FUNDING GAPS 2018
TECHNICAL APPENDIX

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Introduction and Overview of Methodology

Funding Gaps 2018 describes an analysis of funding disparities between the highest and lowest poverty school districts, as well as districts serving the most and the fewest students of color. The analysis considers disparities in state and local revenues. It does not include federal revenues, which are intended to provide supplemental services to specific groups of students such as students in poverty, English learners, and students with disabilities. The only federal dollars included in our analysis are Impact Aid and Indian Education Aid, which help to replace state and local funds.

Our analysis includes a total of 13,258 regular public school districts that serve 48 million students. Because the Census Bureau data on which this analysis relies (the Public Elementary-Secondary Education Finance Data and the Small Area Income and Population Estimates) do not include independently operated charter schools or districts that only operate charter schools, our analysis excludes these districts.

Districts are classified as high-poverty and low-poverty based on the percentage of students living below the poverty line in calendar year 2015. They are classified as serving the most or the fewest students of color based on student enrollment data by race/ethnicity from the 2014–15 school year. Our revenue estimates are based on a three-year average of district financial information (for fiscal years 2013–2015) to minimize the impact of year-to-year revenue fluctuations, such as those arising from capital investments. State and local revenues are adjusted for inflation, as well as for regional differences in labor market costs.

We measure funding disparities by calculating the differences in state and local revenues per student between groups of districts serving the most and the fewest students in poverty, as well as between groups of districts serving the most and the fewest students of color.

This technical appendix describes our data sources and methodology in detail.

Data Sources

This analysis uses extant district-level data from several federal sources — the U.S. Census Bureau, the National Center for Education Statistics (NCES), and the Bureau of Labor Statistics (BLS). The following is a list of data sources and variables used in this analysis.

District Financial Data: U.S. Census Bureau, "Public Elementary and Secondary Education Finance Data, 2013–2015," https://www.census.gov/programs-surveys/school-finances.html (Downloaded August 2017).

These files contain the results of Census' Annual Survey of School System Finances, which has been administered to all public elementary and secondary school systems annually since 1977.

The analysis uses the following variables from these files:

- NCES unique identification number (NCESID)
- School-level code (SCHLEV)
- Fall membership (V33)
- Total revenue from state sources (TSTREV)
- Total revenue from local sources (TLOCREV)
- Impact Aid (B10)
- Indian Education Aid (B12)

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District Enrollment Data: National Center for Education Statistics, "Common Core of Data, Local Education Agency (School District) Universe Survey Data, 2014–15," http://nces.ed.gov/ccd/pubagency.asp (Downloaded August 2017).

The Common Core of Data (CCD) contains a listing of every education agency in the country that provides public elementary and/or secondary education or educational support services, complete with information on location, type of district, student demographics, and more.

The analysis uses the following variables from this dataset:

- NCES unique identification number (LEAID)
- Education agency type code (LEA_TYPE)
- Education agency boundary change code (SY_STATUS)
- American Indian/Alaskan Native students (AM)
- Asian students (AS)
- Hispanic students (HI)
- Black, non-Hispanic students (BL)
- Hawaiian Native/Pacific Islander students (HP)
- Calculated enrollment (MEMBER)

District Poverty Data: U.S. Census Bureau, "Small Area Income and Poverty Estimates by School District, 2015," https://www.census.gov/programs-surveys/saipe.html (Downloaded August 2017).

The Small Area Income and Poverty Estimates (SAIPE) dataset contains estimates of the overall number of 5- to 17-year-olds, as well as the number of 5- to 17-year-olds in poverty in each school district, based on data from the Census American Community Survey (ACS).

The analysis uses the following variables from this dataset:

- State FIPS code (FIPST)
- NCES unique identification number (DISTRICTID)
- Number of children in district, ages 5-17 (POP517)
- Number of children in district, ages 5-17, in poverty (POV517)

Geographic Cost of Living Adjustment Data: Lori Taylor, The Bush School of Government and Public Service at Texas A&M University, "ACS-based CWI 2013–2015," http://bush.tamu.edu/research/faculty/Taylor_CWI/ (Received November 2017).

The comparable wage index (CWI) measures systematic variations in the salaries of college graduates who are not educators to estimate the geographic differences in labor market costs outside of school district control. The CWI adjustment allows for better comparison of finances across districts, states, and the nation.[1]

The analysis uses the following variables from this file:

- NCES unique identification number (LEAID)
- ACS-based Comparable Wage Index (ACSCWI)
- ACS-based Comparable Wage Index for states (ST_ACSCWI)

Inflation Data: Bureau of Labor Statistics, "Consumer Price Index — All Urban Consumers, U.S. City Average," https://beta.bls.gov/dataViewer/view/timeseries/CUUR0000SA0 (Downloaded August 2017).

This index gives data on changes in the prices paid by urban consumers for a representative basket of goods and services, allowing for comparisons of financial values at different points in time. The analysis uses the annual CPI for all urban consumers for 2013, 2014, and 2015.

Dataset Construction

To conduct our analysis, we began with the 2015 Census financial file to determine the sample of districts to be included in the analysis (N=14,376). This file was merged with the 2013 and 2014 Census financial files, 2014–15 district enrollment data, 2015 district poverty data, and CWI data using the NCES district identification numbers.

We addressed several data issues prior to performing any calculations:

1. Missing poverty data: When a district did not have 2015 poverty data, we used 2014 poverty data where available.[2]

2. Missing district-level CWI data: When a district did not have district-level CWI data, we used the CWI data for another district in the same county where possible, or the state CWI if neither the district-level data nor county-level data were available.

3. Matching New York City financial and demographic data: New York City financial data are reported as a single, citywide record. The district's data on student enrollment by race/ethnicity are reported separately for each of the city's 32 geographic districts. To create one district record, we aggregated the enrollment by ethnicity data for the geographic districts to match the financial record used in our analysis.

4. Matching financial and demographic data for five California districts: Financial data for five California districts are reported at the unified (secondary and elementary combined) level, while enrollment by ethnicity is reported separately for elementary and secondary districts. We aggregated the enrollment data for the elementary and secondary levels to their respective unified district level.[3]

5. Matching financial and demographic data for other districts: Data for another 17 districts were reported under different NCES local education agency identification numbers in the financial file and the poverty file. We manually matched data for these districts by comparing district names in both files.[4]

Then, the following types of districts were removed from our dataset, as they were outside the scope of the analysis or were missing key data points:

1. Districts that were not classified as "regular" elementary, middle, or high school districts:

    a. Districts categorized in the Census finance file as having a School Level Code (SCHLEV) equal to Vocational or Special Education School System (05), Nonoperating School System (06), or Educational Service Agency (07). These districts serve special populations of students, are no longer functional, or are funded in unique ways that put them beyond the scope of this analysis.

    b. Districts that were classified as a "State-operated agency," "Federal-operated agency," or "Other education agency" (types 5, 6, or 8) in the CCD file were removed from the sample, as they also serve special populations of students.

    c. Districts that only operate charter schools (type 7 in the CCD file) were excluded since the majority of charter districts are not included in the Census finance data collection.

2. Districts missing key financial or enrollment data needed for the analysis:

    a. A small number of districts that had no student enrollment in 2015.

    b. Districts with no state or local revenues, the dependent variables in the analysis.

3. Districts that had revenue and enrollment data, but were missing key demographic information needed for the analysis:

    a. Districts missing total enrollment or enrollment by race/ethnicity in the CCD file.

    b. Districts missing poverty data in the Small Area Income and Poverty Estimates (SAIPE) file.

These exclusion criteria removed a total of 1,118 unique districts from our dataset. As a result, our analysis captures about 92 percent of districts, 99 percent of students, and 97 percent of state and local revenues reported in the Census Public Elementary and Secondary Finance Data (see Table 1).

TABLE 1: Counts of Districts, Students, and Local and State Revenues Captured in Analysis, by State

	Total Number of Districts, Students, and Dollars Captured in Analysis			Totals in Analysis as Percentage of Totals in the Census Public Elementary and Secondary Finance Data		
	DISTRICTS	STUDENTS	STATE AND LOCAL REVENUES (in thousands)	DISTRICTS	STUDENTS	STATE AND LOCAL REVENUES
U.S.	13,258	48,273,846	$581,122,171	92.2%	99.5%	96.8%
ALABAMA	132	732,730	$6,546,558	98.5%	99.7%	99.7%
ALASKA	53	130,755	$2,576,875	100.0%	100.0%	100.0%
ARIZONA	209	942,741	$7,003,991	88.2%	99.8%	98.1%
ARKANSAS	235	479,027	$4,636,664	93.6%	99.9%	98.1%
CALIFORNIA *	934	6,128,829	$65,493,275	88.4%	98.4%	92.6%
COLORADO	178	872,320	$8,873,082	90.8%	100.0%	99.3%
CONNECTICUT	166	505,366	$10,192,651	95.4%	100.0%	95.7%
DELAWARE *	16	114,479	$1,733,688	84.2%	94.0%	92.2%
FLORIDA	67	2,743,641	$23,853,450	100.0%	100.0%	100.0%
GEORGIA	180	1,717,805	$16,686,303	91.8%	100.0%	99.6%
HAWAII	1	182,384	$2,444,293	100.0%	100.0%	100.0%
IDAHO	114	274,125	$1,934,346	98.3%	100.0%	99.9%
ILLINOIS	855	2,046,476	$28,915,729	86.2%	100.0%	96.9%
INDIANA	289	1,004,215	$11,433,428	92.3%	100.0%	99.2%
IOWA	338	505,311	$6,216,535	97.4%	100.0%	99.4%
KANSAS	286	496,920	$5,516,458	100.0%	100.0%	100.0%
KENTUCKY	173	688,475	$6,699,908	100.0%	100.0%	100.0%
LOUISIANA	69	660,969	$7,174,305	98.6%	100.0%	99.5%
MAINE	220	174,995	$2,512,360	89.1%	99.3%	98.3%
MARYLAND	24	874,108	$13,672,480	100.0%	100.0%	100.0%
MASSACHUSETTS	293	888,203	$15,534,380	90.7%	97.0%	95.9%
MICHIGAN *	541	1,344,181	$15,087,629	90.0%	99.9%	86.5%
MINNESOTA	330	807,009	$10,622,752	84.4%	100.0%	96.1%
MISSISSIPPI	144	489,333	$3,912,768	98.6%	99.8%	99.8%
MISSOURI	518	892,755	$9,289,465	99.6%	100.0%	96.0%
MONTANA	406	144,447	$1,577,538	94.0%	100.0%	99.3%
NEBRASKA	243	311,745	$3,755,186	92.7%	99.8%	96.2%
NEVADA	17	438,948	$3,949,789	100.0%	100.0%	100.0%
NEW HAMPSHIRE	174	183,038	$2,928,119	99.4%	100.0%	100.0%
NEW JERSEY *	542	1,304,361	$26,593,758	92.2%	97.4%	94.4%
NEW MEXICO	89	326,297	$3,289,862	100.0%	100.0%	100.0%
NEW YORK	678	2,631,376	$60,817,344	99.4%	100.0%	100.0%
NORTH CAROLINA	115	1,465,031	$11,557,364	100.0%	100.0%	100.0%
NORTH DAKOTA	172	106,026	$1,439,680	84.3%	100.0%	96.9%
OHIO *	610	1,600,122	$20,950,765	83.2%	100.0%	92.3%
OKLAHOMA	517	671,715	$5,428,624	99.0%	100.0%	99.9%
OREGON *	179	566,938	$6,081,884	82.9%	99.4%	93.1%
PENNSYLVANIA *	499	1,589,429	$26,309,649	83.7%	100.0%	93.6%
RHODE ISLAND	36	134,574	$2,165,161	90.0%	100.0%	99.2%
SOUTH CAROLINA	81	737,401	$7,894,827	91.0%	100.0%	99.6%
SOUTH DAKOTA	151	132,836	$1,208,296	95.0%	100.0%	100.0%
TENNESSEE	140	987,389	$8,266,478	98.6%	99.3%	99.2%
TEXAS	1,023	5,000,536	$49,431,589	97.8%	99.9%	99.4%
UTAH	41	573,913	$4,304,871	100.0%	100.0%	100.0%
VERMONT *	228	84,130	$1,602,383	71.7%	98.8%	84.7%
VIRGINIA	132	1,279,867	$14,794,453	99.2%	100.0%	99.7%
WASHINGTON	295	1,072,359	$12,499,517	97.0%	100.0%	98.6%
WEST VIRGINIA	55	279,565	$3,078,547	87.3%	100.0%	98.8%
WISCONSIN	422	860,784	$10,790,530	98.8%	99.9%	99.7%
WYOMING	48	93,867	$1,842,584	100.0%	100.0%	100.0%

Note: (*) and teal shading indicates that our analysis captures less than 95 percent of students or revenues.

CALIFORNIA: Dropped districts include a number of special education districts with substantial revenues, as well as Joint Power Associations (JPAs), which report state and local revenues but no student enrollment; **DELAWARE:** All dropped districts are regional vocational school districts; **MICHIGAN:** The majority of dropped districts are Intermediate Districts, which report state and local revenues but no student enrollment; **NEW JERSEY:** The majority of dropped districts are countywide vocational school districts or special services districts; **OHIO:** The majority of dropped districts are Educational Service Centers and joint vocational districts, which report state and local revenues but no student enrollment; **OREGON:** The majority of dropped districts are Educational Service Districts, which report state and local revenues but no student enrollment; **PENNSYLVANIA:** Dropped districts include a number of Intermediate School Units and vocational districts that report state and local revenues but no student enrollment; **VERMONT:** The majority of dropped districts are Supervisory Unions and non-operational school districts, which report state and local revenues but no student enrollment.

Calculating District Revenues

Our analysis is based on three-year averages of state and local revenues per student for every district, adjusted for geographic cost differences and inflation. We estimate total district revenues by multiplying the three-year average by 2015 district enrollment to approximate the total resources available to the district given the number of students served in 2015.

This section describes the district-level, three-year average calculations. Note that we create two revenue estimates for each district — one for state and local funding gap analyses and one that includes state revenue only.

Calculating district revenues for the state and local funding analyses

1. Calculate sum of state and local revenues for each year (STLOCREV).

When calculating total revenue for a district, we include state and local funds, as well as dollars for Impact Aid and Indian Education Aid as they help to replace local funds. Because data are reported in thousands of dollars, we also multiply each value by 1,000. For each district, we calculate the following:

$$2013: STLOCREV_{13} = (TSTREV_{13} + TLOCREV_{13} + B10_{13} + B12_{13}) * 1,000$$

$$2014: STLOCREV_{14} = (TSTREV_{14} + TLOCREV_{14} + B10_{14} + B12_{14}) * 1,000$$

$$2015: STLOCREV_{15} = (TSTREV_{15} + TLOCREV_{15} + B10_{15} + B12_{15}) * 1,000$$

2. Adjust district level revenues for inflation (INFREV).

Next, we adjust 2013 and 2014 state and local revenue values to 2015 dollar values using their respective CPI values:[5] For each district, we calculate the following:

$$2013: INFREV_{13} = STLOCREV_{13} * (CPI_{2015}/CPI_{2013})$$

$$2014: INFREV_{14} = STLOCREV_{14} * (CPI_{2015}/CPI_{2014})$$

$$2015: INFREV_{15} = STLOCREV_{15}$$

2. Calculate a three-year average, per-student revenue (AVGRVPST).

Next, we calculated three-year average state and local revenues per student — weighted by student enrollment, so that no one year's finances had an effect on the three-year average beyond that of its enrollment. For each district, we calculate the following:

$$AVGRVPST = (INFREV_{13} + INFREV_{14} + INFREV_{15}) / (V33_{13} + V33_{14} + V33_{15})$$

If enrollment or revenue data were missing for 2013 or 2014, that year's data were excluded from the calculation.

4. Estimate total revenues for each district (ESTTOTREV).

We calculated total revenues for each district by multiplying the average revenue per student by 2015 enrollment. For each district, we calculate the following:

$$ESTTOTREV = AVGRVPST * V33_{15}$$

5. Adjust district-level revenues for geographic cost differences (STADJTOTREV, USADJTOTREV)

To account for the fact that the costs of providing education services vary from one region to another, we adjusted the three-year average district revenues for each district using the 2013–2015 ACS-CWI.

$$STADJTOTREV = ESTTOTREV / ACSCWI_{1315} * ST\_ACSCWI_{1315}$$

$$USADJTOTREV = ESTTOTREV / ACSCWI_{1315}$$

Calculating revenue amounts for the state funding analyses

To perform the state revenue analysis, we repeated steps one through five, excluding TLOCREV, B10, and B12 in step one.

$$2013: INFSTREV_{13} = TSTREV_{13} * (CPI_{2015}/CPI_{2013}) * 1,000$$

$$2014: INFSTREV_{14} = TSTREV_{14} * (CPI_{2015}/CPI_{2014}) * 1,000$$

$$2015: INFSTREV_{15} = TSTREV_{15} * 1,000$$

Calculating Gaps in Revenues Between the Highest and Lowest Poverty Districts

To calculate funding gaps between the highest and lowest poverty districts, we assigned districts to quartiles based on poverty rates, ensuring that each quartile had approximately 25 percent of students. We then compared the average, per-student revenues for the highest and lowest poverty quartiles.

In the state-by-state analysis, districts were sorted by poverty rate and assigned to quartiles within each state. For the national analysis, districts were sorted by poverty rate, regardless of state, and assigned to nationwide quartiles.

All states were included in the national poverty gap analysis, but a number were excluded from the state-by-state analysis. These include Hawaii, which has only one school district, and Nevada, whose student population is heavily concentrated in one district and could not be sorted into quartiles. We also exclude Alaska from within-state analyses because the state's geography and climate drive differences in the cost of education that are not fully reflected in wages and therefore not accounted for in the regional cost of labor adjustment.[6] Finally, because so many New York students are concentrated in New York City, we sorted districts in that state into two halves, as opposed to four quartiles, for all within-state analyses.

Assign districts to within-state and national quartiles

1. Calculate the percent of children in poverty for each district (PCTPOV).

We divided the number of children ages 5 to 17 in the district living in poverty by the total number of children ages 5 to 17 in the district from the SAIPE file. For each district, we calculate:

$$PCTPOV = POV517 / POP517$$

2. Sort districts into quartiles (STQPOV, USQPOV)

To assign districts to within-state quartiles, we sorted districts from the highest poverty rate to the lowest poverty rate — in each state for the within-state quartiles or nationally for the nationwide quartiles, and then divided them into four quartiles so that each quartile had approximately 25 percent of all students — in the state or in the country. Quartile 1 has the districts with the highest poverty rates, while Quartile 4 has the districts with the lowest poverty rates.

Calculating gaps in state and local revenues between the highest and lowest poverty districts

3. Calculate average, per-student revenues for each quartile (STQREVPST, USQREVPST).

Next, we calculated per-student revenues in each state and nationally. For each within-state and nationwide quartile, we calculate:

$$STQREVPST = \sum STADJTOTREV / \sum V33_{15}$$

$$USQREVPST = \sum USADJTOTREV / \sum V33_{15}$$

4. Calculate funding gap between the highest and lowest poverty quartile (STGAP, USGAP).

Finally, we subtracted the per-student funding value of the lowest poverty quartile from that of the highest poverty quartile and calculated the gap as a percentage of the per-student funding value in the lowest poverty quartile. For each state and for the nation, we calculate:

$$STGAP = STQREVPST_{Q1} - STQREVPST_{Q4}$$
$$\text{and } PCTSTGAP = STGAP / STQREVPST_{Q4}$$

$$USGAP = USQREVPST_{Q1} - USQREVPST_{Q4} \text{ and}$$
$$PCTUSGAP = USGAP / USQREVPST_{Q4}$$

Calculating gaps in state revenues between the highest and lowest poverty districts in each state

To calculate the funding gaps in state revenues, we repeated steps three and four using state revenues only.

Accounting for the additional needs of students in poverty

To account for the fact that students in poverty may require additional support to succeed in school, we re-ran the poverty gap analyses (both within-state and national) with the assumption that it costs a district 40 percent more to educate a student in poverty than a student not in poverty. To do this, we counted every student in poverty as 1.4 students, and every student not in poverty as one student. The total weighted number of students (V33WTD) in each district was calculated as follows:

$$V33WTD = (PCTPOV * V33_{15} * 0.4) + V33_{15}$$

District quartile assignments did not change, but we re-calculated per-student revenues for each quartile using the sum of V33WTD as the denominator and re-calculated gaps as described in steps three and four in the *Calculating gaps in state and local revenues between the highest and lowest poverty districts* section.

Calculating Gaps in Revenues Between Districts Serving the Most and the Fewest Students of Color

In addition to poverty gaps, we also examined gaps between districts serving the most students of color and those serving the fewest, both within states and nationwide. To run this analysis, we used the same dataset and methodology as used in the poverty gap analysis, except districts were assigned to quartiles based on the percentage of students of color they serve, not the percentage of students in poverty. The percentage of students of color was calculated by dividing the total number of Black, Latino, and American Indian students in the districts by the total number of students in the districts. In Hawaii, the calculation was the same, except Asian American and Hawaiian/Pacific Islander students were included in the numerator.

As in the poverty analysis, Hawaii, Alaska, and Nevada were excluded from the within-state analysis, while New York was divided into halves as opposed to quartiles. These analyses also exclude Maine, New Hampshire, Vermont, and West Virginia. because students of color make up less than 10 percent of enrollment in these states, which is substantially less than the representation of students of color in all other states.

$$PCTSOC = (AM + BL + HI) / MEMBER$$

NOTES

1. We use the ACS-based CWI because the extended NCES-CWI is not available at the district level for years later than 2013.

2. This results in our analysis using 2014 poverty data for 93 percent of districts in Vermont.

3. These districts are: Arena Union Elementary/Point Arena Joint Union High School District, Santa Cruz City School District, Petaluma City Schools, Santa Rosa City Schools, and Modesto City School District.

4. These include four districts in Illinois, one district in Louisiana, five districts in Maine, two districts in North Dakota, two districts in New York, one district in Oklahoma, and two districts in Oregon.

5. CPI values for 2013, 2014, and 2015 are 232.957, 236.736, and 237.017, respectively.

6. Lori L. Taylor, Jay Chambers, and Joseph P. Robinson, "A New Geographic Cost of Education Index for Alaska: Old Approaches With Some New Twists," *Journal of Education Finance* 30, No 1 (2004): 51-78, http://www.jstor.org/stable/40704220.

ABOUT THE EDUCATION TRUST

The Education Trust is a nonprofit organization that promotes closing opportunity gaps by expanding excellence and equity in education for students of color and those from low-income families from pre-kindergarten through college. Through research and advocacy, the organization builds and engages diverse communities that care about education equity, increases political and public will to act on equity issues, and increases college access and completion for historically underserved students.

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