeconomic status versus school resources. While reaffirming the effect of student background on learning, their research synthesis also documented effects of alterable student characteristics such as metacognition, program design variables such as the intensity of education services provided to the learner, and classroom variables affecting the quantity and quality of instruction.

A number of research studies suggest ways that schools can improve the educational achievement of students. Ronald Edmonds's Search for Effective Schools Project identified schools that effectively educate poor students and published the distinguishing characteristics of those schools (Edmonds, 1979). Finn and Achilles (1990) reported that kindergarten and first-

grade students, particularly minority students, benefit academically from small classes (about 15 students) and a follow-up study of these students indicated that benefits persist to fourth grade (Nye et al., 1991). Educational researchers such as Comer (1988), Slavin (1990), and Levin (1991) have documented improvements in achievement associated with schoolwide reform models.

Purpose

The objective of this research was to develop a classification system for New York State public school districts that would aggregate districts that were similar in terms of demographics, resources, and student performance.

An ideal classification system needed to meet the following criteria:

1. have essential characteristics that are easily described;
2. be limited to a manageable number of groups to simplify both narrative and graphic presentation;
3. provide summary information that meets the identified needs of report users;
4. produce categories of districts that share common characteristics, problems, and concerns;
5. maximize between group differences in performance, demographics, and resources while minimizing within group variability; and
6. provide information that is relevant to policy concerns of the Board of Regents.

Four classification variables, presumed to have substantial influence on district policy, resources, and instructional program, were selected. These variables were enrollment, student poverty, district capacity to raise resources locally, and the number of students per square mile.

Method and Results

Data

The unit of analysis was the district; 687 districts were included. Data used in the this study were collected through the New York State Education Department's (NYSED) Basic Educational Data System and Testing Program, state income and property tax records, and the school district aggregation project of the United States Decennial Census. The five largest districts—New York City, Buffalo, Rochester, Syracuse, and Yonkers—were not included because data are reported separately for these districts, which educate over 40 percent of elementary and secondary students in New York State.

Stage 1

The initial effort, which sought to maximize the simplicity criterion, involved examining a series of unidimensional variables — enrollment in fall 1991, a measure of student poverty[1], an indicator of property and income wealth (Combined Wealth Ratio or CWR) in

1990-91, and the number of enrolled students per square mile (sparsity). Districts were divided into quartiles according to their scores on each of these criteria. *Eta* was then used to measure the relationship of the classification variable with a set of indicators: third-grade reading performance[2], achievement of a diploma indicating completion of a college-preparatory program (Regents diplomas)[3], attendance, percent white (non-Hispanic) enrollment, instructional expenditures per pupil, pupils per teacher, and the four classification variables (see Table 1).

Insert Table 1 about here.

Each unidimensional classification was rejected for failure to separate groups sufficiently on a wide range of indicators. For example, enrollment did not differentiate resource-rich from resource-poor (CWR) districts, high-spending from low-spending districts, nor low- and high-performing districts on third-grade reading. The sparsity criterion produced categories that were heterogeneous with respect to third-grade reading performance and attendance. CWR produced relatively homogeneous categories with respect to student poverty and instructional expenditures, but not enrollment, attendance, or third-grade reading. Poverty differentiated relatively well (compared with other indicators) on instructional expenditures, Regents diplomas, and third-grade reading, but did not differentiate on CWR, enrollment, attendance, or pupils per teacher.

Stage 2

A cluster analysis was undertaken to divide districts into the four groups with the greatest separation on the four classification variables analyzed in stage 1: enrollment, sparsity, CWR, and poverty. To place more weight on poverty in determining clusters, this variable was entered twice. The Quick Cluster procedure (SPSS/PC+) was used for this analysis.

The final cluster means are shown in Table 2, while the indicator means are shown in Table 3. The analysis of variance showed significant differences ($p < .001$) among clusters on each classification variable (Table 4). Inspection of the cluster means generated the following descriptions.

Insert Tables 2, 3, and 4 about here.

Cluster 1 The 284 districts assigned to this cluster could be characterized as above average in enrollment and below average in the percentage of students in poverty, but average in ability to raise resources locally (CWR) and in the number of students per square mile. Almost four in five of these districts could be characterized as suburban; that is, they were part of a Metropolitan Statistical Area (MSA) as defined by the 1980 Decennial Census but were not city

districts. The remainder were small city districts (21) or rural (not part of a MSA) districts (40).

Cluster 2 — These 96 districts could be described as having low levels of student poverty, high capacity to raise resources locally, and a higher than average number of students per square mile. Further examination revealed that 95 of these districts were suburban; the remaining district was a small city district.

Cluster 3 — These 272 districts could be characterized as small enrollment, high poverty, low resource capacity districts with few students per square mile. More than four in five of these districts were not part of a MSA.

Cluster 4 — The 35 districts in the smallest cluster could also be characterized as high poverty, low resource capacity districts, but differed from districts in cluster 3 in that they were larger urban and suburban districts. Twenty of these districts were small and medium city districts; the remaining were noncity districts that were part of a MSA.

Stage 3

Classifications based on cluster analysis were judged too difficult for the general public or the average educator or legislator to understand. Therefore, a multidimensional classification criterion was developed to mimic the clusters produced in Stage 2. An index was developed using the poverty and CWR variables[4]. The index assesses each public school district's student needs (estimated by poverty) and ability to provide resources (CWR) relative to the State average. The resulting measure, the need/resource capacity (N/RC) index, assigns a district with an average capacity to provide for the needs of its students an index of one. The larger the disparity between the needs of district students and district ability to provide for these needs, the higher the district's score on the index.

Districts were divided into three groups according to their scores on the need/resource capacity index: the 30 percent with the highest needs relative to resource capacity (High N/RC), the 50 percent with average needs relative to capacity (Average N/RC), and the 20 percent with less than average needs relative to resource capacity (Low N/RC). The High N/RC districts, those with the least local resource capacity relative to student needs, were divided into two groups according to whether or not they were rural in character. Districts were classified as rural if they had (a) fewer than 50 students per square mile or (b) enrollments of fewer than 2,500 and fewer than 100 students per square mile.

The resulting system includes six summary groups: four groups based on need relative to capacity—Low N/RC, Average N/RC, Rural High N/RC, and Urban-Suburban High N/RC—plus New York City and the Large Cities Districts. The districts in the High N/RC categories exhibit relatively high percentages of poverty and low local resource capacity along with lower achievement on State assessments. The category means for each of the indicator variables are presented in Table 5, while *etas* are shown in Table 1. This classification system provides greater separation among groups on average than any single-dimension classification

system; however, the percentages of variability on the classification and indicator variables that are explained by category membership are generally not large.

Insert Table 5 about here.

Discussion

The classification system resulting from this research is used in NYSED's annual report to the Governor and the Legislature on the educational status of the state's schools. The N/RC categories differentiate districts on a variety of measures beyond those explicitly examined in this study: expenditure per pupil, median teacher salary, teachers' educational credentials, and a range of performance measures from minimum competency in elementary schools to college-going rate.

The classification scheme documents that those students who are most at risk of educational disadvantage attend districts that have the fewest resources, that employ teachers with the least experience and the weakest credentials, and that demonstrate the lowest level of performance. Yet Edmonds (1979) concludes from his research on effective schools that schools can be "held responsible for effectively teaching basic school skills to all children." And indeed examination of school performance within the High N/RC categories documents strong performance in some schools. In 1995, in the rural High N/RC school at the 90th percentile, 97 percent of third-graders scored above the State minimum standard in reading; in urban-suburban High N/RC Districts, the comparable percentage was 96.

Comparing rural with urban-suburban districts within the High N/RC category reveals that on average students in these rural schools achieve at higher levels than their urban-suburban counterparts. This finding supports the contention that "inner city" environments are less supportive of academic achievement than other environments. While effective schools can raise the achievement levels of disadvantaged students, the wider community must share in the responsibility for meeting social, economic, and health needs of these students.

The documented relationships between student demographics, resources, and achievement are useful to policy-makers in a number of areas. They support the Board of Regents proposals (a) to distribute state aid so as to achieve greater equity of fiscal resources and (b) to provide supplemental aid to those districts with the largest percentages of at-risk students. They document the need to recruit better qualified teachers for the lowest-performing schools, through incentive programs, through collaboration with teacher-education institution to prepare paraprofessionals in these schools for certification, and through staff development to allow teachers to better meet the diverse needs of students, particularly those from low income and minority families. They support the need to identify and implement successful schoolwide reform models and effective instructional programs in particular academic areas. They are useful for children's advocacy groups lobbying State and local governments for additional resources for educationally disadvantaged students. They are useful to districts in identifying districts with similar characteristics who can share successful practices.

The next step is to document improved achievement in particular schools with the addition of greater fiscal resource, better qualified teachers, and successful programs. Only through such documentation will policy-makers be convinced that achievement among educationally disadvantaged students can be improved by efficient and careful allocation of resources to improve teaching and learning.

Notes

1. A weighted average of the 1991 kindergarten through grade 6 free-and-reduced-price-lunch percentage and the percentage of students in poverty as assessed by the 1990 Decennial Census.

2. Percentage of tested third-graders scoring above the State minimum competency standard in 1992.

3. Percentage of high school graduates completing the requirements for Regents endorsements in 1992.

4. The ratio of the poverty percentage (expressed in standard score form) to the CWR (expressed in standard score form).

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Table 1

Values of eta^2 for Each Indicator Within Each Classification System

	Classification System				
Indicator	Enroll-ment	Sparsity	CWR	Poverty	N/RC
Enrollment	0.71	0.34	0.09	0.07	0.14
Sparsity	0.17	0.66	0.15	0.10	0.22
CWR	0.01	0.01	0.25	0.09	0.21
Poverty	0.12	0.27	0.35	0.90	0.76
Third-grade reading	0.01	0.01	0.04	0.12	0.14
Regents diplomas	0.07	0.08	0.04	0.14	0.10
Attendance	0.06	0.03	0.02	0.04	0.17
Percent white	0.12	0.23	0.08	0.00	0.18
Instructional expenditure	0.02	0.21	0.37	0.20	0.35
Pupils per teacher	0.23	0.11	0.13	0.01	0.06

Table 2

Final Cluster Centers in Standardized Scores

Cluster	Enrollment	Sparsity	CWR	Poverty
1	0.34	-0.07	-0.10	-0.60
2	-0.17	0.96	1.27	-1.10
3	-0.52	-0.51	-0.30	0.87
4	1.97	1.91	-0.17	1.18

Table 3

Indicator Means for Each Cluster

	Cluster			
Indicator	1	2	3	4
Third-grade reading	91.4%	94.4%	88.9%	84.2%
Regents diplomas	45.5%	42.5%	37.6%	30.6%
Attendance	94.5%	95.1%	95.0%	93.1%
Percent white	92.3%	85.6%	96.5%	60.6%
Instructional expenditure	$6,061	$9,050	$5,099	$6,667
Pupils per teacher	14.2	11.9	13.4	14.6

Table 4

Analysis of Variance for Cluster Analysis

Variables	Cluster Mean Square	df	Error mean square	df	F	p
Enrollment	82.09	3	0.64	683	129.16	.000
Sparsity	96.22	3	0.58	683	165.12	.000
CWR	60.85	3	0.75	683	81.29	.000
Poverty	158.11	3	0.31	683	517.47	.000

Table 5

Indicator Means for Each N/RC Category

	Category			
Indicator	Low	Average	High-Rural	High-Urban-Suburban
Third-grade reading	94.2%	90.8%	88.3%	83.9%
Regents diplomas	46.9%	42.1%	37.0%	30.6%
Attendance	95.1%	94.9%	95.0%	93.2%
Percent white	88.5%	92.7%	96.2%	67.4%
Instructional e xpenditure	$8,394	$5,818	$5,023	$6,208
Pupils per teacher	12.6	13.9	13.5	14.3