Measuring the Gap: The State of Equity of Student Achievement in Kentucky

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Abstract

The No Child Left Behind Act of 2002 has increased emphasis on "closing the gap" between the achievement of African-American and disadvantaged children and that of their respective peers. Using the 2001 results of Kentucky's accountability tests (e.g., CTBS-5, KCCT), Chi-square analyses were performed to determine whether, when disaggregated by quartile (CTBS-5) or proficiency-level (KCCT), a significant difference existed for each school between the distributions of disadvantaged and minority students and those of their respective peers. Chi-square analyses were additionally performed to determine whether statistically significant relationships existed between exogenous school characteristics (e.g., school size, school poverty level) and the equity of student achievement. Results of the study indicated that a majority of elementary, middle, and high schools displayed inequitable student outcomes between disadvantaged and minority students and their respective peers on both assessments. Moreover, school size was shown to relate significantly to the equity of student assessment results at the elementary and high school levels.

Prior to No Child Left Behind, only 17 states had required that student achievement data be disaggregated ("Quality Counts", 2002). With equity now a component of Adequate Yearly Progress (AYP)(Center on Educational Policy, 2002), it has become critical the current level of equity of achievement between African-American and disadvantaged students and their respective peers be established so that progress may be measured. The purpose of this study was to describe the degree to which ethnic and socioeconomic equity existed in Kentucky elementary, middle and high schools in 2001, and to assess whether a trend exists between equitable student outcomes and overall school socioeconomic-level and school size.

Nature of Public School Accountability

In general, public school accountability models have been constructed around a framework of systemic goals, standards of school performance, a means of school performance measurement, and a system rewards and sanctions assigned to schools based upon varying levels of school performance (Hanushek & Raymond, 2001). Public school accountability systems have sought to leverage change by opening schools to public scrutiny for the purpose of placing pressure upon schools to take steps to increase student test scores (Gullatt & Ritter, 2000; Ladd, 2001). Prior to the passage of the No Child Left Behind Act (NCLB Act) of 2002, 48 states and the District of Columbia had enacted accountability systems that utilized education goals and standards in core subject areas to raise aggregate student achievement ("Quality Counts", 2002).

Accountability in Kentucky

In 1992, Kentucky's accountability system, at that time the Kentucky Instructional Results Information System (KIRIS), was implemented as part of the Kentucky Education Reform Act (KERA). KIRIS was designed to reflect the degree to which schools were improving the effectiveness of their instructional program within the context of the Kentucky's learning goals, as measured by both cognitive and non-cognitive indicators. A system of rewards and sanctions based upon schools' progress toward "improvement goals" was implemented as an incentive for schools to progress toward KIRIS goals (KDE, 1998).

With KIRIS, each individual school was assigned a KIRIS improvement goal every two-years based upon the difference between each school's current KIRIS accountability index and the 20-year statewide goal of 100. This method of establishing improvement goals was intended to allow interim goals to be individualized for each school, with initially low-performing schools having to show larger biennial gains than schools that were initially high-performing (KDE, 1998).

Schools meeting or exceeding their improvement goal were designated as being in "Rewards", which entitled them to receive monetary rewards from the state. Schools failing to meet their improvement goal, but that scored at or above their baseline, were identified as "Maintaining". These schools were not eligible for rewards and were required to submit a school improvement plan. Schools whose KIRIS scores dropped below their baseline were designated as being in "Decline". Depending upon the degree to which the school was in Decline, consequences ranging from a required school improvement plan, the assignment of a "highly skilled educator", and the option of parents to transfer students to another school were all possible (KDE, 1998).

From KIRIS to CATS. Highly criticized for several reasons, including the lack of a national norm-referenced test as part of each school's accountability index, KIRIS was replaced by the Commonwealth Accountability Testing System (CATS) in 1998. CATS differed from KIRIS in several ways, but most fundamentally in the addition of the Comprehensive Test of Basic Skills Survey Edition (CTBS-5) in three grade levels (3, 6, 9) to compose five percent of each school's CATS index. The remaining 90% to 95% of the CATS index for elementary, middle, and high schools was composed of the results of the Kentucky Core Content Test (KCCT), writing portfolios, and non-cognitive indicators (KDE, 2000).

Provisions of NCLB

The NCLB Act of 2002 established federal public school accountability guidelines requiring consequences for schools failing to meet accountability goals in terms of both aggregate and disaggregate student achievement, primarily in the areas of reading and mathematics. The NCLB Act has stipulated that students must be tested in reading and mathematics each year in grades 3 through 8, and at least once in grades 10 through 12, with science testing to be required later in selected grades. Schools will be held accountable for overall student achievement, as well as the equity of disaggregated student outcomes, inclusive of major racial and economic categories (CEP, 2002).

The consequences for failing to meet aggregate and disaggregate accountability goals increased with each year of non-compliance. Specifically, schools failing to meet their performance goals for two consecutive years must receive technical assistance from the district, with students having the option to transfer to another school within the district. Schools failing to meet their goals for a third consecutive year would continue to receive technical assistance, must allow intra-district school choice, and allow eligible students to use their portion of Title I funds to purchase tutoring or other services directly from the district or an outside agency. A fourth consecutive year of failure would continue the previous consequences, but also impose re-staffing or other fundamental changes. After a fifth consecutive year of failure, a change in school governance was mandated (i.e., charter school, privatization of management services, state takeover of operations) (CEP, 2002).

Impact of Exogenous School Characteristics on Equity

The emphasis of the NCLB Act on narrowing the achievement gap between minority and disadvantaged students and their peers, and the subsequent mandatory disaggregation of student assessment data as part of the accountability system (CEP, 2002), has constituted a major shift in focus for most state accountability systems. For example, only 17 states even required disaggregated student testing results to even be reported in 2001 ("Quality Counts", 2002).

Additionally, the identification or development of valid and reliable measures of student performance for accountability purposes has generated significant controversy (Ladd, 2001), with several studies having shown that exogenous factors have influenced aggregate student achievement on accountability tests. For example, approximately 52% to 62% of the variance in aggregate school or school district performance on accountability assessments has recently been shown to vary with student socioeconomic factors in both Illinois and Ohio (Lyons, 2001; Sutton & Soderstrom, 1999; Wilson & Martin, 2001). Moreover, it has been asserted that exogenous school characteristics such as school size, and overall poverty level have impacted the gap between the achievements of students from poverty as compared to their peers (Johnson, Howley, & Howley, 2002; "Low-income children", 2001).

As Kentucky adapts CATS to comply with the NCLB Act by developing, among other things, a definition and means of measuring the equity of student outcomes on existing accountability assessments, it stands to reason that the current state of equity should be established so that progress can be fairly and accurately gauged. Additionally, the impact of exogenous variables on equity would possibly have implications as policy-makers look to adapt Kentucky's existing accountability system to meet federal mandates. Therefore, the purpose of this study was as follows:

(1) To establish the an equity baseline for Kentucky's public elementary, middle, and high schools on the reading and mathematics subtests of the state's accountability assessments prior to the implementation of the tenets of NCLB.

(2) To investigate possible relationships between exogenous characteristics (e.g., school size, school poverty level) of Kentucky's public elementary, middle, and high schools on the equitability of student outcomes on the math and reading subtests of the state's accountability assessments

Methodology

Participants

The sample consisted of 729 of 782 elementary schools, 164 of 213 middle schools, and 220 of 245 high schools from the State of Kentucky. Schools were eliminated that did not exhibit the grade level structure of P-5, 6-8, and 9-12.

Instruments

The 2001 results of the math and reading subtests of the Comprehensive Test of Basic Skills version 5 (CTBS-5) and the Kentucky Core Content Test (KCCT) were used to assess student achievement for elementary, middle, and high schools in Kentucky. These results were obtained in a disaggregated format from the Kentucky Department of

	GRADE LEVEL								
	3	4	5	6	7	8	9	10	11
CTBS									
READING	✓			✓			✓		
MATHEMATICS	✓			✓			✓		
KCCT									
READING		✓			✓			✓	
MATHEMATICS			✓			✓			✓

SOURCE: KDE, 2000

Education ("Spring 2001 Kentucky Performance Report – National Norm Referenced Test (NRT) Data Disaggregation"; "Spring 2001 Kentucky Performance Report – Data Disaggregation Pages with Scaled Scores"). The subtests were not administered at every grade level. Table 1 summarized the grade-levels for which the reading and mathematics subtests of the CTBS-5 and KCCT assessments were administered.

CTBS. The CTBS was a norm-referenced, multiple-choice test of student basic skills in 11 areas for kindergarten through Grade 12. The validity and reliability of the CTBS has been considered good. Version four, which was replaced by version five in 1990, was characterized as an exemplary general achievement test battery (Hopkins, 2002).

KCCT. The KCCT was a criterion-referenced test designed to assess students against the education standards of the State of Kentucky. The KCCT assessed students over seven content areas, inclusive of reading and mathematics, using a combination of multiple-choice and open-response questions (KDE, 2001). There was no information available regarding the validity or reliability of the KCCT.

	SCHOOL ENROLLMENT	FREE/REDUCED LUNCH PARTICIPATION
ELEMENTARY SCHOOL		
1	69 to 254	1% to 40.00%
2	257 to 368	40.17% to 52.13%
3	370 to 474	52.26% to 64.45%
4	475 to 577	64.60% to 77.35%
5	578 to 1292	77.66% to 97.86%
MIDDLE SCHOOL		
1	200 to 428	3.74% to 32.85%
2	438 to 552	33.12% to 41.79%
3	554 to 675	42.20% to 52.09%
4	690 to 810	52.30% to 63.12%
5	812 to 1552	63.34% to 88.77%
HIGH SCHOOL		
1	83 to 417	2.14% to 25.64%
2	420 to 615	26.14% to 35.00%
3	618 to 813	35.09% to 45.12%
4	827 to 1074	45.78% to 58.60%
5	1093 to 2012	58.84% to 92.96%

Procedure

Federal Free/Reduced Lunch Data for all public elementary, middle, and high schools in the State of Kentucky was obtained from the Kentucky Department of Education ("October free and reduced price data—2001-2002"). This list was compared to the school-level reports for the CTBS-5 and KCCT assessments for 2001, with schools not appearing on all three lists eliminated from the samples.

Size and socioeconomic classification. After the samples of elementary, middle, and high schools had been established, the school enrollment and percent free/reduced lunch participation data was used assigned schools to a quintile based upon school size and then a quintile based upon school socioeconomic level. Table 2 identifies the cut points for the socioeconomic and school size quintiles for elementary, middle, and high school students.

School-level disaggregated assessment data was obtained from the Kentucky Department of Education for the CTBS-5 and KCCT assessments. Disaggregations for free/reduced lunch participation (e.g., participants, non-participants) and ethnicity (e.g., Caucasian, African-American) were matched with each elementary, middle, and high school in the three samples. For each subtest, the disaggregated data reported the number of students from each school that scored in each national quartile

for the CTBS-5, and the number of students classified as Novice, Apprentice, and Proficient/Distinguished for the KCCT.

Equity Analysis. A Two-Way Chi-square was used to determine whether a significant difference ($p < .05$) existed between the distribution of students across either the CTBS-5 quartiles, or the KCCT classifications, for students disaggregated based upon ethnicity or socioeconomic level. Elementary, middle, and high schools were classified as equitable or inequitable based upon the Chi-square analysis for the reading and mathematics subtests for each disaggregation. The number of elementary, middle, and high schools classified as equitable or inequitable were reported.

School size and socioeconomic level. The degree to which school size or school socioeconomic level impacted the equity of student achievement was investigated using a Two-way Chi-square analysis. The Chi-square was used to determine whether a significant relationship ($p < .05$) existed between the frequency with which schools were designated as equitable or inequitable and the frequency with which they were designated in the either the school size quintiles or the socioeconomic quintiles. If a significant relationship existed, the frequency distributions were examined to determine whether the Chi-square was the result of a discernable trend or whether the statistical result appeared spurious.

Results

	ELEMENTARY N=707		MIDDLE N=165		HIGH N=220	
ECONOMIC STATUS	**READING**	**MATH**	**READING**	**MATH**	**READING**	**MATH**
EQUITY	287	236	35	41	77	79
	40.6%	33.4%	21.2%	24.8%	35.0%	35.9
INEQUITY	156	117	88	95	122	114
	22.1%	16.5%	53.3%	57.6%	55.5%	51.8%
ETHNICITY						
EQUITY	2	3	15	16	32	14
	0.3%	0.4%	9.1%	9.7%	14.5%	6.4%
INEQUITY	8	0	48	43	39	41
	1.1%	0%	29.1%	26.1%	17.7%	18.6%

Chi-square analyses were performed for elementary, middle, and high schools to determine whether student achievement on the reading and mathematics subtests of the CTBS-5 and KCCT was equitable between disadvantaged students and their peers and African-American students and Caucasian students. If less than 10 students were present in an achievement category, the disaggregated test results were not compiled by the KDE due to student confidentiality reasons. As a consequence, a large number of schools could not be classified as equitable or inequitable in some analyses. Tables 3 and 4 summarized the equity classifications for elementary, middle, and high schools.

	ELEMENTARY N=707		MIDDLE N=165		HIGH N=220	
ECONOMIC STATUS	**READING**	**MATH**	**READING**	**MATH**	**READING**	**MATH**
EQUITY	309	329	34	22	65	57
	43.7%	46.5%	20.6%	13.3%	29.5%	25.9%
INEQUITY	189	167	126	138	141	150
	26.7%	23.6%	76.4%	83.6%	64.1%	68.2%
ETHNICITY						
EQUITY	106	97	18	18	25	24
	15.0%	13.7%	10.9%	10.9%	11.4%	10.9%
INEQUITY	63	72	50	50	48	49
	8.9%	10.2%	30.3%	30.3%	21.8%	22.3%

Chi-square analyses were performed to investigate whether statistically significant and discernable trends existed between the equitability classification of schools, and the size and economic classifications of schools. Chi-square values for these analyses were summarized in Tables 5 and 6. Significant Chi-square values have been identified, with significant, but indiscernible trends being designated as such.

	ELEMENTARY		MIDDLE		HIGH	
CTBS-5	**READING**	**MATH**	**READING**	**MATH**	**READING**	**MATH**
FRL	12.368*	3.353	3.353	11.236*	7.644	5.252
ETHNICITY	32.456**	27.501**	3.569	5.743	9.092	3.152
KCCT						
FRL	5.571	6.523	0.403	1.571	6.070	3.422
ETHNICITY	9.000	--------	2.509	8.542	1.725	9.113

* X^2 significant at the $p = .05$ level
** X^2 significant at the $p = .001$ level

	ELEMENTARY		MIDDLE		HIGH	
CTBS-5	READING	MATH	READING	MATH	READING	MATH
FRL	21.016**	18.515**	7.303	5.796	46.462**	39.610**
ETHNICITY	8.802	18.769++	8.059	6.946	17.676**	9.954+
KCCT						
FRL	1.816	5.805	5.276	4.706	23.239**	17.285**
ETHNICITY	.900	--------	5.994	8.558	4.103	10.198*

* X^2 significant at the $p = .05$ level
** X^2 significant at the $p = .001$ level
+ X^2 significant at the $p = .05$ level, indiscernible trend
+ X^2 significant at the $p = .001$ level, indiscernible trend

Discussion

This study was designed strictly as a descriptive investigation of the state of equity in Kentucky, and of potential trends that might exist between schools of different sizes and of different poverty levels. There are factors (e.g., teacher quality, principal attributes and effectiveness, class size, etc..), which certainly limit the generalizability of this study. Moreover, this study addresses only the equitability of student scores, rather than both equitability and excellence of student scores.

Despite the limitations of this descriptive investigation, it is asserted that the value lies in the following areas: (a) the heightening of awareness of the current status of equity of student assessment outcomes in Kentucky, (b) the heightening of the awareness of the potential impact of exogenous variables on the equity of student performance and the policy implications relative to adaptations of CATS for NCLB.

The State of Equity

Socioeconomic and ethnic equity analyses relative to student performance on the reading and mathematics subtests of the CTBS-5 and KCCT for Kentucky's elementary, middle, and high schools indicate that in no case were a majority of schools shown to be equitable. In general, it appeared that elementary schools faired better than middle and high schools in terms of equity, although the number of elementary schools with insufficient economic and racial diversity to warrant data disaggregation left questions unanswered concerning the equity of elementary schools, particularly in terms of ethnicity.

Overall, schools displayed less inequity on the KCCT than the CTBS-5 in terms of achievement in the areas of mathematics and reading. The fact that Kentucky public school curriculum is aligned with the same standards for which the KCCT was written might explain this difference, with the focus of school-wide curriculum on the core content negating potential inequity that surfaced on the generic basic skills test. Conversely, it is postulated that public schools that have failed to align their curriculum to the Kentucky Core Content for whatever reason (e.g., technical inaptitude, lack of leadership) may have displayed more inequity on the KCCT than those that did.

Impact of Exogenous Variables

So far as the impact of exogenous variables on the equity of student achievement, it was noted that for elementary and high schools, there were more significant trends in terms of school size, than overall socioeconononomic status.

School size. A significant trend for larger schools to display more inequity in terms of disadvantaged students as compared to their peers existed for both elementary and high schools on the reading and mathematics subtests of the CTBS-5. This pattern existed only for high schools on the KCCT. Although there was not a pattern across subtests, school size did result in significant trends on the CTBS-5 reading subtest and the mathematics subtest of the KCCT.

The results of the analyses is congruent with research that asserts that large schools benefit advantaged students at the expense of disadvantaged students, at least for the elementary and high schools. Although grade level structure was controlled for, it is quite possible that other differences exist between schools for which there were no control. The fact that middle schools did not display the same pattern as did elementary and high schools further reinforces this conclusion.

School size factors did not impact the equity between African-American students and their peers in as consistent a fashion as with the school size factors. A closer examination of the schools included in the sample may very well show additional confounding factors that are concurrent with school size, therefore impacting the Chi-square results.

School socioeconomic level. School socioeconomic level had no discernable impact on high school equity, and appeared to impact middle schools only in terms of the equity between disadvantaged students and their peers on the math subtest of the CTBS-5, but with no discernable trend. The inequity of elementary student scores in terms of ethnicity on the reading and mathematics subtests of the CTBS-5, and in terms of free and reduced lunch participation on the reading subtest of the CTBS-5 were

the only significant result of this analysis. However, there was not a clear, discernable trend evident.

Policy Implications

The establishment of education state-level accountability systems over the past several years has led to as comprehensive an understanding as ever of the aggregate performance of schools on state-mandated accountability assessments. However, the NCLB Act of 2002 has made it critical that education policy makers, as well as public school educators, have systematic means in place of gauging the performance of disadvantaged and minority students on these same tests when compared to their peers.

Kentucky's accountability system, which has been highly regarded nationally ("Quality Counts, 2002"), has likewise provided education policy-makers, the general public, and public school educators with a comprehensive understanding of how schools have performed relative to Kentucky's educational goals. Until recently, however, the focus of Kentucky's accountability system has not been on disaggregated student results, and even now the general public is not fully aware of how schools are performing in terms of equity.

The 2001 disaggregated accountability assessment results indicate that a majority of Kentucky schools had inequitable outcomes, particularly in the upper grades. Additionally, it appears that in terms of equity, large schools are not as successful as smaller schools. This trend warrants further study, particularly in a climate of efficiency where school districts are encouraged to consolidate resources, inclusive of school building administration.

Certainly, more investigation is needed to support any assertions that a school's size, economic status or both relate causally to equity on student assessments. Moreover, equity in the absence of excellence will not bode well under any accountability system. Therefore, it seems that a research agenda for future equity studies should target the level of aggregate student assessment results along with the disaggregated results.

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