

$$(\ln) \text{SCHOOL} = b_0 + b_1 \text{State}_i + b_2 \text{LaborMarket}_{ij} + b_3 \text{CWI}_{ij} + b_4 \text{FINANCE}_{ij} + b_5 \text{PopulationDensity}_{ij} + b_6 \text{Enrollment}_{ij} + b_7 \text{INDICATORS}_{ij} + b_8 \text{Scale}_{ij} + b_9 \text{Poverty}_{ij} + b_{10} \text{SchlType}_{ij} + b_{11} \text{DATABASE}_{ij} + e$$



DISTRICT COST DATABASE

USER'S GUIDE

VERSION 1.0 (RELEASED 2021)

This School Finance Indicators Database (SFID) is a collection of data and analysis measuring the adequacy and fairness of K-12 education finance and resources. Its purpose is to provide a single source of data for policymakers, the public, and researchers working in the fields of education finance and economics.

This **District Cost Database (DCD)** is one of two primary public datasets released annually as part of the SFID (this is the first release of the DCD). It allows users to assess the adequacy of K-12 public education spending for roughly 12,000 individual school districts by comparing these districts' actual spending levels to estimates of spending levels that would be required to achieve a common student outcome goal (i.e., national average test scores). The latter (required spending levels), which can be interpreted as imperfect but reasonable and policy-relevant adequate spending targets, are based on models, described below, that are designed to account for a host of educational and non-educational factors that affect the relationship between funding and outcomes. The database also includes a small group of "contextual" variables, such as district child poverty rates (U.S. Census) and districts' racial and ethnic composition, so that users can assess the relationship between spending adequacy and these other characteristics.

A similar set of NECM-based adequacy measures is also available for states (by district poverty quintile); these estimates are part of the State Indicators Database (SID), the SFID's other primary public dataset. Both the DCD and SID datasets, as well as online data visualization tools, reports and briefs using the data, and other resources, are available at: <http://schoolfinancedata.org>.

SECTIONS IN THIS GUIDE

1. **Data use agreement**
2. **Introduction to the database:** a brief non-technical description of methods; some caveats about interpreting and using the data; additional variables included in the full dataset; and how to access the DCD.
3. **List of variables:** a list of all variables in the database, with descriptions and notes.



DATA USE AGREEMENT

The School Finance Indicators Database, as well as the contents of this report, are the sole property of the authors. Public use of the datasets and results is encouraged, with proper attribution. Any alternative use of the data, models, or methods of the SFID must be approved by the authors.

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You agree to acknowledge "*Albert Shanker Institute/Rutgers Graduate School of Education: School Finance Indicators Database, District Cost Database*" as the source of these data. In publications, please cite the data as:

Baker, Bruce D., Di Carlo, Matthew, Srikanth, Ajay, and Weber, Mark A. 2021. *Albert Shanker Institute/Rutgers Graduate School of Education: School Finance Indicators Database, District Cost Database*. Retrieved from: <http://www.schoolfinancedata.org>

Subject to your compliance with the terms and conditions set forth in this Agreement, Rutgers University and the Albert Shanker Institute grant you a revocable, non-exclusive, non-transferable right to access and make use of the Data Sets.

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INTRODUCTION TO THE DATABASE

The District Cost Database (DCD) is a dataset (15 variables) of K-12 school funding adequacy and related measures for approximately 12,000 individual U.S. public school districts. The DCD is part of the School Finance Indicators Database (SFID), a collection of education funding and resource allocation data and analysis published annually by researchers from the Albert Shanker Institute and the Rutgers University Graduate School of Education.

Note: The first version of this district dataset was published by the Century Foundation (2020). We are grateful to the Century Foundation for their important role in supporting the development of these methods.

A quick overview of the National Education Cost Model

In this section, we briefly describe our methods in non-technical terms. For a more thorough discussion of the data and models, as well as other issues addressed below, see Baker et al. (in press) and Baker et al. (2018).

The most important measure included in this district database is what we call “required spending,” which is the estimated amount of spending (per-pupil) each district would have to spend in order to achieve a common outcome goal (i.e., national average test scores). This variable is central, of course, because it is the common standard against which we assess the adequacy of *actual* district spending (i.e., total spending, direct to elementary and secondary education). We interchangeably refer to required spending as “adequate spending,” “predicted cost,” or “cost target.”

Our required spending estimates are derived from the National Education Cost Model (NECM), which is part of the SFID. The NECM has been used to calculate *state-level* adequacy measures for the SFID since its first release in 2019 (also see Baker et al. 2018). This new *district-level* dataset uses the NECM, which is continually updated and improved, to produce the same basic set of measures for individual school districts. The NECM estimates are, to our knowledge, the first input/output-based measures of state and district spending adequacy that can be (carefully) compared across states. The data in this release are for 2018 (the 2017-18 school year).¹

The NECM uses a dataset of district test scores, funding, and numerous other variables between 2009 and 2018.² The core purpose of the NECM is to account for the fact that

¹ Note that the 2021 release of our State Indicators Database also includes NECM estimates for the 2017-18 school year, but they are provided for entire states (by poverty quintile). These state estimates may differ slightly from those included in this DCD release (the state measures are aggregated district measures) due to updated testing data.

² In addition to the SFID's District Indicators Database (SFID 2021), the NECM relies heavily on three additional datasets. The first is the Comparable Wage Index for Teachers (Cornman et al. 2019), an index of regional wage and salary variation developed by researchers at the National Center for Education Statistics (NCES) in collaboration with Dr. Lori Taylor of Texas A&M, who worked with NCES to develop the original version of the index in 2006. The second is the EDGE School Neighborhood Poverty Index, also published by the NCES, which is specifically designed to measure poverty surrounding schools and districts (Geverdt 2019). The third and perhaps most important NECM data source is the Stanford Education Data Archive (SEDA), a groundbreaking database of nationally-normed test scores going back to 2009 (Reardon et al. 2021). The SEDA allows for a better comparison of individual districts' test results across all states, a crucial tool for producing cost model estimates that are comparable across the U.S.

the cost of providing a given level of education is not uniform across districts. Perhaps most importantly, districts that serve larger shares of high-needs students (e.g., higher Census child poverty rates) will have higher costs. In addition, other factors, such as labor costs (e.g., districts in areas with higher costs of living will need to pay their employees more), size (economies of scale), and population density, all affect the “value of the education dollar.” The model, therefore, first estimates the relationships between district spending and these important factors, including testing outcomes.

Importantly, the model accounts for the fact that school funding both affects and is affected by testing outcomes. For example, a district with higher test scores will tend to have higher property values than a district with lower scores. This high valuation allows the former district to collect more property tax revenues, which, in turn, boosts spending and positively affects testing outcomes. The NECM uses econometric methods to account for this endogeneity and tease out the causal relationship between spending and outcomes.

This initial model yields a kind of “relationship inventory” of how each factor is related to spending. We then use the “inventory” to predict the cost (spending levels) of achieving a common outcome level (e.g., national average math and reading test scores) for each individual district, based on that district’s configuration of characteristics (in a sense, by comparing each district to similar districts). These “required spending” estimates can then be compared with *actual* spending levels in each district (this same basic process also yields our state-level estimates, which are aggregated district-level estimates). The difference between actual and required spending is a measure of adequacy relative to the common goal of national average scores. Actual spending data are from the U.S. Census Annual Survey of School System Finances.

Adequacy can be expressed in different ways, such as per-pupil funding gaps (actual minus required spending), actual spending as a percentage of required spending, or the percentage difference between actual and required spending.

A note on missing and excluded data: estimates are not available for every single U.S. school district (i.e., the database does not include all districts). Some of these districts are excluded due to missing finance and/or testing data. This includes but is not limited to fiscally-independent charter schools or other types of special schools or service centers. Wherever feasible, data are imputed to maximize our non-missing sample. We have also decided to exclude from the final database estimates for districts that serve fewer than 100 students, as results based on these small samples tend to be less reliable.

Limitations of the measures

It is important to interpret DCD estimates with caution. Even if we had a way to calculate perfect estimates of education costs, we would certainly never imply that these spending levels, if put into place in a given state or district, would quickly and certainly raise scores to the national average. This not only because that implication assumes efficient use of the additional funds, but also because real improvement is gradual and requires sustained investment.

More importantly, of course, our estimates are far from perfect. This is true of all cost models, but the NECM contends with particularly daunting challenges insofar as it is estimating education costs across the entire nation. Most basically, no model can control for everything (researchers call this “omitted variable bias”). The NECM includes numerous variables that influence the (bi-directional) relationship between funding and student outcomes, but there are unobserved (i.e., unmeasured or unmeasurable) factors that we cannot include. And estimating costs across all states exacerbates this problem (e.g., comparing costs between, say, Connecticut and Mississippi).

Second, the variables that we *do* have are imprecise. Our dataset of test scores, for example, represent a truly groundbreaking effort to make all states’ tests comparable across the nation (Reardon et al. 2021), but these methods, as well as the underlying state testing data, are necessarily subject to error (random and systematic). Similarly, on the funding side of the equation, our data may be biased by differences between states in how spending is tracked and reported to federal agencies (despite the best efforts of the latter). We have specific concerns about recent spending data from Vermont and New York, and about testing outcome data in western and upstate New York.

Third and finally, it bears emphasizing that our cost estimates are based on common outcomes defined solely in terms of math and reading scores in grades 3-8. This is a very narrow picture of student performance. Districts may be spending money in ways that benefit students but do not necessarily affect these testing outcomes.

All that said, we believe the NECM produces reasonable cost estimates that are useful for assessing spending adequacy against a common standard and, ultimately, for improving state and federal school finance policy. We are constantly updating and improving the model to address the issues discussed above.

Additional variables in the DCD

In addition to required and actual spending, as well as basic information about each district, such as district name, state, and NCES local education agency identification number, the DCD includes a small group of supplemental district-level variables:

1. *Outcome gaps.* In order to facilitate the comparison of spending adequacy with actual testing outcomes, the database includes a variable measuring, in standard deviations, the difference between each district’s average score (math and reading combined) and the U.S. average (Reardon et al. 2021).
2. *District contextual characteristics.* We include a small set of measures of district characteristics, including U.S. Census child poverty rates, total enrollment, percent special education students, percent Black students, percent Hispanic students, and percent English language learners.³

Users who wish to incorporate additional variables can use the NCES unique district identification numbers included in the database to merge in district-level datasets.

³ Other than the Census child poverty rates, all of these district characteristics are from the NCES Common Core of Data. We use the terms “Black” and “Hispanic” in the database because these are the categories used by the NCES.

Accessing the data

The full district dataset in Stata or Excel format, as well as a data visualization tool for viewing individual districts' estimates, are available at the SFID project website:

<http://schoolfinancedata.org>

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LIST OF VARIABLES

The table below provides a list of all variables in the District Cost Database, along with brief descriptions and, where applicable, additional notes. Only districts with non-missing actual/required spending estimates are included in the dataset (n=12,220). With two exceptions—*outcomegap* and *iep*—all the variables below are available for all districts in the database (see the notes below). With the exception of state, state abbreviation, and district name, all variables are continuous (numeric). With the exception of year, state, and state abbreviation, all variables are district-level estimates. For information on data sources, see above. This first DCD release includes data for 2018 only.

Variable name	Description	Notes
year	Year of data	Year refers to the spring semester of the school year (e.g., 2018 is the 2017-18 school year).
leaid	NCES district identification number	National Center for Education Statistics unique district identifier.
district	District name	
state_name	State	
stabbr	State two-letter abbreviation	
ppcstot	Actual spending per-pupil	Total state and local expenditures, direct to elementary and secondary education.
predcost	Required (adequate) spending per-pupil	Based on national average test score benchmark.
fundinggap	Gap between actual and required spending per-pupil	The difference between <i>ppcstot</i> and <i>predcost</i> (negative values indicate spending below predicted cost targets).
outcomegap	Gap between district and U.S. average test scores (s.d.)	Expressed in standard deviations (negative values mean the district's scores are below the U.S. average). Outcome gaps are missing for roughly 800 districts.
enroll	Total student enrollment	
pov	Census child (5-17 year old) poverty rate	
iep	Percent special education students	Percent special education is missing for approximately 150 districts, most in Colorado.
ell	Percent English language learners	
black	Percent Black students	
hisp	Percent Hispanic students	