

Technical Explanation for *Quality Counts*' School Finance Equity Indicators

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I. Introduction

Education Week has graded each state on the equity of its education resources since *Quality Counts* was first published in January 1997. In that report, and in three subsequent reports, equity was defined as equality of expenditures among school districts. It was measured using the "coefficient of variation," adjusting for input costs and student needs (i.e. students in poverty and special education costs). While this statistic does provide a straightforward measure of variability in spending across districts in each state, it cannot tell us what is causing variations in spending. Specifically, that measure does not tell us the extent to which states have made an effort to achieve finance equity. And since *Quality Counts* traditionally focuses on state policies and efforts, we wanted to be able to better speak to a state's contribution to equity across districts.

A district's education spending is largely determined by the amount of state aid the district receives and the amount of local revenue it raises from property taxes. Generally, a district with higher property values is capable of generating more revenue from a property tax than a district with lower values, even if both tax property at the same rate.

Many states target more financial aid to poorer districts to help remedy local difficulties in generating revenue. But this assistance varies greatly from state to state. And even with targeting, the total amount that poorer districts can generate per pupil with the same local tax effort may be still far less than that of their wealthier counterparts.

"Equity" in spending, as measured by the coefficient of variation, can be achieved if a state's poorer districts taxed themselves at a greater rate than wealthy districts, regardless of whether the state has taken any initiative to remedy the problem itself through targeting. In order to ascertain whether or not states are doing their part to promote equity in school finance, *Education Week* has devised a new set of equity indicators. *Quality Counts* introduced these new indicators provisionally in 2000 and formally adopted them in 2001 for computing grades. The following is a description of how these indicators are computed. Also provided is a list of the data sources needed to compute the indicators. However, the reader should feel free to use any other, more recent, sources of finance data to complete an analysis of their own.

II. Purpose

This paper provides readers with a more in-depth description of how *Education Week* calculates its new equity indicators. The calculations require data from multiple sources, which must be aggregated into a single database. Each of these data sources is outlined below, as well as the specific variables required.

A state's grade for equity of resources was based on four separate indicators:

- State Equalization Effort
- Wealth Neutrality Score

- McLoone Index
- Relative Inequity in Spending per Student Among Districts (Coefficient of Variation)

For each indicator, a series of new variables must be created. Each of these new variables are explained below, followed by a description of how each indicator is computed using the new variables.

Further information on the methodology and theory can be obtained from the following resources:

American Education Finance Association (AEFA) Annual Meeting, March 9-11, 2000 - Powerpoint Presentation, "School Finance Equity - Grading the States on Performance Outcomes," Greg F. Orlofsky, Education Week; Jerry C. Fastrup, U.S. General Accounting Office.

United States General Accounting Office, "School Finance: State Efforts To Equalize Funding Between Wealthy and Poor School Districts," June 1998 [GAO/HEHS-98-92]

United States General Accounting Office, "School Finance: State Efforts To Reduce Funding Gaps Between Poor and Wealthy Districts," February 1997 [GAO/HEHS-97-31]

United States General Accounting Office, "School Finance: State and Federal Efforts To Target Poor Students," January 1998 [GAO/HEHS-98-36]

Fastrup, Jerry C., "Taxpayer and Pupil Equity: Linking Policy Tools With Policy Goals," *Journal of Education Finance*, Volume 23, Number 1, Summer 1997.

Berne, Robert and Leanna Stiefel, "Measurement of Equity in School Finance: Conceptual, Methodological, and Empirical Dimensions," Baltimore: Johns Hopkins University Press, c1984.

III. Data Compilation

The data used for *Quality Counts* were compiled from a number of sources and merged into a single database in order to create variables for each school district in the nation. Abbreviations for each variable were taken directly from the original sources whenever possible or assigned if the variable did not already have an abbreviation.

A. Database I: U.S. Census Bureau's Public Elementary-Secondary Education Finance Data for 2000 (often referred to as the National Center for Education Statistics' F-33 Data Base)

The variables used in this database:

State Identification Number (STATE)

School System Name (NAME)

School Level Code (SCHLEV)

NCES ID Code (NCESID)

Year of Data (YRDAT)

Fall Membership October 1998, Fiscal Year 99, (V33)

Total Revenue from State Sources (TSTREV)

Total Revenue from Local sources (LOCREV)

Total Current Spending for Elementary-Secondary Programs (TCURELSC)

B. Database II: NCES Common Core of Data Public Elementary and Secondary School District Universe 1999-2000

The variables used in this database:

NCES Agency ID (LEAID)

State Abbreviation (ST99)

Agency Type-Code (TYPE99)

Total Schools (SCH99)

Students with an Individualized Education Plan (SPECED99)

C. Database III: Chambers Cost of Education Index 1993-94

The variables used in this database:

NCES Agency ID (NLEA_ID)

Cost of Education Index (CEIL93)

D. Database IV: U.S. Census Bureau's Small Area Income And Poverty Estimates, School District Estimates (1997)

The variables used in this database:

FIPS State Code (FIPS)

CCD District ID (CCDID) (These first two variables merged together are the NCESID)

District Name (DISTNAME)

Estimated Total Population (TOTALPOP)

Estimated Population of Children 5 to 17 years of Age (CHILD)

Estimated Number of Poor Children 5 to 17 years of Age who are Related to the Head of the Household (POORCHRN)

E. Database V: School District Data Book 1990 Census School District Special Tabulation U.S. Summary [SDDB-01] developed by the MESA Group. Available on CD-ROM, for more information: <http://nces.ed.gov/surveys/sdds>

The variables used in this database:

Table H062 - Aggregate Value of Specified owner-occupied housing units by mortgage status (WEALTH)

Table P202 – Area in square kilometers (AREA)

NCESID

These data sets were merged into one file, using the NCESID in each data set as the unique identifier. For the U.S. Census Bureau's Small Area Income And Poverty Estimates, School District Estimates (1997), the first two variables (FIPS State Code and CCD District ID) merged together create the NCES ID. Several variables, including the district name and state code, are not used to calculate the equity indicators, but may provide useful additional information.

IV. Elimination of Data

Since the purpose of the indicators is to analyze equity in revenue and spending among public elementary and secondary public school districts, all districts that did not meet certain criteria were eliminated from the study. Districts were eliminated according to the following steps:

- Eliminate districts with school levels other than elementary, secondary, or unified (SCHLEV should be 1, 2, or 3 only).
- Eliminate districts with no schools (Remove all districts for which the variable, SCH99 = 0).
- Eliminate districts that are state or federal level (Remove all districts for which the variable, TYPE99 = 3, 4, 5, 6, or 7).
- Eliminate districts with fall membership (V33) under 200.

V. Equity Measures

A. State Equalization Effort:

State equalization effort involves a multiple regression that determines the extent to which states are targeting revenues to particular school districts with specific needs. Fiscal variables were adjusted to reflect regional cost differences using the Chambers Cost of Education Index, and each of the variables was indexed so that differences were measured relative to the state average. The variables used in the analysis are as follows:

1. Dependent Variable: Adjusted State Revenue per Pupil Index

2. Independent Variables

- a. Adjusted Property Wealth per Pupil Index (as measured by the Aggregate Value of Owner-Occupied Housing)
- b. Percent of Students in Poverty Index
- c. Percent of Special Education Students Index (as measured by the percentage of students with Individualized Education Plans)
- d. Enrollment-squared Index
- e. Land Area per Pupil Index (in kilometers)

3. New variables

a. Adjusted State Revenue per Pupil Index:

Total State Enrollment (TSE) = (Σ V33 for each state)

Share of Total State Enrollment (STSE) = V33 / TSE

State-indexed Cost of Education Index (SICEI) = CEIL93 / (Σ (STSE * CEIL93) for each state)

Adjusted Cost of Education Index (ADJCEI) = (0.85 * SICEI) + 0.15 (Assign a 1 if missing data)

Adjusted State Revenue (ADJSTRV) = (STREV / ADJCEI)

Adjusted State Revenue per Pupil (ADSTRVPP) = (ADJSTRV * 1000) / V33

Total Adjusted State Revenue for each State (TADSTREV) = (Σ ADJSTRV for each state)

Average Adjusted State Revenue per Pupil for Each State (AVGASTPP) = (TADSTREV / TSE) * 1000

Adjusted State Revenue per Pupil Index (ADSPPIND) = (ADSTRVPP / AVGASTPP)

b. Adjusted Property Wealth per Pupil Index:

Adjusted District Wealth (ADJWLTH) = (WEALTH / ADJCEI)

Total Adjusted District Wealth (TADWTH) = (Σ ADJWLTH for each state)

Adjusted District Wealth per Pupil (ADJDWPP) = (ADJWLTH / V33)

Average Adjusted District Wealth per Pupil (AVGDWPP) = (TADWTH / TSE)

Adjusted District Wealth per Pupil INDEX (ADDWIND) = (ADJDWPP / AVGDWPP)

c. Percent of Students in Poverty Index:

Estimated percentage of children 5 to 17 in poverty (POVPER) = (POORCHRN / CHILD)

Estimated number of children in poverty (NUMPOV) = POVPER * V33

Total estimated number of children in poverty for each state (TPOVST) = (Σ NUMPOV for each state)

Average Percentage of Children in Poverty for Each State (POVAVG) = (TPOVST / TSE)

Percent of Students in Poverty Index (POVINDEX) = (POVPER / POVAVG)

d. Percent of Special Education Students Index:

Total number of Special Education Students in Each State = (Σ SPECED99 for each state)

Percent of enrollment that is Special Education (PERIEP) = (SPECED99 / V33)

Average Percent Enrollment for each State (IEPAVG) = (TOTSPCED / TSE)

Percent Special Education Students Index (IEPINDEX) = (PERIEP / IEPAVG)

e. Enrollment-Squared Index:

District Enrollment Squared (V33_2) = (V33)²

Total District Enrollment Squared for each state (TOTV33_2) = (Σ V33_2 for each state)

District Enrollment Squared per Pupil Index (ENSQUIND) = (V33_2 / TOTV33_2) / (V33 / TSE)

f. Land Area per Pupil Index:

Area per Pupil (AREAPP) = (AREA / V33)

Total Area per State (TSAREA) = (Σ AREA for each state)

Average Area per Pupil for each State (AVGARPP) = (TSAREA / TSE)

Area Per Pupil Index (AREAINDX) = (AREAPP / AVGARPP)

4. Analysis

a. Each state was analyzed using the following weighted-least-squares regression equation:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$

Where:

Y = Adjusted State Revenue per Pupil Index (ADSPPIND)

α = Constant

X_1 = Adjusted District Wealth per Pupil Index (ADDWIND) (Sign can be - or 0)

X_2 = Percent Students in Poverty Index (POVINDEX) (+)

X_3 = Percent IEP Students Index (IEPINDEX) (+)

X_4 = Enrollment squared index (ENSQUIND) (+ or -)

X_5 = Land area per pupil index (AREAINDX) (+)

Weighting Variable (WGT) = $(V33 / TSE) * \text{Number of districts in each state}$

Variables were only included for each state's regression if their coefficients had the signs (+ or -) listed above. Otherwise these variables were excluded, and the regression was run again.

The coefficient for Adjusted District Wealth per Pupil Index, β_1 , from each state's regression produced our "targeting score." This is essentially the degree to which the amount of aid received from the state is related to the property wealth of the district, controlling for the other independent variables that may be related to the amount of revenue districts receive.

b. One final variable, "state share of funding," is needed to calculate the state equalization effort:

Adjusted Local Revenue (ADJLOCRV) = $(LOCREV / ADJCEI)$

Adjusted State & Local Revenue (STLOCREV) = $(ADJLOCRV + ADJSTRV)$

Total Adjusted State & Local Revenue (TASLR) = $(\sum \text{STLOCREV for each state})$

State Share of Funding for each state = $(TADSTREV / TASLR)$

B. Wealth Neutrality Score

While a state's effort to provide an equitable distribution of its funds to districts is an important indicator of equity, there is still the matter of local revenue. Generally, districts with different levels of wealth differ in the amount of revenue per pupil they are able to generate if they tax themselves at the same rate. Furthermore, districts usually differ in the amount they choose to tax themselves. The "state equalization effort" measure assumes that all districts are taxing themselves at the same rate.

A "wealth neutrality score" illustrates the relationship between districts' total education funding (both state and local) and their property wealth. Here, instead of determining the extent to which the state is targeting additional funds to students in poverty or in special education, we assumed that more money is required to educate these students. In this case the cost of educating each

student in poverty was assumed to be equal to the cost of educating 1.2 non-poor students. The cost of educating students with Individual Education Plans (IEPs) was assumed to be equivalent to the cost of educating 2.3 students without IEPs. To reflect the cost differences in educating these students, we "weighted" state enrollment count using these numbers.

Next, we created indexes similar to those used to calculate the "targeting score." This time there were only two variables in our regression.

1. Dependent Variable: Adjusted State & Local Revenue per Weighted Pupil Index

2. Independent Variable: Adjusted Property Wealth per Weighted Pupil Index

3. New variables

Weighted Enrollment (WGTENROL) = (SPECED99 * 1.3) + (NUMPOV * 0.2) + V33

Total Weighted Enrollment for each State (TOTWTENR) = (Σ WGTENROL for each state)

Adjusted Local Revenue (ADJLOCRV) = (LOCREV / ADJCEI)

Adjusted State & Local Revenue (STLOCREV) = (ADJLOCRV + ADJSTRV)

Adjusted State & Local Revenue per Weighted Pupil (ASLRPWP) = (STLOCREV / WGTENROL)

Total Adjusted State & Local Revenue (TASLR) = (Σ STLOCREV for each state)

Average Adjusted State & Local Revenue per Weighted Pupil (AVASLRWP) = (TASLR / TOTWTENR)

Adjusted State & Local Revenue per Weighted Pupil Index (ASLRPIND) = (ASLRPWP / AVASLRWP)

Adjusted District Wealth per Weighted Pupil (ADWWP) = (ADJWLTH / WGTENROL)

Average Adjusted District Wealth per Weighted Pupil (AADWPWP) = (TADWTH / TOTWTENR)

Adjusted District Wealth per Weighted Pupil Index (ADJWWP) = (ADWWP / AADWPWP)

4. Analysis

Each state was analyzed using the following weighted-least-squares regression equation:

$$Y = \alpha + \beta_1 X_1$$

Where:

Y = Adjusted State & Local Revenue per Weighted Pupil Index (ASLRPIND)

α = Constant

X_1 = Adjusted District Wealth per Weighted Pupil Index (ADJWWP)

Weighting Variable (WGT) = $(V33 / TSE) * \text{Number of districts in each state}$

C. McLoone Index

The McLoone index is a measure of equity that focuses entirely on the students in the bottom half of the spending distribution. It is based on the assumption that if all the pupils in the state were lined up according to the amount their districts spend on them, perfect equity would be achieved if every district spent at least as much as was spent on the pupil exactly in the middle of the distribution.

1. New variables

Adjusted Expenditures (ADJEXP) = $(TCURELSC / ADJCEI)$

Adjusted Expenditures per Weighted Pupil (ADJPWP) = $(ADJEXP * 1000) / \text{WGTEENROL}$

For each state studied, we computed the median-level expenditure per weighted pupil among all districts weighted for enrollment (V33). This number is essentially the spending figure for the student(s) who are at exactly the 50th percentile. When computing this figure, one must weight by enrollment to account for the different sizes of districts in each state ==> Median Adjusted Expenditures per Weighted Pupil for each state (weighted by V33) (MADJPWP).

2. Analysis

McLoone Index = $\sum (V33_i * ADJPWP_i) / \sum (V33_i * MADJPWP)$

Where:

i = Districts below the state median adjusted per weighted pupil expenditure;

$V33_i$ = Student enrollment in school district i ;

$ADJPWP_i$ = Adjusted expenditures per weighted pupil in school district i ; and

$MADJPWP$ = Median adjusted expenditures per weighted pupil for all pupils.

D. Relative Inequity in Spending per Student Among Districts (Coefficient of Variation)

Prior to 2001, *Quality Counts*' equity grade relied solely on this indicator which is equal to the standard deviation of adjusted spending per pupil across all districts in a state (adjusted to reflect cost differences and student needs), divided by the states' average spending per pupil. The standard deviation is a measure of dispersion (i.e. how spread out spending levels are across a state's districts).

$$\text{Standard Deviation (S)} = \sqrt{\sum (y_i - y_j)^2 / (n - 1)}$$

where:

y_j = Adjusted expenditures per weighted pupil in school district i (ADJPWPi)

(weighted by enrollment, V33)

y_i = spending per pupil in district i

$$\text{Coefficient of Variation (CV)} = S / y_j$$

In this case, the coefficient of variation was a weighted average for each school level (i.e. SCHLEV99 = 1, 2, 3).

$$\text{Weighted CV} = [(S_{\text{SCHLEV}=1} / y_{j \text{SCHLEV}=1}) + (S_{\text{SCHLEV}=2} / y_{j \text{SCHLEV}=2}) + (S_{\text{SCHLEV}=3} / y_{j \text{SCHLEV}=3})] / 3$$