

Family Engagement Impact Study Technical Appendix

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Data Sources and Descriptions

All the data used in this study is publicly available at the following websites.

School Characteristics and Outcomes

- **Total student enrollment, enrollment by student group, mean class size, school grade band, 5Essentials, and all outcomes:** *Illinois State Board of Education* (isbe.net/ilreportcarddata)
- **Magnet indicator, Charter indicator, Title 1 Eligible indicator, and school locale:** *National Center for Education Statistics Common Core of Data* (nces.ed.gov/ccd/elsi)
- **School Modality in 2020-2021:** *COVID-19 School Data Hub* (covid schooldatahub.com/states/Illinois) Note that the Illinois State Board of Education provided the data to the COVID-19 School Data Hub, who makes it publicly available.

Community Characteristics

- **Social Vulnerability Index:** *Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry/ Geospatial Research, Analysis, and Services Program* (atsdr.cdc.gov/placeandhealth/svi)
- **Census self-response rate:** *United States Census* (www2.census.gov/programs-surveys/decennial/2020/data/tracking-response-rates/self-response-rates-map/)
- **Cohesiveness (friend clustering, support) and Civic engagement (volunteering, # civic orgs):** *Opportunity Insights Social Capital Atlas* (data.humdata.org/dataset/social-capital-atlas)
- **County-wide institutional health, community health, collective efficacy, and family unity:** *US Congress Joint Economic Committee, Social Capital Project* (jec.senate.gov/public/index.cfm/republicans/socialcapitalproject)
- **School district size:** *Illinois State Board of Education* (isbe.net/ilreportcarddata)

Outcome Variables

Variable	Source	Description
Chronic Absenteeism	ISBE	"The number of chronically absent students, divided by the enrollment of the responsible school, multiplied by 100. Students are considered chronically absent as defined in Section 26-18 of the School Code. Medically homebound and hospitalized students are excluded from this calculation." Section 26-18 defines chronic absence as "absences that total 10% or more of school days of the most recent academic school year, including absences with and without valid cause, as defined in Section 26-2a of this Code, and out-of-school suspensions for an enrolled student."
Student Attendance Rate	ISBE	"A weighted measure of the number of days a student is present relative to the total number of potential attendance days."
ELA and Math Test Participation	ISBE	"The number and percentage of students that received valid scores on the state's required accountability assessments or its approved alternate assessment in the subject areas of ELA, math, and science. The percentage of participation is the count of students with valid scores, divided by the student enrollment, multiplied by 100."
English Language Arts (ELA) Proficiency	ISBE	"The percentage of students who are proficient (i.e., performance levels 4 and 5 on the Illinois Assessment of Readiness, performance levels 3 and 4 on DLM-AA, performance levels 3 and 4 on SAT in the subject area of ELA)."
Math Proficiency	ISBE	"The percentage of students who are proficient (i.e., performance levels 4 and 5 on IAR, performance levels 3 and 4 on DLM-AA, performance levels 3 and 4 on SAT) in the subject area of math."
5Essentials Supportive Environment (Student Ratings of School Climate)	ISBE	A "summary indicator that describes the school's performance" based on student surveys. The score is on a scale from 1-99 and measures the extent to which students believe a school is safe (students feel safe both in and around the school building, and while they travel to and from home), supportive (students and teachers share a high level of mutual trust and respect), and demanding (school expects all students to attend college and promotes college-readiness).

School Level Control Variables

Variable	Source	Description
5Essentials Involved Families Score	ISBE	A "summary indicator that describes the school's performance" based on teacher surveys. The score is on a scale from 1-99 and measures the extent to which all school staff develop strong relationships with families. More specifically, this score measures teacher perceptions of "Parent influence on decision making in schools", "Parent involvement in school", and "Teacher-parent trust"
Average 4Essentials Score	ISBE	In addition to Involved Families, the other 5Essentials are Effective Leaders, Collaborative Teachers, and Supportive Environment - four foundational supports that help explain why student achievement differs among schools. This variable is included to help control for the overall conditions of the school outside of family engagement. The score is on a scale from 1-99 and is the average of the available four Essentials values.
School Modality	COVID-19 School Data Hub	In-person means "fully in-person instruction 5 days a week for all or most students," hybrid means "a blend or combination of in-person and virtual instruction for all or the majority of students," and remote means "fully remote or distance learning for all or the majority of students." Each school has a value that indicates the percentage of students that participated in each type of learning model for the 2020-2021 school year.
Student Race and Ethnicity	NCES and ISBE	The race or ethnicity of a student is one of seven values: American Indian or Alaska Native, Asian, Black, Hispanic or Latinx, Multiracial (two or more races), Native Hawaiian or Pacific Islander, or White. NCES and ISBE Student Race and Ethnicity data is very highly correlated ($r > .99$), so we use both sources. The NCES data has fewer missing data, so we use NCES values first. In about 3% of cases, we then use ISBE data to fill in missing NCES data.
% Low-income students	ISBE	The percentage of students who "receive or live in households that receive Supplemental Nutrition Assistance Program or Temporary Assistance to Needy Families benefits; are classified as homeless, migrant, runaway, Head Start, or foster children; or live in a household where the household income meets the U.S. Department of Agriculture income guidelines to receive free or reduced-price meals."

School Level Control Variables

Variable	Source	Description
% Students with Disabilities	ISBE	The percentage of students "who were identified as having a disability through formal evaluations and met specific criteria as stated under the Individuals with Disabilities Education Act (IDEA) to be eligible for special education and related services by a team of individuals who developed an Individualized Education Program (IEP) It also includes students with a 504 Plan who are identified as students with a disability who have met specific criteria as stated under the Section 504 of the Rehabilitation Act of 1973 and are eligible to receive accommodations and related services in a general education setting."
Average Class Size	ISBE	"The number of students in a classroom, specifically either the number of students being taught by individual teachers in a classroom or the average number of students being taught by teachers in a school."
Log of Student Enrollment	ISBE	The log of the total number of students enrolled as of October 1st of the school year. Using the log of the enrollment allows our model to provide an estimate on the relationship between a 10% change in enrollment and the outcome.
Charter School Indicator	NCES	Indicator if school is a charter school, defined by NCES as a school "that provides free elementary and/or secondary education to eligible students under a specific charter granted by the state legislature or other appropriate authority."
Magnet School Indicator	NCES	Indicator if school is a magnet school, defined by NCES as a "school or program is a special school or program designed to: attract students of different racial/ethnic backgrounds for the purpose of reducing, preventing, or eliminating racial isolation; and/or to provide an academic or social focus on a particular theme (e.g., science/math, performing arts, gifted/talented, or foreign language)."

School Level Control Variables

Variable	Source	Description
Title 1 Eligible School Indicator	NCES	Indicator is a school is Title 1 Eligible, defined by NCES as “a school designated under appropriate state and federal regulations as being high poverty and eligible for participation in programs authorized by Title I of P.L. 107-110. A Title I eligible school is one in which the percentage of children from low-income families is at least as high as the percentage of children from low-income families served by the LEA as a whole or that the LEA has designated as Title I eligible because 35 percent or more of the children are from low-income families.”
School Grade Band	ISBE	Indicators for whether the school is in an Elementary School, Middle School, or High School based on NCES definitions. Schools with a minimum grade level at or below 3 rd and a maximum grade level of 8 th are Elementary. Schools with a minimum grade level between 4 th and 7 th and a maximum grade level between 4 th and 9 th are Middle. Schools with a minimum grade level between 7 th and 12 th and a maximum grade level between 10 th and 12 th are High. Schools are classified as “Other” if they do not fit any of those criteria” – for example, a K-12 school – and they make up only 1.2% of the 2022 dataset.
School District Size	ISBE	Indicator for Large, Medium, and Small-sized school districts.
School Locale	NCES	Indicators for whether the school is in a City, Town, or Rural, with Suburb the excluded category. These categories are more general versions of the 12 available categories. According to NCES, “locales are assigned to schools based on their reported physical address location. Agencies may operate schools in more than one type of locale therefore an agency locale assignment reflects the dominant locale where most students are enrolled in school. The 12 locales include: City-Large (11), City-Midsize (12), City-Small (13), Suburb-Large (21), Suburb-Midsize (22), Suburb-Small (13), Town-Fringe (31), Town-Distant (32), Town-Remote (33), Rural-Fringe (41), Rural-Distant (42), Rural-Remote (43).”

Community Level Control Variables

Variable	Source	Description
Census Self-Response Rate	U.S. Census	"Self-response rates are calculated by dividing the number of self-responses collected online, by phone, and by mail by the number of mailable housing units in Self Response enumeration areas and the number of housing units in Update Leave enumeration areas and multiplying by 100." Only one response per housing unit is used to determine this rate." This rate is used as a proxy for trust in government*. Tract data joined to schools via the 'point-in-place' method. The data is from 2020.
Social Vulnerability Index	CDC/ATSDR	CDC's measure of social vulnerability, which "refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss." Tract data joined to schools via the 'point-in-place' method. The data is from 2018 and 2020.
Cohesiveness - Support Ratio	Opportunity Insights	Based on Facebook data, the rate at which friend pairs share additional mutual friends in zip code. Zip code data joined to schools via the 'point-in-place' method. That data is from 2022.
Cohesiveness - Clustering	Opportunity Insights	Based on Facebook data, the rate at which two people in a zip code who are friends with the same person are friends with each other. Zip code data joined to schools via the 'point-in-place' method. That data is from 2022.
Density of Civic Organizations	Opportunity Insights	A measure of civic engagement based on Facebook data, the proportion of people who are members of civic groups. Zip code data joined to schools via the 'point-in-place' method. That data is from 2022.
Volunteering Rate	Opportunity Insights	A measure of civic engagement based on Facebook data, the number of civic organizations per 1000 people. Zip code data joined to schools via the 'point-in-place' method. That data is from 2022.

*For example, see: cepr.harvard.edu/sites/hwpi.harvard.edu/files/cepr/files/explaining_covid_losses_5.23.pdf
 Sources: www2.census.gov/programs-surveys/decennial/2020/data/tracking-response-rates/response-rate-map-faqs.pdf, and atsdr.cdc.gov/placeandhealth/svi/index.html and data.humdata.org/dataset/social-capital-atlas

Community Level Control Variables

Variable	Source	Description
Collective Efficacy Index	Social Capital Project	A measure of social capital based on violent crimes per 100,000. County data joined to schools via the 'point-in-place' method. The data is from 2008-2014.
Community Health Index	Social Capital Project	A composite measure of social capital based on the number of non-religious non-profit organizations per 1,000 (2015), the number of religious congregations per 1,000 (2010), and an "Informal Civil Society Sub-Index" that captures the share of 'people who volunteered (2015), attended a public meeting (2015), reported having worked with neighbors to fix/improve something (2015), served on a committee or as an officer (2013), attended a meeting where politics was discussed (2008), and took part in a demonstration in the past year (2008)'. County data joined to schools via the 'point-in-place' method.
Family Unity Index	Social Capital Project	A composite measure of social capital based on the share of births in past year to women who were unmarried, the share of women ages 35-44 who are currently married (and not separated), and the share of own children living in a single-parent family. County data joined to schools via the 'point-in-place' method. The data is from 2016.
Institutional Health Index	Social Capital Project	A composite measure of social capital based on mail-back response rates for the 2010 Census, 2012 and 2016 voting rates for citizens 18+ in presidential elections, and a "Confidence in Institutions Sub-Index" that captures the share of people who report "at least some confidence in corporations, in the media, and in public schools" (2013). County data joined to schools via the 'point-in-place' method.

Modeling Approach

We used publicly available school and community level data to model the connection between pre-pandemic family engagement and post-pandemic outcomes.

$$Y_{it} = \beta_0 + \beta_1 * Involved_Families_{i,2019} + \beta_2 * Y_{i,2019} + \beta_3 * 4Essentials_{i,2019} + \mathbf{BS}_{i,t} + \epsilon_{it}$$



OUTCOMES

t = 2022

Engagement Outcomes

- Student Attendance Rate
- Chronic Absenteeism
- Math/ELA Test Participation

Learning Outcomes

- Math/ELA Proficiency

School Climate Outcomes

- 5Essentials Supportive Environment (i.e., student ratings of school climate)



FAMILY ENGAGEMENT

This is our key variable of interest

Primary Specification

- 2019 Involved Families Score



LAGGED OUTCOME

Controlling for outcome prior to pandemic controls for pre-pandemic differences between schools so we can focus on the extent to which family engagement is associated with better-than-expected outcomes.

Primary Specification

- 2019 outcome



KEY CONTROL VARIABLES

We control for other characteristics of schools that might be associated with the post-pandemic outcome. These include:

Perceptions on Other 4 Essentials

Help to isolate the role of family engagement above and beyond other organizational characteristics of schools.

Schools' Characteristics

- School measures of student poverty, race/ethnicity, disability, total enrollment, and mean class size;
- School types (elementary, middle, high; and magnet, charter, title 1 eligible);
- locale (city, suburb, etc.);
- School in-person modality in 2020-21

Community Characteristics

- Tract (CDC Social Vulnerability, Census rates);
- Zip (Civic engagement & Cohesiveness);
- County (Institutional & community health)
- School District Size

In addition to our main model specification, we also examine the extent to which the relationship between family engagement and outcomes varied by school type, as well as how it differed from a fully pre-pandemic relationship.

To what extent does the relationship between family engagement and outcomes vary by school type?

For each outcome, we repeated the main model specification with interaction effects between the Involved Families Index and school percent FRL, school level (elementary, middle, high), and school locale (city, suburban, town, rural). We used three different models, each with a separate interaction effect.

To what extent does the relationship between family engagement and post-pandemic outcomes differ from its pre-pandemic version?

We repeat all models with the 2018-2019 version of the outcomes and appropriately lagged controls. This allows us to measure the relationship between the Involved Families Index and outcomes in a purely pre-pandemic time.

We showcase the effect of family engagement by providing the estimated difference in the outcome for two schools who are a distance apart on the Involved Families Index that is equal to the difference between the 90th and 10th percentile.

Making sense of the 1-99 Involved Families Index

Though all models use the raw IRT-based Involved Families Index for each school, we don't believe the typical reader will easily know how to interpret a change of 1, 10, 20, ...etc. points on this scale.

Therefore, all model-based Involved Families Index results below are converted to the relationship associated with a change in index of 52 points, which represents moving from the 10th percentile statewide on family engagement (IFE = 26) to the 90th percentile (IFE = 78).

We include over 3,000 schools in the primary models and use imputation to address small amounts of missing data.

Analytic sample

We include schools that appear in both the 2019 and 2022 Illinois Report Card dataset, are classified by NCES as "regular" schools (i.e., "a public elementary/secondary school providing instruction and education services that does not focus primarily on special education, vocational/technical education, or alternative education"), are K-12 schools, and are not virtual schools. In 2022, there are 3,841 schools in the raw data set and the filtered data set includes 3,720 schools - a loss of about 3% of schools.

Dealing with missing data

For any variable we can reasonably assume would be the same for almost all schools across time, we first impute using the "Last Observation Carried Forward" approach and then using the "Next Observation Carried Backward" approach. We imputed values this way for the following variables: school locale, school types (charter, magnet, title 1 eligible), school grade band, and school district size. For all other control variables with missing data, we used random forests imputation. We imputed values for the following variables using this approach % Low-Income students, % Students with Disabilities, Race and Ethnicity, Average Class Size, Census Self-Response Rate, Density of Civic Organizations, and Volunteering Rate. Overall, there are a very small number of imputed values (see the descriptive statistics for details). The variable with the highest number of imputed values is % Low-Income students which has less than 2% imputed values (65 of 3,720).

For each model, only schools that have non-missing values for the outcome of interest and the control variables are included. Our sample size for each model, therefore, varies somewhat based on data availability. The imputed values are used directly in the model along with a set of binary variables that indicate if the original control variable was missing.

Descriptive Statistics

The tables in this section provide summary statistics for all control and outcome variables used in the statistical modeling for this study.

Most of the results presented in this study are based on the primary 'Pandemic-Related' model which explores the relationship between the Involved Families scores in 2019 with student outcomes in 2022. Consequently, the descriptive statistics below focus on the control variables used in this model, most of which were measured in 2022.

For numeric variables, each table in this section presents mean or average value, standard deviation, minimum value, and maximum value. For categorical variables, each table presents the proportion of schools in the dataset that fit into that category. The "Geography" value indicates the level at which the data is publicly available and used in this study.

Where we compare these findings to the 'Pre-Pandemic Relationship,' we require input variables from 2016 and 2018 with outcome variables in 2019. Accordingly, the tables in this section include summary statistics for the control and outcome variables included in the 'Pandemic-Related: 2019 to 2022' models, the 'Pre-Pandemic: 2016 to 2019' models, and the 'Pre-Pandemic: 2018 to 2019' models.

The final slide in this section includes the summary statistics for the outcome variables in 2019 and 2022.

Control Variables - 'Pandemic-Related: 2019 to 2022' Model

	Mean	SD	Min	Max	Prop	Geography
Lagged Outcome Variable						
Chronic Absenteeism in 2019	0.16	0.14	0.00	1.00	-	School
ELA Proficiency in 2019	0.35	0.18	0.00	0.97	-	School
ELA Test Participation in 2019	0.99	0.04	0.25	1.00	-	School
Math Proficiency in 2019	0.30	0.19	0.00	0.95	-	School
Math Test Participation in 2019	0.98	0.04	0.22	1.00	-	School
Student Attendance Rate in 2019	0.94	0.03	0.50	1.00	-	School
Supportive Environment Score in 2019	60.55	17.13	2.00	99.00	-	School
Five Essentials						
Average 4Essentials Score in 2019	54.81	13.37	9.00	99.00	-	School
Involved Families Score in 2019	51.56	19.56	2.00	99.00	-	School
School Modality						
% Hybrid Learning in 2020-21	0.28	0.22	0.00	1.00	-	School
% In-person Learning in 2020-21	0.27	0.30	0.00	1.00	-	School
Student Race and Ethnicity						
% American Indian or Alaska Native	0.00	0.01	0.00	0.22	-	School
% Asian	0.04	0.08	0.00	0.83	-	School
% Black	0.18	0.28	0.00	1.00	-	School
% Hispanic or Latinx	0.22	0.26	0.00	1.00	-	School
% Multiracial	0.04	0.03	0.00	0.34	-	School
% Native Hawaiian or Pacific Islander	0.00	0.00	0.00	0.06	-	School
Student Enrollment Characteristics						
% Low-Income Students	0.50	0.27	0.02	1.00	-	School
% Students with Disabilities	0.20	0.06	0.04	1.00	-	School
Average Class Size	20.07	4.48	2.00	33.30	-	School
Log of Student Enrollment in 2019	5.98	0.71	3.37	8.44	-	School
School Types						
Charter School	0.04	0.19	0.00	1.00	-	School
Magnet School	0.04	0.19	0.00	1.00	-	School
Title 1 Eligible School	0.84	0.36	0.00	1.00	-	School
School Grade Band						
Elementary School	-	-	-	-	0.622	School
High School	-	-	-	-	0.178	School
Middle School	-	-	-	-	0.188	School
Other School	-	-	-	-	0.012	School

	Mean	SD	Min	Max	Prop	Geography
School District Size						
Large District	-	-	-	-	0.619	District
Medium District	-	-	-	-	0.288	District
Small District	-	-	-	-	0.093	District
School Locale						
City	-	-	-	-	0.256	School
Rural	-	-	-	-	0.212	School
Suburb	-	-	-	-	0.410	School
Town	-	-	-	-	0.122	School
Community Characteristics						
Census Self-Response Rate	0.72	0.12	0.29	0.95	-	Census Tract
Social Vulnerability Index in 2020	0.46	0.28	0.00	1.00	-	Census Tract
Cohesiveness - Support Ratio	0.92	0.07	0.20	1.00	-	Zipcode
Density of Civic Organizations	0.01	0.01	0.00	0.08	-	Zipcode
Volunteering Rate	0.08	0.03	0.02	0.28	-	Zipcode
Collective Efficacy Index	-0.66	1.22	-7.06	1.17	-	County
Community Health Index	-0.62	0.39	-1.26	1.43	-	County
Family Unity Index	0.00	0.76	-3.51	1.94	-	County
Institutional Health Index	-0.25	0.31	-1.61	0.68	-	County
Imputation Flag						
% American Indian or Alaska Native	-	-	-	-	0.003	School
% Asian	-	-	-	-	0.002	School
% Low-Income Students	-	-	-	-	0.017	School
% Multiracial	-	-	-	-	0.001	School
% Students with Disabilities	-	-	-	-	0.012	School
Average Class Size	-	-	-	-	0.007	School
Title 1 Eligible School	-	-	-	-	0.002	School
Census Self-Response Rate	-	-	-	-	0.001	Census Tract
Density of Civic Organizations	-	-	-	-	0.030	Zipcode
Volunteering Rate	-	-	-	-	0.025	Zipcode

Note: The dataset for the 2019 to 2022 analysis includes 3,720 K-12 schools. Some variables represent a different number of schools due to variations in data availability.

Control Variables - 'Pre-Pandemic: 2016 to 2019' Model

	Mean	SD	Min	Max	Prop	Geography
Lagged Outcome Variable						
ELA Proficiency in 2016	0.35	0.18	0.00	1.00	-	School
ELA Test Participation in 2016	0.98	0.07	0.00	1.00	-	School
Math Proficiency in 2016	0.29	0.19	0.00	0.94	-	School
Math Test Participation in 2016	0.98	0.07	0.00	1.00	-	School
Student Attendance Rate in 2016	0.95	0.02	0.72	1.00	-	School
Supportive Environment Score in 2016	51.03	17.99	2.00	99.00	-	School
Five Essentials						
Average 4Essentials Score in 2016	51.45	15.47	9.50	99.00	-	School
Involved Families Score in 2016	53.42	19.84	2.00	99.00	-	School
Student Race and Ethnicity						
% American Indian or Alaska Native	0.00	0.00	0.00	0.10	-	School
% Asian	0.04	0.08	0.00	0.81	-	School
% Black	0.17	0.28	0.00	1.00	-	School
% Hispanic or Latinx	0.21	0.26	0.00	1.00	-	School
% Multiracial	0.04	0.03	0.00	0.29	-	School
% Native Hawaiian or Pacific Islander	0.00	0.00	0.00	0.05	-	School
Student Enrollment Characteristics						
% Low-Income Students	0.50	0.28	0.00	1.00	-	School
% Students with Disabilities	0.18	0.05	0.01	0.61	-	School
Average Class Size	21.18	4.58	2.00	34.60	-	School
Log of Student Enrollment in 2016	6.03	0.70	2.71	8.45	-	School
School Types						
Charter School	0.01	0.10	0.00	1.00	-	School
Magnet School	0.03	0.18	0.00	1.00	-	School
Title 1 Eligible School	0.87	0.34	0.00	1.00	-	School
School Grade Band						
Elementary School	-	-	-	-	0.627	School
High School	-	-	-	-	0.170	School
Middle School	-	-	-	-	0.192	School
Other School	-	-	-	-	0.011	School

	Mean	SD	Min	Max	Prop	Geography
School District Size						
Large District	-	-	-	-	0.610	District
Medium District	-	-	-	-	0.295	District
Small District	-	-	-	-	0.096	District
School Locale						
City	-	-	-	-	0.237	School
Rural	-	-	-	-	0.217	School
Suburb	-	-	-	-	0.420	School
Town	-	-	-	-	0.126	School
Community Characteristics						
Social Vulnerability Index in 2018	0.45	0.28	0.00	1.00	-	Census Tract
Cohesiveness - Support Ratio	0.92	0.07	0.39	1.00	-	Zipcode
Density of Civic Organizations	0.01	0.01	0.00	0.08	-	Zipcode
Volunteering Rate	0.08	0.03	0.02	0.28	-	Zipcode
Collective Efficacy Index	-0.63	1.23	-7.06	1.17	-	County
Community Health Index	-0.61	0.39	-1.26	1.43	-	County
Family Unity Index	0.01	0.77	-3.51	1.94	-	County
Institutional Health Index	-0.24	0.31	-1.61	0.68	-	County
Imputation Flag						
Density of Civic Organizations	-	-	-	-	0.031	Zipcode
Volunteering Rate	-	-	-	-	0.026	Zipcode

Note: The dataset for the 2016 to 2019 analysis includes 3,601 K-12 schools. Some variables represent a different number of schools due to variations in data availability.

Control Variables - 'Pre-Pandemic: 2018 to 2019' Model

	Mean	SD	Min	Max	Prop	Geography
Lagged Outcome Variable						
Chronic Absenteeism in 2018	0.15	0.15	0.00	1.00	-	School
ELA Proficiency in 2018	0.35	0.19	0.00	0.99	-	School
ELA Test Participation in 2018	0.98	0.05	0.16	1.00	-	School
Math Proficiency in 2018	0.30	0.19	0.00	0.97	-	School
Math Test Participation in 2018	0.98	0.05	0.16	1.00	-	School
Student Attendance Rate in 2018	0.94	0.03	0.49	0.99	-	School
Supportive Environment Score in 2018	53.79	17.22	5.00	99.00	-	School
Five Essentials						
Average 4Essentials Score in 2018	53.11	15.18	7.50	97.00	-	School
Involved Families Score in 2018	53.75	19.36	3.00	99.00	-	School
Student Race and Ethnicity						
% American Indian or Alaska Native	0.00	0.00	0.00	0.10	-	School
% Asian	0.04	0.08	0.00	0.81	-	School
% Black	0.18	0.29	0.00	1.00	-	School
% Hispanic or Latinx	0.21	0.26	0.00	1.00	-	School
% Multiracial	0.04	0.03	0.00	0.29	-	School
% Native Hawaiian or Pacific Islander	0.00	0.00	0.00	0.05	-	School
Student Enrollment Characteristics						
% Low-Income Students	0.51	0.28	0.00	1.00	-	School
% Students with Disabilities	0.18	0.06	0.01	0.96	-	School
Average Class Size	21.19	4.74	2.00	34.60	-	School
Log of Student Enrollment in 2018	6.00	0.70	3.04	8.44	-	School
School Types						
Charter School	0.04	0.19	0.00	1.00	-	School
Magnet School	0.04	0.19	0.00	1.00	-	School
Title I Eligible School	0.85	0.36	0.00	1.00	-	School
School Grade Band						
Elementary School	-	-	-	-	0.621	School
High School	-	-	-	-	0.178	School
Middle School	-	-	-	-	0.189	School
Other School	-	-	-	-	0.012	School

	Mean	SD	Min	Max	Prop	Geography
School District Size						
Large District	-	-	-	-	0.618	District
Medium District	-	-	-	-	0.288	District
Small District	-	-	-	-	0.094	District
School Locale						
City	-	-	-	-	0.256	School
Rural	-	-	-	-	0.212	School
Suburb	-	-	-	-	0.409	School
Town	-	-	-	-	0.123	School
Community Characteristics						
Social Vulnerability Index in 2018	0.45	0.28	0.00	1.00	-	Census Tract
Cohesiveness - Support Ratio	0.92	0.07	0.20	1.00	-	Zipcode
Density of Civic Organizations	0.01	0.01	0.00	0.08	-	Zipcode
Volunteering Rate	0.08	0.03	0.02	0.28	-	Zipcode
Collective Efficacy Index	-0.66	1.22	-7.06	1.17	-	County
Community Health Index	-0.62	0.39	-1.26	1.43	-	County
Family Unity Index	0.00	0.76	-3.51	1.94	-	County
Institutional Health Index	-0.25	0.31	-1.61	0.68	-	County
Imputation Flag						
Density of Civic Organizations	-	-	-	-	0.030	Zipcode
Volunteering Rate	-	-	-	-	0.025	Zipcode

Note: The dataset for the 2018 to 2019 analysis includes 3,708 K-12 schools. Some variables represent a different number of schools due to variations in data availability.

Outcomes in 2019 and 2022

Outcomes in 2019

	Mean	SD	Min	Max
Attendance and Engagement				
Chronic Absenteeism	0.16	0.14	0.00	1.00
ELA Test Participation	0.99	0.04	0.25	1.00
Math Test Participation	0.98	0.04	0.22	1.00
Student Attendance Rate	0.94	0.03	0.50	1.00
Achievement				
ELA Proficiency	0.35	0.18	0.00	0.97
Math Proficiency	0.30	0.19	0.00	0.95
School Climate				
5Essentials Supportive Environment	60.56	17.13	2.00	99.00

Note: The dataset for the 2018 to 2019 analysis includes 3,708 K-12 schools. Some variables represent a different number of schools due to variations in data availability.

Outcomes in 2022

	Mean	SD	Min	Max
Attendance and Engagement				
Chronic Absenteeism	0.29	0.17	0.03	0.99
ELA Test Participation	0.98	0.04	0.41	1.00
Math Test Participation	0.98	0.04	0.41	1.00
Student Attendance Rate	0.91	0.05	0.45	1.00
Achievement				
ELA Proficiency	0.28	0.18	0.00	0.95
Math Proficiency	0.24	0.18	0.00	0.95
School Climate				
5Essentials Supportive Environment	60.57	15.71	3.00	99.00

Note: The dataset for the 2019 to 2022 analysis includes 3,720 K-12 schools. Some variables represent a different number of schools due to variations in data availability.

Models Output

Pandemic-Related

2019 to 2022

The tables in this section provide the model output from the primary modeling approach that includes the Involved Families score from 2019 and the outcome from 2022.

Each table in this section presents both the “standardized” and “raw” coefficients. “Raw” refers to models that include each variable’s original values – for example, Involved Families scores of 1 to 99. See the Descriptive Statistics appendix for each variable’s raw scale. “Standardized” values have been put on a common scale to have a mean of 0 and standard deviation of 1 (a z-score) where the estimate represents the change in SDs a 1-SD change in the variable is associated with. This allows us to compare the coefficients more directly to one another.

The p-value is the same for both models, and a p-value less than .05 suggests that the observed association between the corresponding variable and the outcome is statistically significant. This means it's unlikely we would see such an association by chance alone, assuming no actual relationship exists.ⁱ

The raw coefficients are used in the visuals that appear in the body of this deck. For example, for Chronic Absenteeism in 2022, the raw coefficient for Involved Families is -.0012. This means that, holding all other variables in the model constant, for each 1-point increase in Involved Families we expect chronic absenteeism to decrease by 0.12%. Accordingly, a 52-point increase (which is the difference between a 10th and 90th percentile school) is associated with a 6.2% drop in Chronic Absenteeism ($52 * -.0012 = -.062$).

ⁱ Source: James, Gareth, et al. *An Introduction to Statistical Learning: With Applications in R*. Springer, 2022.

Chronic Absenteeism in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Chronic Absenteeism in 2019	0.40	0.01	0.4779	0.0172	0.000
Five Essentials					
Average 4Essentials Score in 2019	0.00	0.01	0.0001	0.0002	0.721
Involved Families Score in 2019	-0.14	0.02	-0.0012	0.0001	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	-0.04	0.01	-0.0276	0.0108	0.011
% In-person Learning in 2020-21	0.00	0.02	0.0024	0.0098	0.808
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.01	0.01	0.3093	0.2762	0.263
% Asian	-0.04	0.01	-0.0875	0.0235	0.000
% Black	0.16	0.02	0.0939	0.0139	0.000
% Hispanic or Latinx	0.07	0.02	0.0417	0.0134	0.002
% Multiracial	0.01	0.01	0.0331	0.0515	0.521
% Native Hawaiian or Pacific Islander	-0.01	0.01	-0.9606	0.6444	0.136
Student Enrollment Characteristics					
% Low-Income Students	0.12	0.02	0.0730	0.0129	0.000
% Students with Disabilities	0.05	0.01	0.1454	0.0301	0.000
Average Class Size	0.01	0.01	0.0004	0.0005	0.334
Log of Student Enrollment in 2019	-0.02	0.02	-0.0039	0.0036	0.278
School Types					
Charter School	0.09	0.06	0.0150	0.0102	0.141
Magnet School	-0.11	0.05	-0.0186	0.0082	0.024
Title 1 Eligible School	0.07	0.03	0.0114	0.0052	0.029
School Grade Band (vs. Elementary)					
High School	0.37	0.03	0.0627	0.0057	0.000
Middle School	0.00	0.03	-0.0006	0.0044	0.885
Other School	0.26	0.09	0.0432	0.0149	0.004
School District Size (vs. Large)					
Medium District	-0.05	0.03	-0.0086	0.0047	0.069
Small District	-0.18	0.05	-0.0310	0.0086	0.000

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.28	0.05	-0.0470	0.0082	0.000
Suburb	-0.36	0.03	-0.0606	0.0050	0.000
Town	-0.31	0.05	-0.0526	0.0082	0.000
Community Characteristics					
Census Self-Response Rate	-0.04	0.02	-0.0564	0.0219	0.010
Social Vulnerability Index in 2020	0.03	0.02	0.0195	0.0093	0.036
Cohesiveness - Support Ratio	-0.04	0.01	-0.0902	0.0310	0.004
Density of Civic Organizations	-0.02	0.01	-0.4451	0.2319	0.055
Volunteering Rate	-0.03	0.01	-0.1547	0.0601	0.010
Collective Efficacy Index	-0.08	0.02	-0.0104	0.0026	0.000
Community Health Index	0.01	0.01	0.0038	0.0063	0.544
Family Unity Index	0.02	0.02	0.0052	0.0043	0.226
Institutional Health Index	0.04	0.01	0.0204	0.0069	0.003
Imputation Flag					
% American Indian or Alaska Native	-0.08	0.33	-0.0137	0.0551	0.804
% Asian	0.38	0.42	0.0639	0.0700	0.361
% Low-Income Students	-0.06	0.09	-0.0106	0.0157	0.500
% Multiracial	-0.16	0.44	-0.0268	0.0740	0.718
% Students with Disabilities	0.23	0.24	0.0386	0.0399	0.333
Average Class Size	-0.07	0.14	-0.0111	0.0238	0.639
Title 1 Eligible School	0.29	0.29	0.0479	0.0495	0.333
Census Self-Response Rate	0.27	0.36	0.0447	0.0603	0.459
Density of Civic Organizations	0.26	0.22	0.0428	0.0362	0.236
Volunteering Rate	-0.06	0.22	-0.0102	0.0373	0.784
School District Size	-0.10	0.36	-0.0167	0.0608	0.783

Note: The model includes 3,212 schools. The adjusted R-squared value is 0.74

Student Attendance in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Student Attendance Rate in 2019	0.60	0.01	0.9033	0.0180	0.000
Five Essentials					
Average 4Essentials Score in 2019	-0.01	0.01	0.0000	0.0000	0.521
Involved Families Score in 2019	0.07	0.01	0.0002	0.0000	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.04	0.01	0.0078	0.0027	0.004
% In-person Learning in 2020-21	0.00	0.02	-0.0007	0.0025	0.764
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.01	-0.0392	0.0699	0.575
% Asian	0.03	0.01	0.0170	0.0059	0.004
% Black	-0.11	0.02	-0.0178	0.0035	0.000
% Hispanic or Latinx	-0.03	0.02	-0.0062	0.0034	0.064
% Multiracial	0.02	0.01	0.0227	0.0130	0.081
% Native Hawaiian or Pacific Islander	0.01	0.01	0.2190	0.1612	0.174
Student Enrollment Characteristics					
% Low-Income Students	-0.05	0.02	-0.0093	0.0032	0.004
% Students with Disabilities	-0.06	0.01	-0.0524	0.0075	0.000
Average Class Size	-0.01	0.01	-0.0001	0.0001	0.202
Log of Student Enrollment in 2019	0.02	0.01	0.0015	0.0009	0.085
School Types					
Charter School	-0.07	0.05	-0.0034	0.0025	0.177
Magnet School	0.07	0.04	0.0034	0.0021	0.099
Title 1 Eligible School	-0.03	0.03	-0.0012	0.0013	0.348
School Grade Band (vs. Elementary)					
High School	-0.36	0.03	-0.0174	0.0014	0.000
Middle School	-0.01	0.02	-0.0005	0.0011	0.676
Other School	-0.29	0.08	-0.0139	0.0037	0.000
School District Size (vs. Large)					
Medium District	0.07	0.02	0.0032	0.0012	0.008
Small District	0.21	0.04	0.0100	0.0021	0.000

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.30	0.04	0.0146	0.0021	0.000
Suburb	0.34	0.03	0.0166	0.0013	0.000
Town	0.32	0.04	0.0154	0.0021	0.000
Community Characteristics					
Census Self-Response Rate	0.05	0.01	0.0206	0.0055	0.000
Social Vulnerability Index in 2020	-0.01	0.01	-0.0024	0.0023	0.311
Cohesiveness - Support Ratio	0.02	0.01	0.0152	0.0078	0.051
Density of Civic Organizations	0.02	0.01	0.0965	0.0581	0.097
Volunteering Rate	0.02	0.01	0.0255	0.0151	0.091
Collective Efficacy Index	0.07	0.02	0.0026	0.0007	0.000
Community Health Index	0.00	0.01	-0.0005	0.0016	0.760
Family Unity Index	-0.03	0.02	-0.0022	0.0011	0.046
Institutional Health Index	-0.03	0.01	-0.0046	0.0017	0.008
Imputation Flag					
% American Indian or Alaska Native	0.76	0.28	0.0367	0.0137	0.007
% Asian	-1.41	0.35	-0.0680	0.0168	0.000
% Low-Income Students	-0.04	0.07	-0.0020	0.0036	0.587
% Multiracial	-0.99	0.35	-0.0478	0.0168	0.004
% Students with Disabilities	0.41	0.15	0.0199	0.0072	0.006
Average Class Size	-0.09	0.13	-0.0043	0.0060	0.474
Title 1 Eligible School	-0.03	0.23	-0.0014	0.0109	0.900
Census Self-Response Rate	0.00	0.32	-0.0002	0.0153	0.991
Density of Civic Organizations	-0.30	0.18	-0.0144	0.0086	0.092
Volunteering Rate	0.19	0.18	0.0091	0.0089	0.302
School District Size	-0.07	0.32	-0.0033	0.0154	0.830

Note: The model includes 3,274 schools. The adjusted R-squared value is 0.77

ELA Test Participation in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
ELA Test Participation in 2019	0.40	0.01	0.4337	0.0142	0.000
Five Essentials					
Average 4Essentials Score in 2019	-0.02	0.02	-0.0001	0.0001	0.305
Involved Families Score in 2019	0.09	0.02	0.0002	0.0000	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.00	0.02	0.0006	0.0037	0.878
% In-person Learning in 2020-21	-0.04	0.02	-0.0063	0.0034	0.065
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.01	0.0024	0.0959	0.980
% Asian	-0.02	0.02	-0.0088	0.0082	0.280
% Black	-0.07	0.03	-0.0102	0.0048	0.033
% Hispanic or Latinx	-0.04	0.03	-0.0072	0.0047	0.121
% Multiracial	-0.03	0.01	-0.0349	0.0178	0.050
% Native Hawaiian or Pacific Islander	-0.01	0.01	-0.1871	0.2435	0.442
Student Enrollment Characteristics					
% Low-Income Students	-0.06	0.03	-0.0091	0.0044	0.042
% Students with Disabilities	-0.06	0.01	-0.0449	0.0103	0.000
Average Class Size	0.06	0.02	0.0006	0.0002	0.000
Log of Student Enrollment in 2019	0.01	0.02	0.0005	0.0012	0.663
School Types					
Charter School	-0.17	0.08	-0.0072	0.0033	0.029
Magnet School	0.12	0.07	0.0053	0.0028	0.058
Title 1 Eligible School	0.05	0.04	0.0023	0.0018	0.207
School Grade Band (vs. Elementary)					
High School	-0.68	0.04	-0.0292	0.0017	0.000
Middle School	-0.17	0.03	-0.0075	0.0015	0.000
Other School	-0.17	0.12	-0.0073	0.0050	0.142
School District Size (vs. Large)					
Medium District	0.02	0.04	0.0011	0.0017	0.524
Small District	0.07	0.07	0.0031	0.0029	0.285

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.29	0.07	0.0126	0.0028	0.000
Suburb	0.20	0.04	0.0085	0.0017	0.000
Town	0.27	0.07	0.0118	0.0029	0.000
Community Characteristics					
Census Self-Response Rate	0.01	0.02	0.0031	0.0074	0.678
Social Vulnerability Index in 2020	0.01	0.02	0.0008	0.0032	0.793
Cohesiveness - Support Ratio	0.05	0.02	0.0280	0.0108	0.009
Density of Civic Organizations	-0.01	0.01	-0.0342	0.0788	0.664
Volunteering Rate	-0.02	0.02	-0.0241	0.0207	0.246
Collective Efficacy Index	-0.05	0.03	-0.0017	0.0009	0.068
Community Health Index	0.01	0.02	0.0014	0.0022	0.533
Family Unity Index	0.07	0.03	0.0037	0.0015	0.013
Institutional Health Index	-0.02	0.02	-0.0030	0.0024	0.211
Imputation Flag					
% American Indian or Alaska Native	-0.10	0.44	-0.0043	0.0189	0.820
% Asian	-0.41	0.56	-0.0177	0.0240	0.461
% Low-Income Students	-0.20	0.12	-0.0085	0.0050	0.090
% Multiracial	1.05	0.59	0.0451	0.0253	0.075
% Students with Disabilities	0.27	0.24	0.0116	0.0103	0.259
Average Class Size	-0.20	0.21	-0.0084	0.0089	0.342
Title 1 Eligible School	0.02	0.34	0.0010	0.0147	0.944
Census Self-Response Rate	0.35	0.48	0.0152	0.0207	0.463
Density of Civic Organizations	0.24	0.27	0.0102	0.0117	0.380
Volunteering Rate	-0.34	0.28	-0.0146	0.0120	0.226
School District Size	-0.43	0.48	-0.0187	0.0208	0.369

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.42

Math Test Participation in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Math Test Participation in 2019	0.40	0.01	0.4320	0.0142	0.000
Five Essentials					
Average 4Essentials Score in 2019	-0.01	0.02	0.0000	0.0001	0.610
Involved Families Score in 2019	0.09	0.02	0.0002	0.0001	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.00	0.02	-0.0006	0.0039	0.881
% In-person Learning in 2020-21	-0.05	0.02	-0.0073	0.0035	0.039
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.01	-0.0367	0.0995	0.712
% Asian	-0.03	0.02	-0.0138	0.0085	0.105
% Black	-0.08	0.03	-0.0128	0.0050	0.010
% Hispanic or Latinx	-0.05	0.03	-0.0076	0.0048	0.118
% Multiracial	-0.02	0.01	-0.0317	0.0185	0.087
% Native Hawaiian or Pacific Islander	-0.01	0.01	-0.1588	0.2528	0.530
Student Enrollment Characteristics					
% Low-Income Students	-0.05	0.03	-0.0085	0.0046	0.065
% Students with Disabilities	-0.07	0.01	-0.0497	0.0107	0.000
Average Class Size	0.06	0.02	0.0006	0.0002	0.001
Log of Student Enrollment in 2019	0.00	0.02	0.0000	0.0013	0.991
School Types					
Charter School	-0.17	0.08	-0.0073	0.0034	0.032
Magnet School	0.12	0.07	0.0052	0.0029	0.074
Title 1 Eligible School	0.07	0.04	0.0029	0.0019	0.121
School Grade Band (vs. Elementary)					
High School	-0.65	0.04	-0.0289	0.0017	0.000
Middle School	-0.18	0.04	-0.0081	0.0016	0.000
Other School	-0.18	0.12	-0.0079	0.0052	0.127
School District Size (vs. Large)					
Medium District	0.02	0.04	0.0009	0.0017	0.618
Small District	0.06	0.07	0.0025	0.0030	0.398

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.31	0.07	0.0139	0.0029	0.000
Suburb	0.22	0.04	0.0095	0.0018	0.000
Town	0.29	0.07	0.0130	0.0030	0.000
Community Characteristics					
Census Self-Response Rate	0.02	0.02	0.0065	0.0077	0.404
Social Vulnerability Index in 2020	0.01	0.02	0.0013	0.0033	0.689
Cohesiveness - Support Ratio	0.04	0.02	0.0262	0.0112	0.019
Density of Civic Organizations	0.00	0.01	-0.0025	0.0818	0.976
Volunteering Rate	-0.01	0.02	-0.0189	0.0215	0.380
Collective Efficacy Index	-0.06	0.03	-0.0022	0.0009	0.020
Community Health Index	0.01	0.02	0.0016	0.0023	0.484
Family Unity Index	0.08	0.03	0.0048	0.0016	0.002
Institutional Health Index	-0.03	0.02	-0.0037	0.0025	0.135
Imputation Flag					
% American Indian or Alaska Native	-0.12	0.44	-0.0052	0.0196	0.792
% Asian	-0.47	0.56	-0.0209	0.0249	0.401
% Low-Income Students	-0.20	0.12	-0.0088	0.0052	0.089
% Multiracial	1.17	0.60	0.0515	0.0263	0.050
% Students with Disabilities	0.24	0.24	0.0106	0.0107	0.320
Average Class Size	-0.14	0.21	-0.0063	0.0092	0.490
Title 1 Eligible School	-0.07	0.35	-0.0031	0.0153	0.839
Census Self-Response Rate	0.41	0.49	0.0183	0.0215	0.393
Density of Civic Organizations	0.25	0.27	0.0109	0.0121	0.370
Volunteering Rate	-0.29	0.28	-0.0129	0.0125	0.303
School District Size	-0.51	0.49	-0.0226	0.0216	0.296

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.41

ELA Proficiency in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
ELA Proficiency in 2019	0.68	0.01	0.6520	0.0129	0.000
Five Essentials					
Average 4Essentials Score in 2019	-0.01	0.01	-0.0001	0.0002	0.556
Involved Families Score in 2019	0.05	0.01	0.0004	0.0001	0.001
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.03	0.01	0.0206	0.0092	0.026
% In-person Learning in 2020-21	0.06	0.01	0.0356	0.0084	0.000
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.02	0.01	-0.6033	0.2375	0.011
% Asian	0.05	0.01	0.1121	0.0203	0.000
% Black	-0.06	0.02	-0.0386	0.0121	0.001
% Hispanic or Latinx	-0.06	0.02	-0.0400	0.0117	0.001
% Multiracial	0.00	0.01	-0.0061	0.0441	0.891
% Native Hawaiian or Pacific Islander	0.01	0.01	0.6936	0.6021	0.249
Student Enrollment Characteristics					
% Low-Income Students	-0.12	0.02	-0.0755	0.0113	0.000
% Students with Disabilities	-0.02	0.01	-0.0675	0.0255	0.008
Average Class Size	-0.04	0.01	-0.0015	0.0004	0.000
Log of Student Enrollment in 2019	0.03	0.01	0.0076	0.0031	0.013
School Types					
Charter School	-0.10	0.05	-0.0180	0.0081	0.027
Magnet School	0.11	0.04	0.0194	0.0070	0.006
Title 1 Eligible School	-0.10	0.03	-0.0169	0.0044	0.000
School Grade Band (vs. Elementary)					
High School	-0.13	0.02	-0.0224	0.0042	0.000
Middle School	-0.07	0.02	-0.0131	0.0037	0.000
Other School	-0.06	0.07	-0.0110	0.0123	0.373
School District Size (vs. Large)					
Medium District	-0.01	0.02	-0.0021	0.0042	0.612
Small District	-0.08	0.04	-0.0138	0.0072	0.054

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.11	0.04	-0.0198	0.0070	0.005
Suburb	-0.02	0.02	-0.0032	0.0043	0.451
Town	-0.06	0.04	-0.0100	0.0071	0.159
Community Characteristics					
Census Self-Response Rate	-0.02	0.01	-0.0296	0.0184	0.108
Social Vulnerability Index in 2020	0.00	0.01	0.0028	0.0080	0.724
Cohesiveness - Support Ratio	0.00	0.01	-0.0095	0.0265	0.721
Density of Civic Organizations	0.01	0.01	0.1597	0.1950	0.413
Volunteering Rate	0.02	0.01	0.1168	0.0513	0.023
Collective Efficacy Index	-0.02	0.02	-0.0033	0.0023	0.139
Community Health Index	-0.03	0.01	-0.0141	0.0054	0.008
Family Unity Index	0.00	0.02	-0.0003	0.0037	0.926
Institutional Health Index	0.01	0.01	0.0083	0.0059	0.156
Imputation Flag					
% American Indian or Alaska Native	0.28	0.26	0.0504	0.0467	0.280
% Asian	-0.22	0.33	-0.0390	0.0593	0.510
% Low-Income Students	0.39	0.07	0.0690	0.0124	0.000
% Multiracial	-0.32	0.35	-0.0573	0.0626	0.360
% Students with Disabilities	-0.12	0.14	-0.0218	0.0254	0.391
Average Class Size	0.09	0.12	0.0156	0.0219	0.476
Title 1 Eligible School	-0.39	0.21	-0.0693	0.0364	0.057
Census Self-Response Rate	-0.22	0.29	-0.0393	0.0511	0.442
Density of Civic Organizations	0.32	0.16	0.0559	0.0288	0.052
Volunteering Rate	-0.19	0.17	-0.0341	0.0298	0.252
School District Size	-0.31	0.29	-0.0550	0.0515	0.286

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.83

Math Proficiency in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Math Proficiency in 2019	0.66	0.01	0.6335	0.0124	0.000
Five Essentials					
Average 4Essentials Score in 2019	-0.03	0.01	-0.0004	0.0001	0.005
Involved Families Score in 2019	0.06	0.01	0.0006	0.0001	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.03	0.01	0.0245	0.0084	0.004
% In-person Learning in 2020-21	0.09	0.01	0.0537	0.0077	0.000
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.01	0.01	-0.2678	0.2170	0.217
% Asian	0.06	0.01	0.1314	0.0189	0.000
% Black	-0.09	0.02	-0.0559	0.0110	0.000
% Hispanic or Latinx	-0.10	0.02	-0.0716	0.0107	0.000
% Multiracial	-0.02	0.01	-0.0913	0.0403	0.023
% Native Hawaiian or Pacific Islander	0.01	0.01	0.5407	0.5500	0.326
Student Enrollment Characteristics					
% Low-Income Students	-0.11	0.02	-0.0714	0.0104	0.000
% Students with Disabilities	0.00	0.01	-0.0144	0.0233	0.536
Average Class Size	-0.02	0.01	-0.0010	0.0004	0.010
Log of Student Enrollment in 2019	0.02	0.01	0.0053	0.0028	0.057
School Types					
Charter School	-0.17	0.04	-0.0311	0.0074	0.000
Magnet School	0.04	0.04	0.0070	0.0064	0.275
Title 1 Eligible School	-0.10	0.02	-0.0176	0.0041	0.000
School Grade Band (vs. Elementary)					
High School	-0.05	0.02	-0.0093	0.0038	0.015
Middle School	-0.09	0.02	-0.0160	0.0034	0.000
Other School	-0.11	0.06	-0.0198	0.0113	0.079
School District Size (vs. Large)					
Medium District	-0.04	0.02	-0.0077	0.0038	0.044
Small District	-0.15	0.04	-0.0264	0.0066	0.000

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.05	0.04	-0.0089	0.0064	0.164
Suburb	0.04	0.02	0.0076	0.0039	0.054
Town	-0.03	0.04	-0.0051	0.0065	0.430
Community Characteristics					
Census Self-Response Rate	-0.02	0.01	-0.0341	0.0168	0.042
Social Vulnerability Index in 2020	0.00	0.01	-0.0015	0.0073	0.839
Cohesiveness - Support Ratio	-0.01	0.01	-0.0152	0.0242	0.530
Density of Civic Organizations	0.01	0.01	0.2074	0.1784	0.245
Volunteering Rate	0.01	0.01	0.0702	0.0468	0.134
Collective Efficacy Index	-0.03	0.01	-0.0043	0.0021	0.038
Community Health Index	-0.03	0.01	-0.0134	0.0049	0.006
Family Unity Index	0.02	0.01	0.0048	0.0034	0.160
Institutional Health Index	0.00	0.01	-0.0017	0.0054	0.757
Imputation Flag					
% American Indian or Alaska Native	-0.11	0.23	-0.0203	0.0427	0.633
% Asian	-0.11	0.30	-0.0204	0.0542	0.706
% Low-Income Students	0.41	0.06	0.0740	0.0114	0.000
% Multiracial	0.04	0.32	0.0066	0.0572	0.909
% Students with Disabilities	-0.10	0.13	-0.0182	0.0232	0.434
Average Class Size	0.09	0.11	0.0170	0.0200	0.394
Title 1 Eligible School	-0.14	0.18	-0.0248	0.0333	0.457
Census Self-Response Rate	-0.14	0.26	-0.0259	0.0467	0.580
Density of Civic Organizations	-0.18	0.15	-0.0328	0.0263	0.213
Volunteering Rate	0.21	0.15	0.0375	0.0272	0.168
School District Size	-0.24	0.26	-0.0441	0.0471	0.349

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.87

Five Essentials Supportive Environment in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Supportive Environment Score in 2019	0.53	0.02	0.4819	0.0200	0.000
Five Essentials					
Average 4Essentials Score in 2019	-0.02	0.03	-0.0257	0.0334	0.442
Involved Families Score in 2019	0.04	0.02	0.0346	0.0195	0.076
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	-0.02	0.02	-1.4291	1.3469	0.289
% In-person Learning in 2020-21	0.01	0.02	0.6573	1.2324	0.594
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.03	0.01	-79.2640	33.2774	0.017
% Asian	0.06	0.02	11.0196	2.9368	0.000
% Black	-0.18	0.03	-9.8317	1.7170	0.000
% Hispanic or Latinx	-0.08	0.03	-4.6593	1.6594	0.005
% Multiracial	-0.05	0.01	-22.5590	6.4877	0.001
% Native Hawaiian or Pacific Islander	0.04	0.01	275.6788	84.8015	0.001
Student Enrollment Characteristics					
% Low-Income Students	-0.05	0.03	-2.6753	1.6179	0.098
% Students with Disabilities	0.00	0.01	0.4256	3.7210	0.909
Average Class Size	-0.06	0.02	-0.1959	0.0595	0.001
Log of Student Enrollment in 2019	-0.05	0.02	-1.0594	0.4432	0.017
School Types					
Charter School	0.30	0.08	4.7665	1.1904	0.000
Magnet School	0.11	0.06	1.6570	1.0040	0.099
Title 1 Eligible School	0.00	0.04	-0.0155	0.6372	0.981
School Grade Band (vs. Elementary)					
High School	-0.44	0.04	-6.9781	0.5986	0.000
Middle School	-0.28	0.04	-4.4668	0.6143	0.000
Other School	-0.38	0.11	-5.9265	1.7132	0.001
School District Size (vs. Large)					
Medium District	-0.10	0.04	-1.5316	0.6165	0.013
Small District	-0.16	0.07	-2.5147	1.0487	0.017

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.06	0.06	0.9079	1.0122	0.370
Suburb	0.17	0.04	2.7010	0.6284	0.000
Town	0.10	0.07	1.5744	1.0435	0.131
Community Characteristics					
Census Self-Response Rate	0.03	0.02	4.3102	2.6784	0.108
Social Vulnerability Index in 2020	-0.03	0.02	-1.8288	1.1497	0.112
Cohesiveness - Support Ratio	0.00	0.02	-0.8161	3.8437	0.832
Density of Civic Organizations	0.02	0.01	44.2052	28.4193	0.120
Volunteering Rate	0.00	0.02	-1.6626	7.5877	0.827
Collective Efficacy Index	-0.05	0.03	-0.6671	0.3290	0.043
Community Health Index	-0.02	0.02	-0.9715	0.7789	0.212
Family Unity Index	0.03	0.03	0.6417	0.5441	0.238
Institutional Health Index	0.01	0.02	0.5618	0.8572	0.512
Imputation Flag					
% American Indian or Alaska Native	-0.43	0.42	-6.7028	6.5614	0.307
% Asian	-0.25	0.59	-3.8758	9.3176	0.677
% Low-Income Students	0.25	0.11	3.8564	1.7457	0.027
% Multiracial	0.70	0.59	11.0536	9.2906	0.234
% Students with Disabilities	-0.03	0.23	-0.4530	3.5422	0.898
Average Class Size	-0.05	0.23	-0.7773	3.5483	0.827
Title 1 Eligible School	-0.28	0.32	-4.3853	5.0528	0.386
Census Self-Response Rate	-0.22	0.64	-3.5004	10.0190	0.727
Density of Civic Organizations	-0.23	0.28	-3.6428	4.3605	0.404
Volunteering Rate	0.20	0.29	3.1661	4.5097	0.483
School District Size	0.31	0.64	4.8374	10.0360	0.630

Note: The model includes 2,884 schools. The adjusted R-squared value is 0.59

Models Output

School Type Interaction Effects

The tables in this section provide the output from models that add an interaction term to the primary modeling approach to capture variation by school type in the relationship between Involved Families in 2019 with student outcomes in 2022.

To explore how the relationship between Involved Families and student outcomes may differ by school grade band, school locale, and the percent of low-income students in a school, we add an interaction term to the primary model. We separately fit a model for each school type variable - for example, for school grade band, we add the interaction term ($Involved\ Families_{i,2019} * School\ Grade\ Band_{i,2022}$).

Each table contains the same information as in the previous appendix section for the interaction terms for each school type and for each outcome. The estimate for the interaction term indicates how much the association between Involved Families and the outcome differs for each school type category in comparison to the reference category. For example, for school grade band, the estimate indicates how this association differs for High Schools, Middle Schools, or Other Schools, compared to Elementary Schools. A p-value less than .05 suggests that the observed difference is statistically significant, meaning it's unlikely we would see such a difference by chance alone.

Interaction Model Output

Chronic Absenteeism in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Interaction Model 1: School Grade Band (vs. Elementary)					
Involved Families × High School	0.02	0.03	0.0002	0.0002	0.399
Involved Families × Middle School	-0.01	0.02	-0.0001	0.0002	0.642
Involved Families × Other School	-0.24	0.12	-0.0021	0.0010	0.046
Interaction Model 2: School Locale (vs. City)					
Involved Families × Rural	0.00	0.03	0.0000	0.0003	0.910
Involved Families × Suburb	0.09	0.02	0.0008	0.0002	0.000
Involved Families × Town	-0.02	0.04	-0.0001	0.0003	0.683
Interaction Model 3: Percent Low-income Students					
Involved Families × % Low-Income Students	0.05	0.01	0.0014	0.0003	0.000

ELA Test Participation in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Interaction Model 1: School Grade Band (vs. Elementary)					
Involved Families × High School	0.29	0.04	0.0006	0.0001	0.000
Involved Families × Middle School	0.01	0.03	0.0000	0.0001	0.746
Involved Families × Other School	0.09	0.16	0.0002	0.0003	0.570
Interaction Model 2: School Locale (vs. City)					
Involved Families × Rural	-0.14	0.04	-0.0003	0.0001	0.001
Involved Families × Suburb	-0.14	0.03	-0.0003	0.0001	0.000
Involved Families × Town	-0.10	0.06	-0.0002	0.0001	0.086
Interaction Model 3: Percent Low-income Students					
Involved Families × % Low-Income Students	0.04	0.01	0.0003	0.0001	0.007

Student Attendance Rate in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Interaction Model 1: School Grade Band (vs. Elementary)					
Involved Families × High School	0.01	0.02	0.0000	0.0001	0.578
Involved Families × Middle School	0.00	0.02	0.0000	0.0001	0.947
Involved Families × Other School	0.28	0.11	0.0007	0.0003	0.009
Interaction Model 2: School Locale (vs. City)					
Involved Families × Rural	-0.03	0.03	-0.0001	0.0001	0.266
Involved Families × Suburb	-0.09	0.02	-0.0002	0.0001	0.000
Involved Families × Town	-0.03	0.04	-0.0001	0.0001	0.350
Interaction Model 3: Percent Low-income Students					
Involved Families × % Low-Income Students	-0.03	0.01	-0.0003	0.0001	0.000

Math Test Participation in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Interaction Model 1: School Grade Band (vs. Elementary)					
Involved Families × High School	0.29	0.04	0.0007	0.0001	0.000
Involved Families × Middle School	0.02	0.03	0.0001	0.0001	0.502
Involved Families × Other School	0.06	0.16	0.0001	0.0004	0.715
Interaction Model 2: School Locale (vs. City)					
Involved Families × Rural	-0.13	0.04	-0.0003	0.0001	0.003
Involved Families × Suburb	-0.13	0.03	-0.0003	0.0001	0.000
Involved Families × Town	-0.10	0.06	-0.0002	0.0001	0.081
Interaction Model 3: Percent Low-income Students					
Involved Families × % Low-Income Students	0.03	0.01	0.0003	0.0001	0.016

Interaction Model Output

ELA Proficiency in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Interaction Model 1: School Grade Band (vs. Elementary)					
Involved Families × High School	0.01	0.02	0.0000	0.0002	0.817
Involved Families × Middle School	0.01	0.02	0.0001	0.0002	0.737
Involved Families × Other School	-0.07	0.10	-0.0006	0.0009	0.478
Interaction Model 2: School Locale (vs. City)					
Involved Families × Rural	-0.01	0.03	-0.0001	0.0002	0.597
Involved Families × Suburb	0.04	0.02	0.0004	0.0002	0.033
Involved Families × Town	-0.03	0.03	-0.0003	0.0003	0.321
Interaction Model 3: Percent Low-income Students					
Involved Families × % Low-Income Students	-0.07	0.01	-0.0024	0.0003	0.000

Math Proficiency in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Interaction Model 1: School Grade Band (vs. Elementary)					
Involved Families × High School	0.01	0.02	0.0001	0.0002	0.683
Involved Families × Middle School	-0.01	0.02	-0.0001	0.0002	0.508
Involved Families × Other School	0.02	0.09	0.0002	0.0008	0.850
Interaction Model 2: School Locale (vs. City)					
Involved Families × Rural	-0.02	0.02	-0.0002	0.0002	0.346
Involved Families × Suburb	0.03	0.02	0.0003	0.0002	0.092
Involved Families × Town	-0.01	0.03	-0.0001	0.0003	0.820
Interaction Model 3: Percent Low-income Students					
Involved Families × % Low-Income Students	-0.08	0.01	-0.0027	0.0002	0.000

5Essentials Supportive Environment in 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Interaction Model 1: School Grade Band (vs. Elementary)					
Involved Families × High School	0.14	0.04	0.1153	0.0290	0.000
Involved Families × Middle School	0.14	0.03	0.1119	0.0260	0.000
Involved Families × Other School	0.02	0.15	0.0124	0.1193	0.918
Interaction Model 2: School Locale (vs. City)					
Involved Families × Rural	0.10	0.04	0.0786	0.0343	0.022
Involved Families × Suburb	0.05	0.03	0.0374	0.0243	0.124
Involved Families × Town	0.04	0.06	0.0360	0.0450	0.424
Interaction Model 3: Percent Low-income Students					
Involved Families × % Low-Income Students	-0.06	0.01	-0.1762	0.0381	0.000

Models Output

Pre-pandemic

2016 to 2019

The tables in this section provide the model output from the primary modeling approach that includes the Involved Families score from 2016* and the outcome from 2019.

This section looks at the size of the relationship between family engagement and future outcomes in years completely before the pandemic. To mimic the time differential from our main analysis, we look at 2019 outcomes and 2016* family engagement.

Each table in this section presents both the “standardized” and “raw” coefficients. “Raw” refers to models that include each variable’s original values – for example, Involved Families scores of 1 to 99. See the Descriptive Statistics appendix for each variable’s raw scale. “Standardized” values have been put on a common scale to have a mean of 0 and standard deviation of 1 (a z-score) so that the coefficients can be directly compared to one another. The p-value is the same for both models, and a p-value less than .05 suggests that the observed association between the corresponding variable and the outcome is statistically significant. This means it's unlikely we would see such an association by chance alone, assuming no actual relationship exists.ⁱ

The raw coefficients are used in the visuals that appear in the body of this deck. For example, for Student Attendance in 2019, the raw coefficient for Involved Families is .0001. This means that, holding all other variables in the model constant, for each 1-point increase in Involved Families we expect student attendance to increase by 0.01%. Accordingly, a 52-point increase (which is the difference between a 10th and 90th percentile school) is associated with a .5% increase in Student Attendance ($52 \times .0001 = .0052$).

*Chronic absenteeism data was not available in 2016, so for this outcome only we model the relationship between 2018 family engagement and 2019 chronic absenteeism.

ⁱ Source: James, Gareth, et al. *An Introduction to Statistical Learning: With Applications in R*. Springer, 2022.

Chronic Absenteeism in 2019*

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Chronic Absenteeism in 2018	0.63	0.02	0.6007	0.0155	0.000
Five Essentials					
Average 4Essentials Score in 2018	0.00	0.02	0.0000	0.0002	0.936
Involved Families Score in 2018	-0.09	0.02	-0.0006	0.0002	0.000
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.01	0.01	0.3938	0.4298	0.360
% Asian	0.03	0.01	0.0522	0.0248	0.035
% Black	0.15	0.03	0.0736	0.0139	0.000
% Hispanic or Latinx	0.06	0.03	0.0301	0.0139	0.031
% Multiracial	0.05	0.01	0.2263	0.0635	0.000
% Native Hawaiian or Pacific Islander	0.01	0.01	0.5450	0.7285	0.455
Student Enrollment Characteristics					
% Low-Income Students	0.10	0.03	0.0517	0.0146	0.000
% Students with Disabilities	0.07	0.01	0.1863	0.0351	0.000
Average Class Size	-0.01	0.02	-0.0003	0.0005	0.585
Log of Student Enrollment in 2018	-0.05	0.02	-0.0106	0.0041	0.010
School Types					
Charter School	-0.37	0.07	-0.0520	0.0095	0.000
Magnet School	-0.13	0.05	-0.0189	0.0075	0.012
Title 1 Eligible School	-0.10	0.04	-0.0138	0.0060	0.023
School Grade Band (vs. Elementary)					
High School	0.80	0.04	0.1126	0.0062	0.000
Middle School	0.20	0.04	0.0275	0.0054	0.000
Other School	0.51	0.11	0.0723	0.0155	0.000
School District Size (vs. Large)					
Medium District	0.04	0.04	0.0057	0.0061	0.351
Small District	-0.16	0.08	-0.0219	0.0115	0.056

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.22	0.07	-0.0309	0.0097	0.002
Suburb	-0.07	0.04	-0.0104	0.0056	0.063
Town	-0.24	0.07	-0.0336	0.0097	0.001
Community Characteristics					
Social Vulnerability Index in 2018	0.03	0.02	0.0171	0.0096	0.076
Cohesiveness - Support Ratio	0.01	0.02	0.0206	0.0315	0.513
Density of Civic Organizations	-0.01	0.02	-0.2474	0.2611	0.344
Volunteering Rate	0.02	0.02	0.0807	0.0707	0.254
Collective Efficacy Index	0.04	0.03	0.0042	0.0036	0.238
Community Health Index	0.05	0.02	0.0178	0.0078	0.022
Family Unity Index	0.00	0.03	-0.0004	0.0052	0.944
Institutional Health Index	-0.01	0.02	-0.0033	0.0096	0.733
Imputation Flag					
Density of Civic Organizations	0.55	0.37	0.0766	0.0525	0.145
Volunteering Rate	-0.72	0.38	-0.1013	0.0539	0.060

Note: The model includes 1,867 schools. The adjusted R-squared value is 0.77

*Chronic absenteeism data was not available in 2016 so this value represents the relationship between 2018 family engagement and 2019 chronic absenteeism.

Note: Unless noted in the name of the variable, all school level data is from the 2018-19 school year.

Student Attendance in 2019

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Student Attendance Rate in 2016	0.67	0.02	0.7681	0.0181	0.000
Five Essentials					
Average 4Essentials Score in 2016	-0.02	0.02	0.0000	0.0000	0.272
Involved Families Score in 2016	0.08	0.02	0.0001	0.0000	0.002
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.02	0.01	-0.1079	0.0754	0.153
% Asian	-0.02	0.01	-0.0061	0.0043	0.158
% Black	-0.04	0.03	-0.0033	0.0024	0.177
% Hispanic or Latinx	0.01	0.03	0.0007	0.0025	0.769
% Multiracial	-0.08	0.01	-0.0579	0.0105	0.000
% Native Hawaiian or Pacific Islander	0.03	0.01	0.2798	0.1298	0.031
Student Enrollment Characteristics					
% Low-Income Students	-0.13	0.03	-0.0110	0.0026	0.000
% Students with Disabilities	-0.06	0.01	-0.0280	0.0064	0.000
Average Class Size	-0.03	0.02	-0.0001	0.0001	0.128
Log of Student Enrollment in 2016	0.00	0.02	0.0001	0.0007	0.936
School Types					
Charter School	0.14	0.11	0.0033	0.0025	0.185
Magnet School	0.02	0.06	0.0004	0.0013	0.752
Title 1 Eligible School	0.05	0.05	0.0013	0.0012	0.289
School Grade Band (vs. Elementary)					
High School	-0.60	0.05	-0.0140	0.0012	0.000
Middle School	-0.14	0.04	-0.0033	0.0010	0.001
Other School	-0.46	0.15	-0.0108	0.0036	0.003
School District Size (vs. Large)					
Medium District	-0.02	0.04	-0.0005	0.0010	0.604
Small District	-0.04	0.09	-0.0009	0.0021	0.664

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.13	0.07	0.0030	0.0017	0.079
Suburb	0.07	0.04	0.0016	0.0009	0.084
Town	0.17	0.07	0.0039	0.0017	0.020
Community Characteristics					
Social Vulnerability Index in 2018	-0.01	0.02	-0.0009	0.0017	0.581
Cohesiveness - Support Ratio	-0.04	0.02	-0.0127	0.0060	0.035
Density of Civic Organizations	-0.03	0.02	-0.0866	0.0467	0.064
Volunteering Rate	0.02	0.02	0.0161	0.0122	0.189
Collective Efficacy Index	0.10	0.03	0.0019	0.0006	0.001
Community Health Index	0.04	0.02	0.0021	0.0014	0.134
Family Unity Index	0.01	0.03	0.0002	0.0009	0.833
Institutional Health Index	-0.08	0.02	-0.0062	0.0015	0.000
Imputation Flag					
Density of Civic Organizations	-0.16	0.28	-0.0037	0.0065	0.568
Volunteering Rate	0.28	0.30	0.0065	0.0070	0.353

Note: The model includes 1,724 schools. The adjusted R-squared value is 0.78

ELA Test Participation in 2019

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
ELA Test Participation in 2016	0.48	0.02	0.2466	0.0125	0.000
Five Essentials					
Average 4Essentials Score in 2016	0.17	0.04	0.0004	0.0001	0.000
Involved Families Score in 2016	-0.18	0.05	-0.0003	0.0001	0.001
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.03	-0.0383	0.2345	0.870
% Asian	0.06	0.03	0.0278	0.0138	0.044
% Black	-0.07	0.06	-0.0088	0.0077	0.254
% Hispanic or Latinx	0.05	0.06	0.0061	0.0078	0.438
% Multiracial	-0.02	0.03	-0.0213	0.0328	0.517
% Native Hawaiian or Pacific Islander	-0.01	0.03	-0.2081	0.4022	0.605
Student Enrollment Characteristics					
% Low-Income Students	0.14	0.07	0.0167	0.0082	0.041
% Students with Disabilities	-0.18	0.03	-0.1115	0.0193	0.000
Average Class Size	0.00	0.04	0.0000	0.0003	0.939
Log of Student Enrollment in 2016	-0.04	0.05	-0.0021	0.0023	0.366
School Types					
Charter School	-0.41	0.23	-0.0139	0.0079	0.078
Magnet School	0.38	0.12	0.0130	0.0041	0.001
Title 1 Eligible School	-0.03	0.11	-0.0012	0.0038	0.762
School Grade Band (vs. Elementary)					
High School	-0.35	0.09	-0.0119	0.0032	0.000
Middle School	-0.15	0.09	-0.0050	0.0030	0.092
Other School	-0.07	0.33	-0.0023	0.0115	0.838
School District Size (vs. Large)					
Medium District	-0.02	0.10	-0.0007	0.0034	0.835
Small District	-0.15	0.19	-0.0050	0.0065	0.440

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.22	0.15	0.0074	0.0053	0.164
Suburb	0.20	0.09	0.0068	0.0030	0.021
Town	0.25	0.15	0.0087	0.0053	0.099
Community Characteristics					
Social Vulnerability Index in 2018	-0.07	0.04	-0.0092	0.0053	0.080
Cohesiveness - Support Ratio	0.06	0.04	0.0298	0.0188	0.113
Density of Civic Organizations	0.01	0.03	0.0394	0.1465	0.788
Volunteering Rate	0.07	0.04	0.0709	0.0381	0.063
Collective Efficacy Index	0.01	0.06	0.0003	0.0018	0.880
Community Health Index	0.05	0.05	0.0044	0.0045	0.334
Family Unity Index	0.05	0.06	0.0023	0.0027	0.386
Institutional Health Index	0.01	0.04	0.0011	0.0047	0.818
Imputation Flag					
Density of Civic Organizations	0.09	0.58	0.0032	0.0200	0.874
Volunteering Rate	-0.11	0.63	-0.0038	0.0215	0.858

Note: The model includes 1,661 schools. The adjusted R-squared value is 0.31

Math Test Participation in 2019

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Math Test Participation in 2016	0.49	0.03	0.2396	0.0129	0.000
Five Essentials					
Average 4Essentials Score in 2016	0.19	0.05	0.0004	0.0001	0.000
Involved Families Score in 2016	-0.20	0.05	-0.0004	0.0001	0.000
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.03	-0.0354	0.2517	0.888
% Asian	0.07	0.03	0.0326	0.0148	0.028
% Black	-0.09	0.06	-0.0124	0.0083	0.134
% Hispanic or Latinx	0.03	0.06	0.0046	0.0084	0.581
% Multiracial	-0.02	0.03	-0.0268	0.0353	0.448
% Native Hawaiian or Pacific Islander	-0.01	0.03	-0.2348	0.4323	0.587
Student Enrollment Characteristics					
% Low-Income Students	0.13	0.07	0.0170	0.0087	0.052
% Students with Disabilities	-0.16	0.03	-0.1053	0.0207	0.000
Average Class Size	0.01	0.04	0.0000	0.0003	0.889
Log of Student Enrollment in 2016	-0.03	0.05	-0.0015	0.0025	0.536
School Types					
Charter School	-0.49	0.23	-0.0177	0.0085	0.037
Magnet School	0.42	0.12	0.0152	0.0044	0.001
Title I Eligible School	-0.04	0.11	-0.0014	0.0041	0.740
School Grade Band (vs. Elementary)					
High School	-0.28	0.10	-0.0100	0.0034	0.004
Middle School	-0.16	0.09	-0.0057	0.0032	0.072
Other School	-0.07	0.34	-0.0027	0.0123	0.827
School District Size (vs. Large)					
Medium District	0.01	0.10	0.0003	0.0036	0.939
Small District	-0.07	0.19	-0.0026	0.0070	0.706

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.18	0.16	0.0064	0.0057	0.261
Suburb	0.23	0.09	0.0083	0.0032	0.009
Town	0.23	0.16	0.0085	0.0057	0.135
Community Characteristics					
Social Vulnerability Index in 2018	-0.07	0.04	-0.0087	0.0057	0.126
Cohesiveness - Support Ratio	0.05	0.04	0.0269	0.0202	0.183
Density of Civic Organizations	0.02	0.04	0.0982	0.1573	0.533
Volunteering Rate	0.05	0.04	0.0490	0.0409	0.230
Collective Efficacy Index	0.03	0.07	0.0010	0.0019	0.604
Community Health Index	0.04	0.05	0.0039	0.0048	0.421
Family Unity Index	0.02	0.06	0.0011	0.0029	0.696
Institutional Health Index	0.02	0.04	0.0025	0.0051	0.617
Imputation Flag					
Density of Civic Organizations	0.18	0.68	0.0065	0.0247	0.794
Volunteering Rate	-0.20	0.72	-0.0071	0.0261	0.785

Note: The model includes 1,659 schools. The adjusted R-squared value is 0.29

ELA Proficiency in 2019

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
ELA Proficiency in 2016	0.56	0.02	0.5668	0.0204	0.000
Five Essentials					
Average 4Essentials Score in 2016	0.02	0.02	0.0002	0.0002	0.298
Involved Families Score in 2016	0.06	0.02	0.0006	0.0002	0.004
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.02	0.01	-1.0270	0.5125	0.045
% Asian	-0.01	0.01	-0.0290	0.0304	0.340
% Black	-0.13	0.03	-0.0858	0.0171	0.000
% Hispanic or Latinx	-0.09	0.02	-0.0667	0.0172	0.000
% Multiracial	-0.02	0.01	-0.1015	0.0717	0.157
% Native Hawaiian or Pacific Islander	0.02	0.01	1.2950	0.8774	0.140
Student Enrollment Characteristics					
% Low-Income Students	-0.16	0.03	-0.1077	0.0186	0.000
% Students with Disabilities	-0.05	0.01	-0.1797	0.0425	0.000
Average Class Size	0.03	0.02	0.0012	0.0006	0.050
Log of Student Enrollment in 2016	0.03	0.02	0.0091	0.0051	0.073
School Types					
Charter School	0.03	0.09	0.0056	0.0172	0.745
Magnet School	0.19	0.05	0.0349	0.0090	0.000
Title I Eligible School	-0.07	0.05	-0.0136	0.0083	0.103
School Grade Band (vs. Elementary)					
High School	-0.22	0.04	-0.0407	0.0068	0.000
Middle School	0.09	0.04	0.0170	0.0065	0.009
Other School	-0.14	0.14	-0.0261	0.0251	0.298
School District Size (vs. Large)					
Medium District	-0.02	0.04	-0.0031	0.0074	0.679
Small District	0.03	0.08	0.0060	0.0142	0.674

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.10	0.06	0.0176	0.0116	0.128
Suburb	0.13	0.04	0.0238	0.0064	0.000
Town	0.16	0.06	0.0294	0.0115	0.011
Community Characteristics					
Social Vulnerability Index in 2018	-0.02	0.02	-0.0108	0.0115	0.350
Cohesiveness - Support Ratio	-0.01	0.02	-0.0311	0.0414	0.452
Density of Civic Organizations	0.02	0.01	0.3962	0.3198	0.215
Volunteering Rate	-0.02	0.02	-0.1064	0.0831	0.201
Collective Efficacy Index	-0.03	0.03	-0.0040	0.0039	0.301
Community Health Index	0.00	0.02	0.0021	0.0099	0.829
Family Unity Index	0.04	0.02	0.0101	0.0059	0.086
Institutional Health Index	-0.02	0.02	-0.0139	0.0103	0.180
Imputation Flag					
Density of Civic Organizations	-0.36	0.24	-0.0660	0.0439	0.133
Volunteering Rate	0.41	0.26	0.0751	0.0471	0.111

Note: The model includes 1,661 schools. The adjusted R-squared value is 0.8

Math Proficiency in 2019

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Math Proficiency in 2016	0.63	0.02	0.6308	0.0180	0.000
Five Essentials					
Average 4Essentials Score in 2016	0.02	0.02	0.0002	0.0002	0.264
Involved Families Score in 2016	0.05	0.02	0.0005	0.0002	0.003
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.02	0.01	-0.8727	0.4367	0.046
% Asian	0.04	0.01	0.0878	0.0263	0.001
% Black	-0.11	0.02	-0.0758	0.0146	0.000
% Hispanic or Latinx	-0.08	0.02	-0.0567	0.0146	0.000
% Multiracial	0.00	0.01	0.0262	0.0616	0.670
% Native Hawaiian or Pacific Islander	0.01	0.01	0.7993	0.7503	0.287
Student Enrollment Characteristics					
% Low-Income Students	-0.14	0.02	-0.0946	0.0158	0.000
% Students with Disabilities	-0.05	0.01	-0.1580	0.0362	0.000
Average Class Size	0.01	0.01	0.0004	0.0005	0.420
Log of Student Enrollment in 2016	0.05	0.02	0.0146	0.0043	0.001
School Types					
Charter School	-0.03	0.08	-0.0057	0.0147	0.697
Magnet School	0.14	0.04	0.0258	0.0077	0.001
Title 1 Eligible School	-0.09	0.04	-0.0159	0.0071	0.026
School Grade Band (vs. Elementary)					
High School	0.04	0.03	0.0078	0.0062	0.204
Middle School	-0.13	0.03	-0.0240	0.0055	0.000
Other School	0.06	0.11	0.0122	0.0214	0.569
School District Size (vs. Large)					
Medium District	-0.01	0.03	-0.0026	0.0063	0.680
Small District	0.09	0.07	0.0169	0.0122	0.167

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.02	0.05	0.0045	0.0099	0.646
Suburb	0.14	0.03	0.0269	0.0055	0.000
Town	0.08	0.05	0.0159	0.0098	0.106
Community Characteristics					
Social Vulnerability Index in 2018	-0.01	0.01	-0.0074	0.0098	0.449
Cohesiveness - Support Ratio	0.00	0.01	0.0030	0.0351	0.931
Density of Civic Organizations	0.02	0.01	0.4427	0.2732	0.105
Volunteering Rate	-0.02	0.01	-0.1097	0.0709	0.122
Collective Efficacy Index	-0.02	0.02	-0.0025	0.0033	0.446
Community Health Index	-0.01	0.02	-0.0047	0.0084	0.577
Family Unity Index	0.02	0.02	0.0055	0.0050	0.271
Institutional Health Index	-0.01	0.01	-0.0034	0.0088	0.699
Imputation Flag					
Density of Civic Organizations	-0.24	0.23	-0.0458	0.0429	0.286
Volunteering Rate	0.30	0.24	0.0560	0.0453	0.217

Note: The model includes 1,658 schools. The adjusted R-squared value is 0.86

Five Essentials Supportive Environment in 2019

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Lagged Outcome Variable					
Supportive Environment Score in 2016	0.51	0.05	0.4863	0.0438	0.000
Five Essentials					
Average 4Essentials Score in 2016	-0.01	0.07	-0.0067	0.0757	0.929
Involved Families Score in 2016	0.00	0.05	-0.0039	0.0447	0.930
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.02	0.03	69.3638	107.1674	0.518
% Asian	0.08	0.03	16.3187	6.8612	0.018
% Black	-0.03	0.06	-2.0184	3.9365	0.608
% Hispanic or Latinx	-0.07	0.06	-4.9244	4.0406	0.223
% Multiracial	-0.05	0.03	-24.2624	17.3936	0.163
% Native Hawaiian or Pacific Islander	0.00	0.02	-20.0919	163.7085	0.902
Student Enrollment Characteristics					
% Low-Income Students	-0.06	0.06	-3.4585	3.8967	0.375
% Students with Disabilities	-0.04	0.03	-11.7031	8.7168	0.180
Average Class Size	-0.05	0.04	-0.1910	0.1319	0.148
Log of Student Enrollment in 2016	-0.13	0.04	-3.1173	1.0359	0.003
School Types					
Charter School	0.02	0.19	0.3293	3.1682	0.917
Magnet School	-0.15	0.09	-2.5028	1.6021	0.119
Title 1 Eligible School	0.10	0.11	1.7890	1.8340	0.330
School Grade Band (vs. Elementary)					
High School	0.03	0.08	0.4560	1.3083	0.727
Middle School	-0.32	0.09	-5.5527	1.4854	0.000
Other School	-0.14	0.26	-2.4404	4.4619	0.585
School District Size (vs. Large)					
Medium District	-0.13	0.10	-2.2421	1.7642	0.204
Small District	-0.39	0.18	-6.7129	3.0372	0.027

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.17	0.16	2.8447	2.7661	0.304
Suburb	0.33	0.09	5.5654	1.4540	0.000
Town	0.17	0.16	2.8979	2.7629	0.294
Community Characteristics					
Social Vulnerability Index in 2018	-0.05	0.04	-3.0742	2.4047	0.201
Cohesiveness - Support Ratio	0.07	0.04	17.9163	8.7344	0.040
Density of Civic Organizations	-0.01	0.04	-22.6843	79.6701	0.776
Volunteering Rate	-0.04	0.04	-21.3888	18.2420	0.241
Collective Efficacy Index	0.01	0.06	0.1743	0.8947	0.846
Community Health Index	-0.05	0.05	-2.2903	2.2820	0.316
Family Unity Index	0.03	0.06	0.7021	1.3431	0.601
Institutional Health Index	-0.02	0.04	-0.8639	2.4060	0.720
Imputation Flag					
Density of Civic Organizations	0.36	0.50	6.1565	8.4666	0.467
Volunteering Rate	-0.16	0.54	-2.7056	9.2112	0.769

Note: The model includes 1,087 schools. The adjusted R-squared value is 0.35

Robustness Checks

To explore the sensitivity or robustness of our findings, we changed our modeling approach so that the dependent variable is the change in the outcome from 2019 to 2022 ($Y_{it} - Y_{i,2019}$) and the 2019 or lagged outcome is removed from the control variables.

The tables in this section provide the same model output as in previous model output tables but from this alternative modeling approach.

The results suggest that, for this model specification, pre-pandemic family engagement is positively and significantly associated with attendance and engagement outcomes. However, we also find that pre-pandemic family engagement is not significantly associated with student achievement in Math and ELA.

These results provide additional evidence that family engagement in 2019 is related to better attendance and engagement outcomes in 2022. These results are robust.

At the same time, the results from this secondary model specification suggest that, since there is not a relationship between family engagement in 2019 and the change in learning outcomes from 2019 to 2022, the relationship observed in the primary model may depend on accounting for where each school started on each outcome in 2019 and/or model choice. Though we still prefer our primary model for theoretical reasons, these results are not quite as robust to model specification as the results using attendance and engagement outcomes. We encourage further research using achievement-based outcomes, especially research that looks at student's actual test scores rather than the simpler and binary proficiency rates.

Chronic Absenteeism, change from 2019 to 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Five Essentials					
Average 4Essentials Score in 2019	0.02	0.02	0.0001	0.0002	0.456
Involved Families Score in 2019	-0.08	0.03	-0.0004	0.0002	0.006
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	-0.06	0.02	-0.0320	0.0120	0.008
% In-person Learning in 2020-21	-0.03	0.03	-0.0100	0.0108	0.355
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.01	0.0724	0.3052	0.813
% Asian	-0.10	0.02	-0.1285	0.0260	0.000
% Black	0.08	0.04	0.0316	0.0152	0.038
% Hispanic or Latinx	0.07	0.04	0.0312	0.0148	0.035
% Multiracial	-0.03	0.02	-0.1046	0.0568	0.066
% Native Hawaiian or Pacific Islander	-0.03	0.02	-1.5928	0.7146	0.026
Student Enrollment Characteristics					
% Low-Income Students	0.07	0.04	0.0277	0.0142	0.051
% Students with Disabilities	0.01	0.02	0.0186	0.0331	0.573
Average Class Size	0.01	0.02	0.0002	0.0005	0.638
Log of Student Enrollment in 2019	-0.02	0.03	-0.0025	0.0040	0.524
School Types					
Charter School	0.41	0.10	0.0460	0.0116	0.000
Magnet School	0.03	0.08	0.0033	0.0092	0.718
Title 1 Eligible School	0.09	0.05	0.0103	0.0058	0.074
School Grade Band (vs. Elementary)					
High School	-0.16	0.05	-0.0180	0.0054	0.001
Middle School	-0.12	0.04	-0.0132	0.0048	0.006
Other School	0.03	0.15	0.0035	0.0165	0.833
School District Size (vs. Large)					
Medium District	0.00	0.05	0.0004	0.0052	0.938
Small District	-0.20	0.09	-0.0220	0.0096	0.021

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.25	0.08	-0.0272	0.0090	0.002
Suburb	-0.46	0.05	-0.0512	0.0056	0.000
Town	-0.32	0.08	-0.0351	0.0090	0.000
Community Characteristics					
Census Self-Response Rate	0.02	0.03	0.0157	0.0240	0.513
Social Vulnerability Index in 2020	0.05	0.03	0.0215	0.0103	0.037
Cohesiveness - Support Ratio	-0.10	0.02	-0.1482	0.0352	0.000
Density of Civic Organizations	-0.03	0.02	-0.4673	0.2565	0.069
Volunteering Rate	-0.04	0.02	-0.1377	0.0667	0.039
Collective Efficacy Index	-0.09	0.03	-0.0084	0.0029	0.003
Community Health Index	0.04	0.02	0.0105	0.0069	0.130
Family Unity Index	0.07	0.03	0.0097	0.0048	0.043
Institutional Health Index	0.02	0.02	0.0063	0.0076	0.409
Imputation Flag					
% American Indian or Alaska Native	-0.87	0.55	-0.0963	0.0609	0.114
% Asian	1.52	0.70	0.1685	0.0773	0.029
% Low-Income Students	-0.13	0.16	-0.0149	0.0174	0.391
% Multiracial	0.15	0.74	0.0162	0.0817	0.843
% Students with Disabilities	0.36	0.40	0.0395	0.0441	0.370
Average Class Size	-0.19	0.24	-0.0213	0.0263	0.416
Title 1 Eligible School	0.32	0.49	0.0354	0.0548	0.518
Census Self-Response Rate	0.33	0.60	0.0366	0.0667	0.583
Density of Civic Organizations	0.25	0.36	0.0276	0.0400	0.490
Volunteering Rate	0.07	0.37	0.0081	0.0412	0.844
School District Size	-0.43	0.61	-0.0475	0.0672	0.479

Note: The model includes 3,197 schools. The adjusted R-squared value is 0.27

Note: Unless noted in the name of the variable, all school level data is from the 2021-22 school year. Schools with chronic absenteeism values of 0% (n = 2) and 100% (n = 13) in 2019 are dropped because schools with a value of 0% in 2019 were only able to move up in 2022, and schools with a value of 100% were limited to moving down in 2022. Also, when we remove these schools from the primary model, the output is nearly unchanged.

Student Attendance, change from 2019 to 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Five Essentials					
Average 4Essentials Score in 2019	-0.01	0.02	0.0000	0.0000	0.626
Involved Families Score in 2019	0.09	0.02	0.0001	0.0000	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.06	0.02	0.0078	0.0027	0.004
% In-person Learning in 2020-21	0.00	0.03	-0.0003	0.0025	0.890
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.01	0.01	-0.0285	0.0702	0.685
% Asian	0.05	0.02	0.0181	0.0059	0.002
% Black	-0.16	0.03	-0.0164	0.0035	0.000
% Hispanic or Latinx	-0.05	0.03	-0.0057	0.0034	0.090
% Multiracial	0.03	0.02	0.0270	0.0130	0.038
% Native Hawaiian or Pacific Islander	0.02	0.01	0.2350	0.1619	0.147
Student Enrollment Characteristics					
% Low-Income Students	-0.08	0.03	-0.0083	0.0032	0.010
% Students with Disabilities	-0.10	0.02	-0.0463	0.0074	0.000
Average Class Size	-0.03	0.02	-0.0002	0.0001	0.114
Log of Student Enrollment in 2019	0.03	0.02	0.0013	0.0009	0.163
School Types					
Charter School	-0.08	0.09	-0.0023	0.0025	0.360
Magnet School	0.11	0.07	0.0030	0.0021	0.144
Title 1 Eligible School	-0.05	0.05	-0.0014	0.0013	0.290
School Grade Band (vs. Elementary)					
High School	-0.49	0.04	-0.0140	0.0012	0.000
Middle School	0.00	0.04	0.0000	0.0011	0.989
Other School	-0.46	0.13	-0.0132	0.0037	0.000
School District Size (vs. Large)					
Medium District	0.09	0.04	0.0027	0.0012	0.025
Small District	0.33	0.07	0.0093	0.0021	0.000

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.49	0.07	0.0138	0.0021	0.000
Suburb	0.58	0.04	0.0163	0.0013	0.000
Town	0.53	0.07	0.0149	0.0021	0.000
Community Characteristics					
Census Self-Response Rate	0.08	0.02	0.0182	0.0055	0.001
Social Vulnerability Index in 2020	-0.03	0.02	-0.0027	0.0023	0.249
Cohesiveness - Support Ratio	0.03	0.02	0.0132	0.0078	0.091
Density of Civic Organizations	0.03	0.02	0.1052	0.0584	0.071
Volunteering Rate	0.03	0.02	0.0252	0.0152	0.096
Collective Efficacy Index	0.11	0.03	0.0026	0.0007	0.000
Community Health Index	-0.01	0.02	-0.0010	0.0016	0.543
Family Unity Index	-0.06	0.03	-0.0024	0.0011	0.030
Institutional Health Index	-0.04	0.02	-0.0042	0.0017	0.016
Imputation Flag					
% American Indian or Alaska Native	1.37	0.48	0.0390	0.0137	0.005
% Asian	-2.46	0.59	-0.0699	0.0169	0.000
% Low-Income Students	-0.06	0.13	-0.0016	0.0036	0.663
% Multiracial	-1.78	0.59	-0.0507	0.0168	0.003
% Students with Disabilities	0.76	0.25	0.0215	0.0072	0.003
Average Class Size	-0.13	0.21	-0.0038	0.0060	0.528
Title 1 Eligible School	-0.03	0.39	-0.0008	0.0109	0.942
Census Self-Response Rate	0.01	0.54	0.0002	0.0154	0.988
Density of Civic Organizations	-0.52	0.30	-0.0149	0.0086	0.084
Volunteering Rate	0.33	0.31	0.0093	0.0089	0.297
School District Size	-0.12	0.54	-0.0035	0.0155	0.823

Note: The model includes 3,274 schools. The adjusted R-squared value is 0.42

ELA Test Participation, change from 2019 to 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Five Essentials					
Average 4Essentials Score in 2019	-0.07	0.03	-0.0002	0.0001	0.010
Involved Families Score in 2019	0.13	0.03	0.0003	0.0001	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	-0.03	0.03	-0.0044	0.0046	0.334
% In-person Learning in 2020-21	-0.08	0.03	-0.0100	0.0042	0.017
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.02	0.0184	0.1179	0.876
% Asian	-0.06	0.02	-0.0271	0.0100	0.007
% Black	-0.07	0.05	-0.0093	0.0059	0.115
% Hispanic or Latinx	-0.09	0.04	-0.0123	0.0057	0.032
% Multiracial	-0.01	0.02	-0.0153	0.0219	0.486
% Native Hawaiian or Pacific Islander	-0.01	0.02	-0.1226	0.2994	0.682
Student Enrollment Characteristics					
% Low-Income Students	-0.13	0.04	-0.0174	0.0055	0.002
% Students with Disabilities	0.00	0.02	0.0004	0.0126	0.976
Average Class Size	0.05	0.02	0.0004	0.0002	0.032
Log of Student Enrollment in 2019	-0.02	0.03	-0.0009	0.0015	0.572
School Types					
Charter School	-0.20	0.11	-0.0074	0.0040	0.067
Magnet School	0.08	0.09	0.0029	0.0035	0.405
Title 1 Eligible School	0.00	0.06	0.0000	0.0022	0.987
School Grade Band (vs. Elementary)					
High School	-0.46	0.06	-0.0171	0.0020	0.000
Middle School	-0.12	0.05	-0.0045	0.0018	0.015
Other School	0.05	0.17	0.0019	0.0061	0.756
School District Size (vs. Large)					
Medium District	0.00	0.06	0.0002	0.0021	0.934
Small District	0.03	0.10	0.0010	0.0036	0.769

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.14	0.09	0.0052	0.0035	0.134
Suburb	0.06	0.06	0.0021	0.0021	0.327
Town	0.20	0.10	0.0072	0.0035	0.040
Community Characteristics					
Census Self-Response Rate	-0.04	0.03	-0.0113	0.0091	0.219
Social Vulnerability Index in 2020	0.01	0.03	0.0017	0.0040	0.661
Cohesiveness - Support Ratio	-0.03	0.03	-0.0149	0.0132	0.258
Density of Civic Organizations	-0.02	0.02	-0.0887	0.0969	0.360
Volunteering Rate	-0.04	0.02	-0.0377	0.0255	0.140
Collective Efficacy Index	-0.05	0.04	-0.0015	0.0011	0.170
Community Health Index	0.00	0.03	0.0000	0.0027	0.994
Family Unity Index	0.06	0.04	0.0030	0.0018	0.097
Institutional Health Index	-0.04	0.02	-0.0045	0.0029	0.123
Imputation Flag					
% American Indian or Alaska Native	0.10	0.63	0.0035	0.0232	0.881
% Asian	-0.56	0.80	-0.0207	0.0295	0.483
% Low-Income Students	-0.14	0.17	-0.0051	0.0062	0.403
% Multiracial	0.59	0.85	0.0216	0.0312	0.487
% Students with Disabilities	0.27	0.34	0.0100	0.0126	0.429
Average Class Size	-0.23	0.30	-0.0086	0.0109	0.429
Title 1 Eligible School	-0.06	0.49	-0.0023	0.0181	0.898
Census Self-Response Rate	0.77	0.69	0.0284	0.0254	0.264
Density of Civic Organizations	0.29	0.39	0.0105	0.0143	0.463
Volunteering Rate	-0.39	0.40	-0.0143	0.0148	0.335
School District Size	-0.33	0.70	-0.0122	0.0256	0.633

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.05

Math Test Participation, change from 2019 to 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Five Essentials					
Average 4Essentials Score in 2019	-0.06	0.03	-0.0002	0.0001	0.020
Involved Families Score in 2019	0.14	0.03	0.0003	0.0001	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	-0.03	0.03	-0.0054	0.0048	0.259
% In-person Learning in 2020-21	-0.09	0.03	-0.0111	0.0044	0.011
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.00	0.02	-0.0182	0.1225	0.882
% Asian	-0.07	0.02	-0.0347	0.0104	0.001
% Black	-0.08	0.05	-0.0107	0.0061	0.079
% Hispanic or Latinx	-0.08	0.04	-0.0120	0.0060	0.044
% Multiracial	-0.01	0.02	-0.0117	0.0228	0.607
% Native Hawaiian or Pacific Islander	0.00	0.02	-0.0269	0.3111	0.931
Student Enrollment Characteristics					
% Low-Income Students	-0.12	0.04	-0.0173	0.0057	0.002
% Students with Disabilities	0.00	0.02	-0.0029	0.0131	0.823
Average Class Size	0.05	0.02	0.0004	0.0002	0.065
Log of Student Enrollment in 2019	-0.03	0.03	-0.0015	0.0016	0.341
School Types					
Charter School	-0.23	0.11	-0.0086	0.0042	0.041
Magnet School	0.06	0.09	0.0021	0.0036	0.550
Title 1 Eligible School	0.01	0.06	0.0004	0.0023	0.867
School Grade Band (vs. Elementary)					
High School	-0.46	0.06	-0.0174	0.0021	0.000
Middle School	-0.13	0.05	-0.0048	0.0019	0.012
Other School	0.02	0.17	0.0009	0.0064	0.890
School District Size (vs. Large)					
Medium District	0.00	0.06	-0.0001	0.0022	0.946
Small District	0.00	0.10	0.0002	0.0037	0.961

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	0.17	0.09	0.0064	0.0036	0.076
Suburb	0.06	0.06	0.0024	0.0022	0.275
Town	0.22	0.10	0.0085	0.0037	0.021
Community Characteristics					
Census Self-Response Rate	-0.03	0.03	-0.0098	0.0095	0.303
Social Vulnerability Index in 2020	0.01	0.03	0.0018	0.0041	0.660
Cohesiveness - Support Ratio	-0.04	0.03	-0.0201	0.0137	0.142
Density of Civic Organizations	-0.01	0.02	-0.0574	0.1007	0.569
Volunteering Rate	-0.02	0.02	-0.0274	0.0265	0.302
Collective Efficacy Index	-0.07	0.04	-0.0022	0.0012	0.056
Community Health Index	0.00	0.03	0.0002	0.0028	0.952
Family Unity Index	0.09	0.04	0.0044	0.0019	0.022
Institutional Health Index	-0.05	0.02	-0.0056	0.0030	0.064
Imputation Flag					
% American Indian or Alaska Native	0.09	0.63	0.0035	0.0241	0.885
% Asian	-0.68	0.80	-0.0261	0.0306	0.394
% Low-Income Students	-0.15	0.17	-0.0057	0.0064	0.371
% Multiracial	0.67	0.85	0.0256	0.0324	0.429
% Students with Disabilities	0.22	0.34	0.0084	0.0131	0.523
Average Class Size	-0.16	0.30	-0.0063	0.0113	0.577
Title 1 Eligible School	-0.23	0.49	-0.0089	0.0188	0.638
Census Self-Response Rate	0.99	0.69	0.0378	0.0264	0.153
Density of Civic Organizations	0.28	0.39	0.0107	0.0149	0.474
Volunteering Rate	-0.30	0.40	-0.0114	0.0154	0.458
School District Size	-0.42	0.70	-0.0161	0.0266	0.546

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.05

ELA Proficiency, change from 2019 to 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Five Essentials					
Average 4Essentials Score in 2019	-0.07	0.03	-0.0004	0.0002	0.012
Involved Families Score in 2019	-0.05	0.03	-0.0002	0.0001	0.103
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.08	0.03	0.0299	0.0103	0.004
% In-person Learning in 2020-21	0.14	0.03	0.0370	0.0094	0.000
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.01	0.02	-0.2139	0.2634	0.417
% Asian	0.05	0.02	0.0504	0.0224	0.025
% Black	0.10	0.05	0.0295	0.0131	0.025
% Hispanic or Latinx	0.05	0.04	0.0159	0.0128	0.215
% Multiracial	0.00	0.02	0.0073	0.0490	0.882
% Native Hawaiian or Pacific Islander	0.01	0.02	0.3286	0.6687	0.623
Student Enrollment Characteristics					
% Low-Income Students	-0.02	0.04	-0.0055	0.0122	0.655
% Students with Disabilities	0.00	0.02	0.0067	0.0282	0.812
Average Class Size	-0.10	0.02	-0.0018	0.0005	0.000
Log of Student Enrollment in 2019	0.02	0.03	0.0028	0.0034	0.411
School Types					
Charter School	-0.25	0.11	-0.0203	0.0090	0.024
Magnet School	-0.05	0.09	-0.0040	0.0077	0.602
Title 1 Eligible School	-0.11	0.06	-0.0090	0.0049	0.067
School Grade Band (vs. Elementary)					
High School	-0.02	0.06	-0.0017	0.0045	0.712
Middle School	-0.34	0.05	-0.0274	0.0041	0.000
Other School	-0.01	0.17	-0.0012	0.0137	0.931
School District Size (vs. Large)					
Medium District	-0.13	0.06	-0.0106	0.0046	0.021
Small District	-0.27	0.10	-0.0222	0.0080	0.005

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.22	0.09	-0.0176	0.0078	0.024
Suburb	-0.11	0.06	-0.0091	0.0048	0.057
Town	-0.18	0.10	-0.0145	0.0079	0.066
Community Characteristics					
Census Self-Response Rate	-0.08	0.03	-0.0537	0.0204	0.009
Social Vulnerability Index in 2020	0.02	0.03	0.0072	0.0089	0.419
Cohesiveness - Support Ratio	0.01	0.03	0.0159	0.0294	0.588
Density of Civic Organizations	-0.01	0.02	-0.1270	0.2163	0.557
Volunteering Rate	0.06	0.02	0.1360	0.0570	0.017
Collective Efficacy Index	0.04	0.04	0.0027	0.0025	0.277
Community Health Index	-0.05	0.03	-0.0108	0.0060	0.071
Family Unity Index	-0.08	0.04	-0.0083	0.0041	0.043
Institutional Health Index	0.05	0.02	0.0121	0.0065	0.062
Imputation Flag					
% American Indian or Alaska Native	0.69	0.63	0.0563	0.0519	0.278
% Asian	-0.37	0.80	-0.0305	0.0658	0.643
% Low-Income Students	0.48	0.17	0.0392	0.0137	0.004
% Multiracial	-0.51	0.85	-0.0415	0.0696	0.551
% Students with Disabilities	-0.31	0.34	-0.0257	0.0282	0.362
Average Class Size	0.05	0.30	0.0037	0.0243	0.879
Title 1 Eligible School	-0.82	0.49	-0.0671	0.0405	0.097
Census Self-Response Rate	-0.54	0.69	-0.0443	0.0568	0.436
Density of Civic Organizations	0.97	0.39	0.0796	0.0320	0.013
Volunteering Rate	-0.70	0.40	-0.0572	0.0330	0.084
School District Size	-0.55	0.70	-0.0452	0.0572	0.430

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.05

Math Proficiency, change from 2019 to 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Five Essentials					
Average 4Essentials Score in 2019	-0.13	0.03	-0.0007	0.0002	0.000
Involved Families Score in 2019	-0.03	0.03	-0.0001	0.0001	0.296
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	0.08	0.03	0.0283	0.0096	0.003
% In-person Learning in 2020-21	0.21	0.03	0.0531	0.0087	0.000
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	0.01	0.02	0.1355	0.2451	0.580
% Asian	0.01	0.02	0.0068	0.0209	0.743
% Black	0.04	0.04	0.0096	0.0122	0.430
% Hispanic or Latinx	-0.08	0.04	-0.0230	0.0119	0.054
% Multiracial	-0.05	0.02	-0.1044	0.0455	0.022
% Native Hawaiian or Pacific Islander	0.01	0.02	0.3852	0.6222	0.536
Student Enrollment Characteristics					
% Low-Income Students	0.03	0.04	0.0080	0.0114	0.479
% Students with Disabilities	0.03	0.02	0.0430	0.0262	0.101
Average Class Size	-0.09	0.02	-0.0016	0.0004	0.000
Log of Student Enrollment in 2019	0.00	0.03	-0.0004	0.0032	0.910
School Types					
Charter School	-0.48	0.11	-0.0373	0.0084	0.000
Magnet School	-0.25	0.09	-0.0193	0.0072	0.007
Title 1 Eligible School	-0.05	0.06	-0.0042	0.0046	0.363
School Grade Band (vs. Elementary)					
High School	0.16	0.05	0.0123	0.0042	0.004
Middle School	-0.03	0.05	-0.0025	0.0038	0.514
Other School	-0.06	0.16	-0.0049	0.0127	0.703
School District Size (vs. Large)					
Medium District	-0.12	0.06	-0.0089	0.0043	0.039
Small District	-0.33	0.10	-0.0254	0.0074	0.001

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.01	0.09	-0.0006	0.0072	0.930
Suburb	0.00	0.06	0.0002	0.0044	0.972
Town	-0.07	0.09	-0.0057	0.0073	0.437
Community Characteristics					
Census Self-Response Rate	-0.07	0.03	-0.0480	0.0190	0.012
Social Vulnerability Index in 2020	0.02	0.03	0.0050	0.0082	0.543
Cohesiveness - Support Ratio	-0.02	0.03	-0.0181	0.0274	0.508
Density of Civic Organizations	-0.02	0.02	-0.1771	0.2013	0.379
Volunteering Rate	0.03	0.02	0.0764	0.0530	0.150
Collective Efficacy Index	0.02	0.04	0.0012	0.0023	0.611
Community Health Index	-0.04	0.03	-0.0071	0.0055	0.198
Family Unity Index	-0.03	0.04	-0.0027	0.0038	0.485
Institutional Health Index	-0.01	0.02	-0.0027	0.0061	0.653
Imputation Flag					
% American Indian or Alaska Native	-0.21	0.62	-0.0161	0.0483	0.739
% Asian	-0.29	0.79	-0.0227	0.0613	0.711
% Low-Income Students	0.36	0.17	0.0275	0.0128	0.032
% Multiracial	0.28	0.84	0.0214	0.0648	0.741
% Students with Disabilities	-0.26	0.34	-0.0199	0.0263	0.449
Average Class Size	0.00	0.29	0.0004	0.0226	0.987
Title 1 Eligible School	-0.19	0.49	-0.0144	0.0377	0.703
Census Self-Response Rate	-0.36	0.68	-0.0278	0.0529	0.599
Density of Civic Organizations	-0.46	0.39	-0.0359	0.0298	0.229
Volunteering Rate	0.50	0.40	0.0383	0.0308	0.213
School District Size	-0.57	0.69	-0.0440	0.0532	0.408

Note: The model includes 3,158 schools. The adjusted R-squared value is 0.07

Five Essentials Supportive Environment, change from 2019 to 2022

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
Five Essentials					
Average 4Essentials Score in 2019	-0.68	0.03	-0.6456	0.0259	0.000
Involved Families Score in 2019	0.34	0.03	0.2227	0.0202	0.000
School Modality (vs. % Remote Learning)					
% Hybrid Learning in 2020-21	-0.03	0.03	-1.9612	1.4980	0.191
% In-person Learning in 2020-21	-0.02	0.03	-0.9452	1.3691	0.490
Student Race and Ethnicity (vs. % White Students)					
% American Indian or Alaska Native	-0.04	0.02	-89.8321	37.0106	0.015
% Asian	0.04	0.02	5.9030	3.2591	0.070
% Black	-0.19	0.04	-8.5181	1.9089	0.000
% Hispanic or Latinx	-0.12	0.04	-5.8023	1.8451	0.002
% Multiracial	-0.06	0.02	-22.9477	7.2160	0.001
% Native Hawaiian or Pacific Islander	0.05	0.02	258.0657	94.3189	0.006
Student Enrollment Characteristics					
% Low-Income Students	0.09	0.04	4.0793	1.7761	0.022
% Students with Disabilities	-0.01	0.02	-1.3829	4.1380	0.738
Average Class Size	-0.08	0.02	-0.2217	0.0662	0.001
Log of Student Enrollment in 2019	-0.04	0.03	-0.6968	0.4927	0.157
School Types					
Charter School	0.30	0.10	3.8041	1.3234	0.004
Magnet School	0.11	0.09	1.3590	1.1167	0.224
Title 1 Eligible School	0.01	0.06	0.1783	0.7086	0.801
School Grade Band (vs. Elementary)					
High School	-0.35	0.05	-4.4256	0.6567	0.000
Middle School	0.29	0.05	3.7266	0.5862	0.000
Other School	-0.21	0.15	-2.5938	1.9002	0.172
School District Size (vs. Large)					
Medium District	-0.09	0.05	-1.1493	0.6855	0.094
Small District	-0.04	0.09	-0.5453	1.1634	0.639

	Standardized		Raw		P-value
	Estimate	Std Error	Estimate	Std Error	
School Locale (vs. City)					
Rural	-0.05	0.09	-0.6365	1.1239	0.571
Suburb	-0.02	0.05	-0.3156	0.6869	0.646
Town	0.03	0.09	0.4026	1.1595	0.728
Community Characteristics					
Census Self-Response Rate	-0.01	0.03	-0.7708	2.9712	0.795
Social Vulnerability Index in 2020	-0.02	0.03	-0.7199	1.2779	0.573
Cohesiveness - Support Ratio	-0.04	0.02	-7.5761	4.2654	0.076
Density of Civic Organizations	0.00	0.02	6.2199	31.5679	0.844
Volunteering Rate	-0.01	0.02	-1.8861	8.4395	0.823
Collective Efficacy Index	-0.03	0.04	-0.3376	0.3657	0.356
Community Health Index	-0.03	0.03	-1.0238	0.8663	0.237
Family Unity Index	-0.01	0.04	-0.2349	0.6041	0.697
Institutional Health Index	0.03	0.02	1.1669	0.9531	0.221
Imputation Flag					
% American Indian or Alaska Native	-0.85	0.58	-10.6920	7.2960	0.143
% Asian	0.27	0.82	3.4109	10.3590	0.742
% Low-Income Students	0.03	0.15	0.3172	1.9358	0.870
% Multiracial	0.92	0.82	11.6077	10.3336	0.261
% Students with Disabilities	-0.08	0.31	-0.9797	3.9399	0.804
Average Class Size	-0.25	0.31	-3.2012	3.9453	0.417
Title 1 Eligible School	-0.31	0.44	-3.8894	5.6200	0.489
Census Self-Response Rate	-0.15	0.88	-1.9372	11.1436	0.862
Density of Civic Organizations	-0.48	0.38	-6.0797	4.8489	0.210
Volunteering Rate	0.40	0.40	5.1155	5.0153	0.308
School District Size	0.38	0.88	4.7801	11.1627	0.669

Note: The model includes 2,884 schools. The adjusted R-squared value is 0.23

Citations

Data Source Citations

- Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry/ Geospatial Research, Analysis, and Services Program. CDC/ATSDR Social Vulnerability Index 2018 and 2020, Database Illinois. https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html.
- Chetty, Raj, Matthew O. Jackson, Theresa Kuchler, Johannes Stroebe, Nathaniel Hendren, Robert Fluegge, Sara Gong, Federico Gonzalez, Armelle Grondin, Matthew Jacob, Drew Johnston, Martin Koenen, Eduardo Laguna-Muggenberg, Florian Mudekereza, Tom Rutter, Nicolaj Thor, Wilbur Townsend, Ruby Zhang, Mike Bailey, Pablo Barber á, Monica Bhole, and Nils Wernerfelt (2022a). "Social Capital I: Measurement and Associations with Economic Mobility." Nature 608 (7921): 108-121, 2022.
- COVID-19 School Data Hub. 2023. "Percentage of School Year Spent In-Person, Hybrid, or Virtual, School Overall Shares". Data Resources (Version 3/8/23). Retrieved from <https://www.covidschooldatahub.com/states/Illinois>.
- Illinois State Board of Education. Illinois Report Card Public Data Sets for 2015-16, 2016-17, 2017-18, 2018-19, 2020-21, and 2021-22. Retrieved from <https://isbe.net/ilreportcarddata>.
- Illinois State Board of Education. ISBE 5Essentials Data Files for 2015-16, 2016-17, 2017-18, 2018-19, 2020-21, and 2021-22. Retrieved from <https://www.isbe.net/Pages/5Essentials-Survey.aspx>.
- Model Estimates of Poverty in Schools (MEPS), Education Data Portal (Version 0.19.0), Urban Institute, <https://educationdata.urban.org/documentation/>, made available under the ODC Attribution License.
- U.S. Census Bureau. (2020). Census Self-Response Rates. Retrieved from www2.census.gov/programs-surveys/decennial/2020/data/tracking-response-rates/self-response-rates-map
- U.S. Congress, Joint Economic Committee, Social Capital Project. "The Geography of Social Capital in America." Report prepared by the Vice Chairman's staff, 115th Cong., 2nd Sess. (April 2018), <https://www.jec.senate.gov/public/index.cfm/republicans/socialcapitalproject>.
- U.S. Department of Education National Center for Education Statistics Common Core of Data (CCD) "Public Elementary/Secondary School Universe Survey" 2016-17 v.2a 2017-18 v.1a 2018-19 v.1a 2019-20 v.1a 2020-21 v.1a 2021-22 v.1a; "Public Elementary/Secondary School Universe Survey CCD School Data" 2014-15 v.1a 2015-16 v.2a; "Public Elementary/Secondary School Universe Survey Directory Data" 2014-15 v.1a 2015-16 v.2a; "Public Elementary/Secondary School Universe Survey Geographic Data (EDGE)" 2014-15 v.1a 2015-16 v.2a 2016-17 v.1a 2017-18 v.1a 2018-19 v.1a 2019-20 v.1a 2020-21 v.1a 2021-22 v.1a.

Statistical Software Citations

- R Core Team (2021). **R**: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.
- David Robinson, Alex Hayes and Simon Couch (2023). **broom**: Convert Statistical Objects into Tidy Tibbles. R package version 1.0.5. <https://CRAN.R-project.org/package=broom>
- John Fox, Sanford Weisberg and Brad Price (2023). **car**: Companion to Applied Regression. R package version 3.1-2. <https://CRAN.R-project.org/package=car>
- Kyle Walker (2022). **crsuggest**: Obtain Suggested Coordinate Reference System Information for Spatial Data. R package version 0.4. <https://CRAN.R-project.org/package=crsuggest>
- Boxuan Cui (2020). **DataExplorer**: Automate Data Exploration and Treatment. R package version 0.8.2. <https://CRAN.R-project.org/package=DataExplorer>
- Hadley Wickham, Romain François, Lionel Henry, Kirill Müller and Davis Vaughan (2023). **dplyr**: A Grammar of Data Manipulation. R package version 1.1.2. <https://CRAN.R-project.org/package=dplyr>
- Kyle Ueyama (2022). **educationdata**: Retrieve Records from the Urban Institute's Education Data Portal API. R package version 0.1.3. <https://CRAN.R-project.org/package=educationdata>
- Hadley Wickham (2023). **forcats**: Tools for Working with Categorical Variables (Factors). R package version 1.0.0. <https://CRAN.R-project.org/package=forcats>
- David Robinson (2020). **fuzzyjoin**: Join Tables Together on Inexact Matching. R package version 0.1.6. <https://CRAN.R-project.org/package=fuzzyjoin>
- Hadley Wickham, Winston Chang, Lionel Henry, Thomas Lin Pedersen, Kohske Takahashi, Claus Wilke, Kara Woo, Hiroaki Yutani and Dewey Dunnington (2023). **ggplot2**: Create Elegant Data Visualisations Using the Grammar of Graphics. R package version 3.4.2. <https://CRAN.R-project.org/package=ggplot2>
- Richard Iannone, Joe Cheng, Barret Schloerke, Ellis Hughes, Alexandra Lauer and JooYoung Seo (2023). **gt**: Easily Create Presentation-Ready Display Tables. R package version 0.9.0. <https://CRAN.R-project.org/package=gt>
- Kirill Müller (2020). **here**: A Simpler Way to Find Your Files. R package version 1.0.1. <https://CRAN.R-project.org/package=here>

Statistical Software Citations

- Sam Firke (2023). **janitor**: Simple Tools for Examining and Cleaning Dirty Data. R package version 2.2.0. <https://CRAN.R-project.org/package=janitor>
- Vitalie Spinu, Garrett Grolemund and Hadley Wickham (2023). **lubridate**: Make Dealing with Dates a Little Easier. R package version 1.9.2. <https://CRAN.R-project.org/package=lubridate>
- Stefan Milton Bache and Hadley Wickham (2022). **magrittr**: A Forward-Pipe Operator for R. R package version 2.0.3. <https://CRAN.R-project.org/package=magrittr>
- Philipp Schauburger and Alexander Walker (2023). **openxlsx**: Read, Write and Edit xlsx Files. R package version 4.2.5.2. <https://CRAN.R-project.org/package=openxlsx>
- Tyler Rinker and Dason Kurkiewicz (2019). **pacman**: Package Management Tool. R package version 0.5.1. <https://CRAN.R-project.org/package=pacman>
- Thomas Lin Pedersen (2023). **patchwork**: The Composer of Plots. R package version 1.1.3. <https://CRAN.R-project.org/package=patchwork>
- Simon Urbanek (2022). **png**: Read and write PNG images. R package version 0.1-8. <https://CRAN.R-project.org/package=png>
- Hadley Wickham and Lionel Henry (2023). **purrr**: Functional Programming Tools. R package version 1.0.1. <https://CRAN.R-project.org/package=purrr>
- Marvin N. Wright, Stefan Wager and Philipp Probst (2022). **ranger**: A Fast Implementation of Random Forests. R package version 0.14.1. <https://CRAN.R-project.org/package=ranger>
- Hadley Wickham, Jim Hester and Jennifer Bryan (2023). **readr**: Read Rectangular Text Data. R package version 2.1.4. <https://CRAN.R-project.org/package=readr>
- Hadley Wickham and Jennifer Bryan (2023). **readxl**: Read Excel Files. R package version 1.4.3. <https://CRAN.R-project.org/package=readxl>
- Gábor Csárdi, Jim Hester, Hadley Wickham, Winston Chang, Martin Morgan and Dan Tenenbaum (2023). **remotes**: R Package Installation from Remote Repositories, Including 'GitHub'. R package version 2.4.2.1. <https://CRAN.R-project.org/package=remotes>

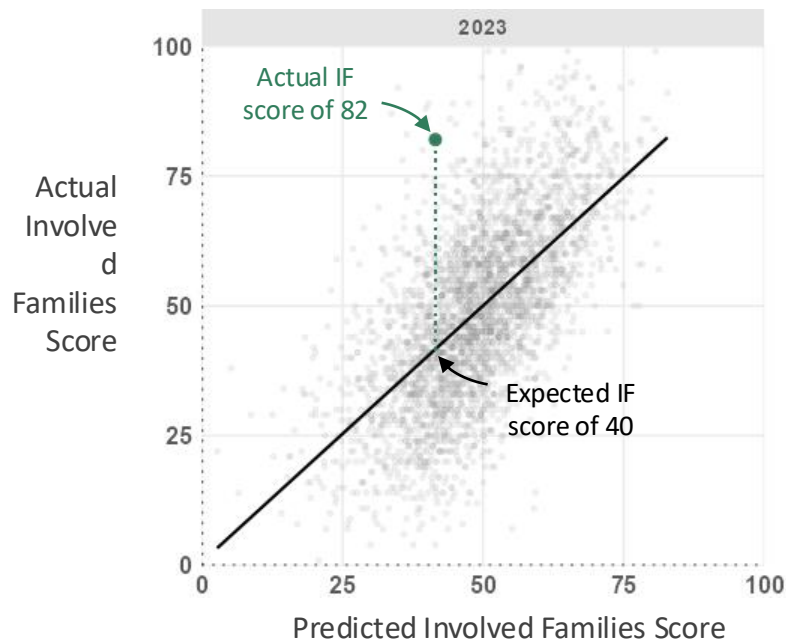
Statistical Software Citations

- Kevin Ushey and Hadley Wickham (2023). **renv**: Project Environments. R package version 1.0.0. <https://CRAN.R-project.org/package=renv>
- Lionel Henry and Hadley Wickham (2023). **rlang**: Functions for Base Types and Core R and 'Tidyverse' Features. R package version 1.1.1. <https://CRAN.R-project.org/package=rlang>
- Hadley Wickham and Dana Seidel (2022). **scales**: Scale Functions for Visualization. R package version 1.2.1. <https://CRAN.R-project.org/package=scales>
- Edzer Pebesma (2023). **sf**: Simple Features for R. R package version 1.0-12. <https://CRAN.R-project.org/package=sf>
- Elin Waring, Michael Quinn, Amelia McNamara, Eduardo Arino de la Rubia, Hao Zhu and Shannon Ellis (2022). **skimr**: Compact and Flexible Summaries of Data. R package version 2.1.5. <https://CRAN.R-project.org/package=skimr>
- Mark van der Loo (2022). **stringdist**: Approximate String Matching, Fuzzy Text Search, and String Distance Functions. R package version 0.9.10. <https://CRAN.R-project.org/package=stringdist>
- Hadley Wickham (2022). **stringr**: Simple, Consistent Wrappers for Common String Operations. R package version 1.5.0. <https://CRAN.R-project.org/package=stringr>
- Kyle Walker and Matt Herman (2023). **tidycensus**: Load US Census Boundary and Attribute Data as 'tidyverse' and 'sf'-Ready Data Frames. R package version 1.4.1. <https://CRAN.R-project.org/package=tidycensus>
- Hadley Wickham, Davis Vaughan and Maximilian Girlich (2023). **tidyr**: Tidy Messy Data. R package version 1.3.0. <https://CRAN.R-project.org/package=tidyr>
- Bob Rudis and Dave Gandy (2019). **waffle**: Create Waffle Chart Visualizations. R package version 1.0.1. <https://gitlab.com/hrbrmstr/waffle>
- Winston Chang (2023). **webshot**: Take Screenshots of Web Pages. R package version 0.5.5. <https://CRAN.R-project.org/package=webshot>
- Winston Chang (2023). **webshot2**: Take Screenshots of Web Pages. R package version 0.1.1. <https://CRAN.R-project.org/package=webshot2>
- Gavin Rozzi (2022). **zipcodeR**: Data & Functions for Working with US ZIP Codes. R package version 0.3.5. <https://CRAN.R-project.org/package=zipcodeR>

Sample Selection

Identifying Bright Spots

We use statistical modeling to predict a school's Involved Families (IF) score based on key student and school characteristics. By comparing the actual IF score to the predicted score, we can identify schools that outperformed expectations.



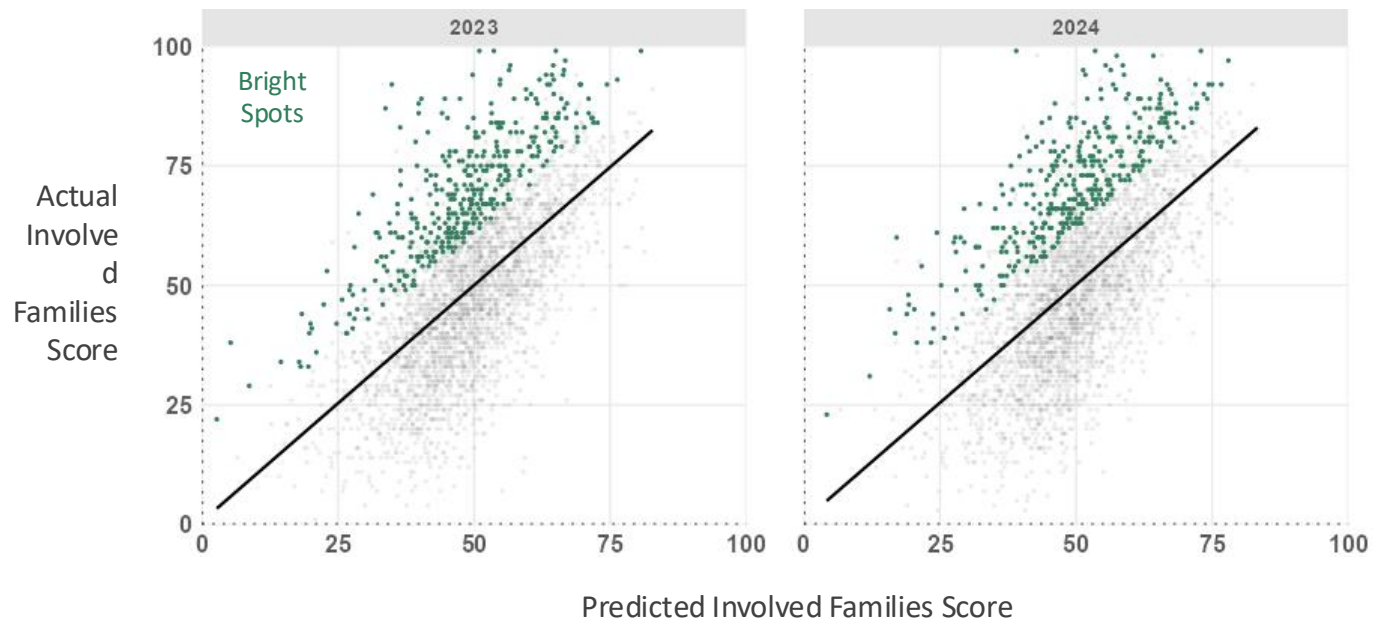
In the figure, each dot represents a school during the 2023 school year. The black line shows where a school's actual IF score matches its predicted score. Schools above the line performed better than expected on the IF measure, indicating stronger family engagement compared to similar schools.

For example, in 2023, **School X** received an IF score of **82**, while our model predicted a score of **40**. This means School X exceeded expectations by a remarkable 40 points, suggesting that it was able to engage families far beyond what would be expected based on its school characteristics.

*We include district size, grade band, locale, charter flag, average class size, student enrollment, teacher retention rate, principal turnover, total per-pupil expenditure, % students with disabilities, % low-income students, % limited English proficient students, and % students by race/ethnic groups. Note that we exclude variables related to the school policies and practices that may lead to improved family-school engagement and that we hope to identify through our qualitative research. We also exclude student outcomes like chronic absenteeism to avoid controlling for the positive side effects of family engagement, as this may hide the positive deviants we aim to identify.

Identifying Bright Spots

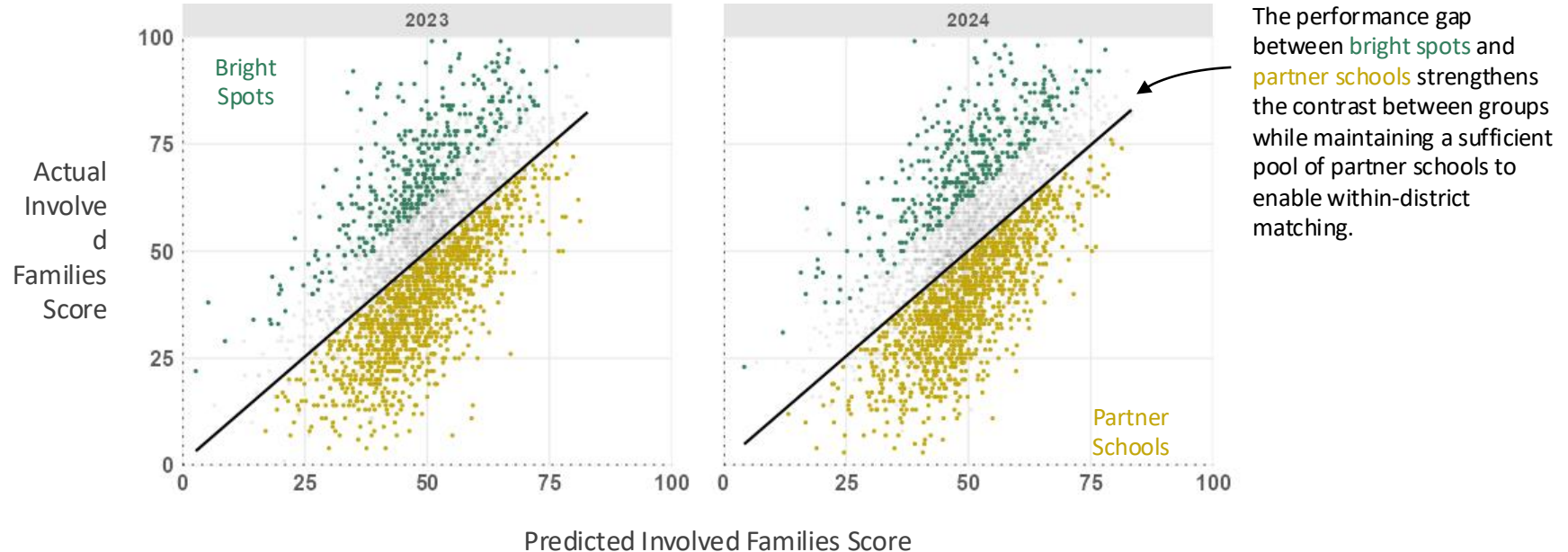
Bright Spots are schools that have much better-than-expected family-school engagement in *both* 2023 and 2024. They place in the top 20% for better-than-expected IF scores in both 2023 and 2024.



Note: If a school lacks Involved Families scores for both 2023 and 2024, we use 2022 and 2023, and if it lacks scores for 2022 and 2023, we use 2022 and 2024

Identifying Partner Schools

Partner schools placed in the bottom 50%, meaning they performed below expectations in both 2023 and 2024*.



The performance gap between **bright spots** and **partner schools** strengthens the contrast between groups while maintaining a sufficient pool of partner schools to enable within-district matching.

*If a school lacks Involved Families scores for both 2023 and 2024, we use 2022 and 2023, and if it lacks scores for 2022 and 2023, we use 2022 and 2024

Bright Spots vs. Partner Schools

Bright spot and partner schools are very similar on key school-level variables that capture school resources and student demographics, but positive deviants typically perform better on chronic absenteeism and achievement.

	STUDENTS (2023)*			
	All Potential Schools	Bright Spots	Partner Schools	
Total	1,574,941	179,489	616,182	
% Low-income students	49%	52%	50%	} We want these school characteristics to be similar
% Students w/disabilities	19%	18%	18%	
% Students w/LEP	15%	16%	15%	
% Black students	16%	19%	16%	
% Latinx students	28%	29%	29%	
% White students	47%	44%	46%	
Involved Families Score	50	70	39	} But we want family engagement to be different.
IF Overperformance	0	+21	-10	
Chronic Absenteeism Rate	27.9%	25.7%	30.5%	
Math Achievement Rate	26.4%	29.9%	23%	
ELA Achievement Rate	32.9%	37.8%	29%	

Selecting Partner Schools

To better control for external factors and uncover the school-initiated practices that improve family-school engagement, we used a matched case-control design* that pairs each bright spot school with the most similar partner school **within the same district**.

We matched each bright spot school to the partner school within the same district that is the same grade band (e.g., Elementary) and as similar as possible based on:

- total student enrollment
- % of students with disabilities
- % of Limited English Proficient students
- % of low-income students
- % of White students and the % of Black students

We prioritize **within district schools** to ensure that matched schools operate under the same administrative conditions and district-wide practices and policies, allowing us to better identify effective school-initiated practices.

*This is the same approach used by UNICEF in their recent positive deviant studies exploring the policies and practices of schools in several countries. Source: [unicef.org/innocenti/projects/data-must-speak](https://www.unicef.org/innocenti/projects/data-must-speak).

Data Sources and Descriptions: School and Staff Characteristics

Variable	Source	Description
School District Size	ISBE	Indicator for Large, Medium, and Small-sized school districts.
School Grade Band	ISBE	Indicator for whether the school is in an Elementary School, Middle School, or High School based on NCES definitions. Elementary schools offer grades K, 1, 2, 3, or 4, more elementary grades than middle grades 5 through 8, and no grades 9 through 12. Schools with equal elementary and middle grades (i.e., that offer grades 1-8, 2-7, 3-6, and 4-5) are Elementary. Middle schools offer grades 5, 6, 7, or 8, more middle grades than elementary or high school grades, and does not offer both K-4 and 9-12. High schools offer grade 12 and more of grades 9 through 11 than middle grades.
School Locale	NCES	Indicator for whether the school is in a City, Rural, Suburb, or Town locale. These categories are more general versions of the 12 available categories. According to NCES, "locales are assigned to schools based on their reported physical address location. Agencies may operate schools in more than one type of locale therefore an agency locale assignment reflects the dominant locale where most students are enrolled in school. The 12 locales include: City-Large (11), City-Midsize (12), City-Small (13), Suburb-Large (21), Suburb-Midsize (22), Suburb-Small (13), Town-Fringe (31), Town-Distant (32), Town-Remote (33), Rural-Fringe (41), Rural-Distant (42), Rural-Remote (43)."
Charter School Indicator	NCES	Indicator if school is a charter school, defined by NCES as a school "that provides free elementary and/or secondary education to eligible students under a specific charter granted by the state legislature or other appropriate authority."
Total per-pupil expenditure	ISBE	"The total of per-pupil school-level expenditures and per-pupil centralized expenditures funded by federal and state/ local source of funds"
Average Class Size	ISBE	"The number of students in a classroom, specifically either the number of students being
Log of Student Enrollment	ISBE	The log of the total number of students enrolled as of October 1st of the school year. Using the log of the enrollment allows our model to provide an estimate on the relationship between a 10% change in enrollment and the outcome.
Teacher Retention Rate	ISBE	"Teacher retention rate at the school level is the total number of full-time teachers retained in the same school in past three years, divided by the total number of full-time teachers from the past three years." <small>NOTE: Includes school years 21-22, 22-23, and 23-24. ISBE data and descriptions come from the Illinois State Board of Education (isbe.net/reportcard). NCES data and descriptions comes from the National Center for Education Statistics (nces.ed.gov/ipeds).</small>
Principal Turnover	ISBE	"The number of different principals at the same school in the last six years. It is reported as a count."

Data Sources and Descriptions: Student Characteristics

Variable	Source	Description
% Students with Disabilities	ISBE	The percentage of students "who were identified as having a disability through formal evaluations and met specific criteria as stated under the Individuals with Disabilities Education Act (IDEA) to be eligible for special education and related services by a team of individuals who developed an Individualized Education Program (IEP) It also includes students with a 504 Plan who are identified as students with a disability who have met specific criteria as stated under the Section 504 of the Rehabilitation Act of 1973 and are eligible to receive accommodations and related services in a general education setting."
% Low-income students	ISBE	The percentage of students who "receive or live in households that receive Supplemental Nutrition Assistance Program or Temporary Assistance to Needy Families benefits; are classified as homeless, migrant, runaway, Head Start, or foster children; or live in a household where the household income meets the U.S. Department of Agriculture income guidelines to receive free or reduced-price meals."
Student Race and Ethnicity	NCES and ISBE	The race or ethnicity of a student is one of seven values: American Indian or Alaska Native, Asian, Black, Hispanic or Latinx, Multiracial (two or more races), Native Hawaiian or Pacific Islander, or White. NCES and ISBE Student Race and Ethnicity data is very highly correlated ($r > .99$), so we use both sources. We use NCES values first because NCES data is about 99.6% complete compared to ISBE data that is about 48% complete. In less than .1% of cases, we then use ISBE data to fill in missing NCES data.
% English Learners (Students with Limited English Proficiency)	ISBE and CRDC	ISBE and CRDC English Learner data is highly correlated ($r = .96$). To maximize coverage, we use ISBE as the primary source because it is more current and supplement with CRDC only for records with missing/unreported ISBE EL values. Among schools with missing ISBE EL values, CRDC shows 90% have <2% EL enrollment and 98% have <5%, suggesting the missingness is concentrated in schools with minimal EL enrollment.

NOTE: Includes school years 21-22, 22-23, and 23-24 for ISBE and NCES. ISBE data and descriptions come from the *Illinois State Board of Education* (isbe.net/reportcard). NCES data and descriptions comes from the *National Center for Education Statistics Common Core of Data* (nces.ed.gov/ccd/elsi). CRDC data are from school year 20-21 only, retrieved via the Urban Institute Education Data Portal (educationdata.urban.org) and sourced from the U.S. Department of Education Office for Civil Rights Civil Rights Data Collection (CRDC)

Data Sources and Descriptions: Outcomes

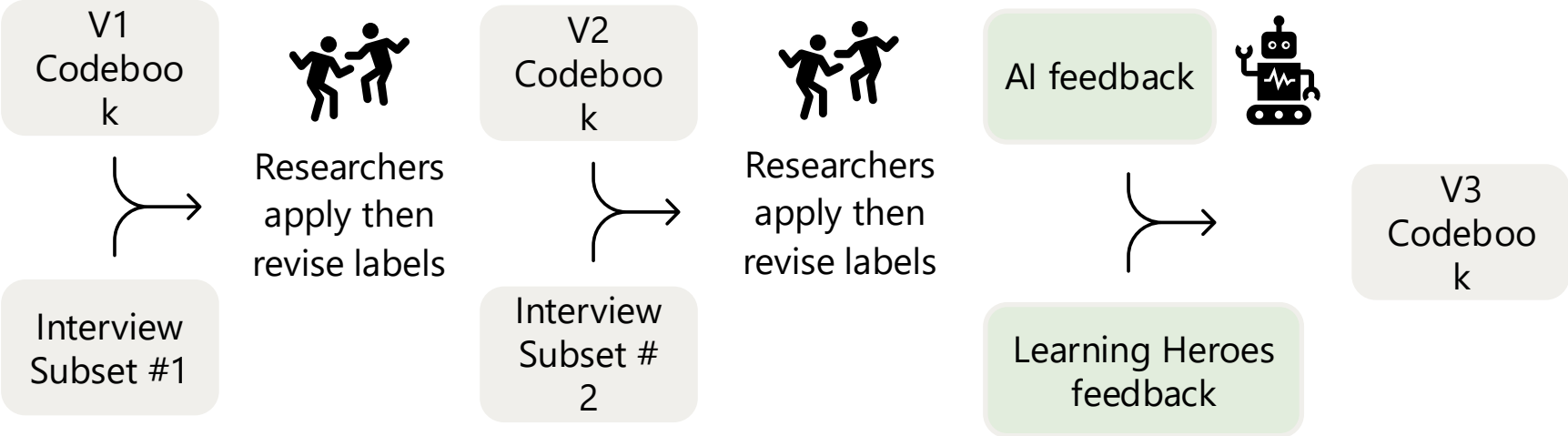
Variable	Source	Description
5Essentials Involved Families Score	ISBE	A "summary indicator that describes the school's performance" based on teacher surveys. The score is on a scale from 1-99 and measures the extent to which all school staff develop strong relationships with families. More specifically, this score measures teacher perceptions of "Parent influence on decision making in schools", "Parent involvement in school", and "Teacher-parent trust."
Chronic Absenteeism	ISBE	"The number of chronically absent students, divided by the enrollment of the responsible school, multiplied by 100. Students are considered chronically absent as defined in Section 26-18 of the School Code. Medically homebound and hospitalized students are excluded from this calculation." Section 26-18 defines chronic absence as "absences that total 10% or more of school days of the most recent academic school year, including absences with and without valid cause, as defined in Section 26-2a of this Code, and out-of-school suspensions for an enrolled student."
Math Proficiency	ISBE	"The percentage of students who are proficient (i.e., performance levels 4 and 5 on IAR, performance levels 3 and 4 on DLM-AA, performance levels 3 and 4 on SAT) in the subject area of math."
English Language Arts (ELA) Proficiency	ISBE	"The percentage of students who are proficient (i.e., performance levels 4 and 5 on the Illinois Assessment of Readiness, performance levels 3 and 4 on DLM-AA, performance levels 3 and 4 on SAT in the subject area of ELA)."

NOTE: Includes school years 21-22, 22-23, and 23-24. ISBE data and descriptions come from the *Illinois State Board of Education* (isbe.net/reportcard). NCES data and descriptions comes from the *National Center for Education Statistics Common Core of Data* (nces.ed.gov/ccd/elsi)

AI-Assisted Labeling Process

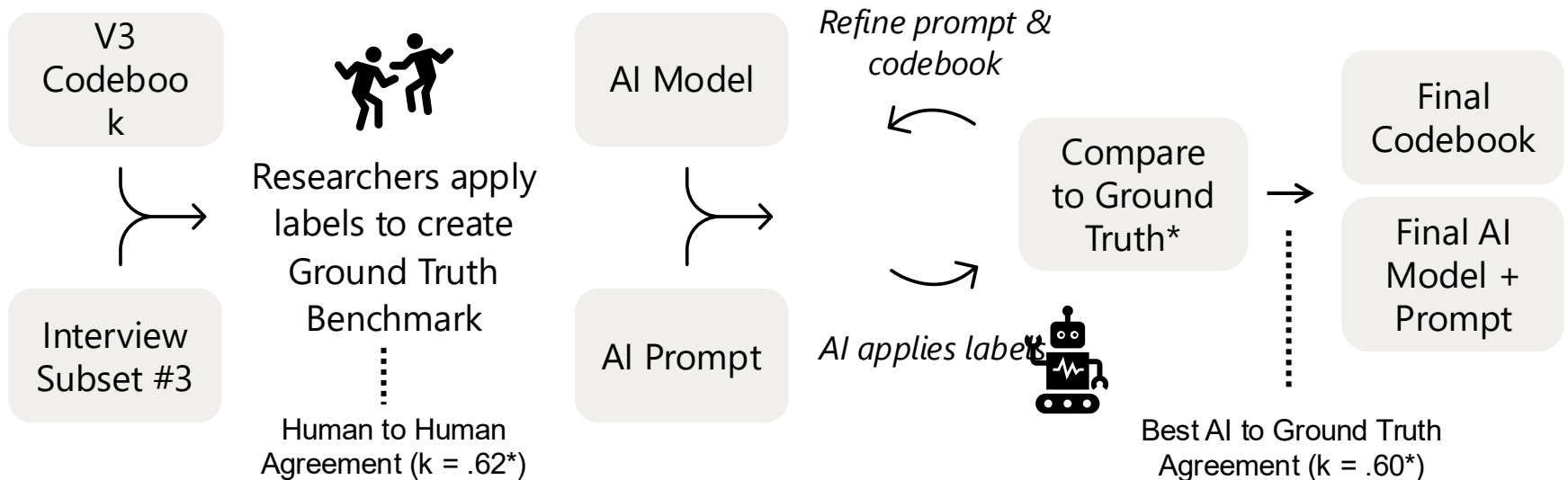
Phase 1: Codebook Development

We developed a codebook from research and initial interviews, applied it on randomly selected transcripts at the question-response level, used AI to surface gaps, and refined it with Learning Heroes' feedback.



Phase 2: Human-AI Label Calibration

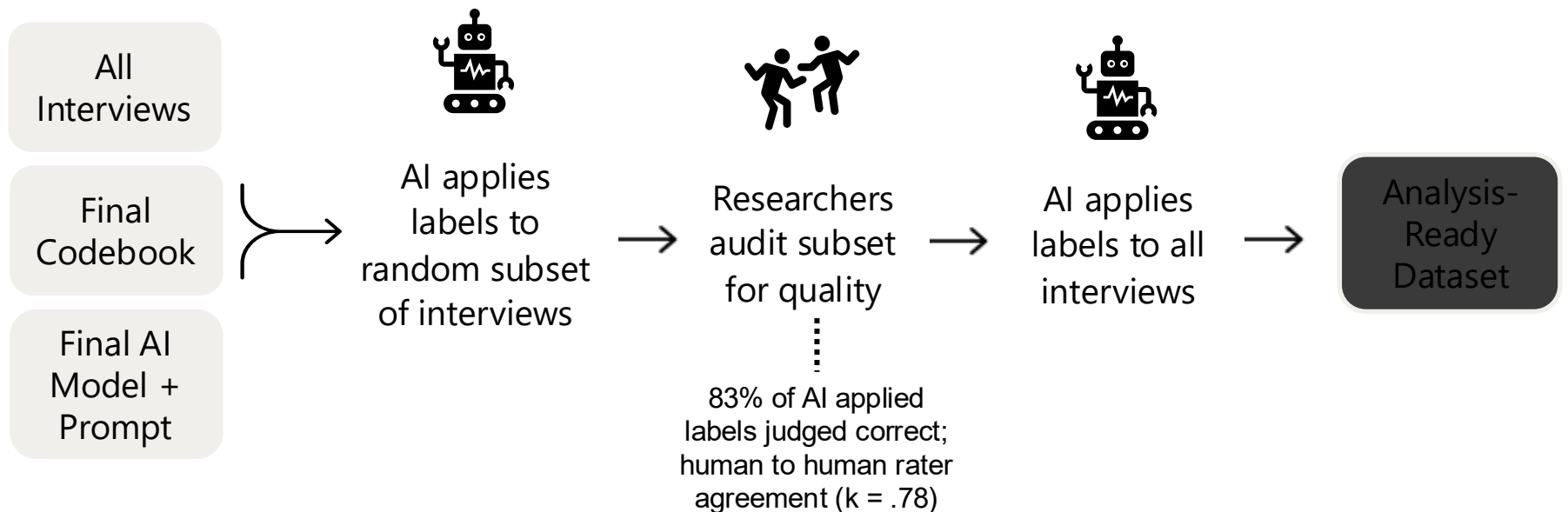
We built a human-labeled ground truth dataset, had AI label the same data, compared results, and iteratively refined the prompt and codebook until we achieved strong agreement.



*Cohen's kappa is a standard inter-rater reliability metric for categorical judgments that adjusts for chance; $k = 0.62$ means researcher agreement equals chance plus 62% of the gap to 100% (e.g., if chance is 50%, that's a rate of 81% agreement). The best AI model + prompt combination achieved $k = .60$ compared to ground truth labels.

Phase 3: AI-Assisted Labeling

After final testing, we used the best performing model, prompt, and codebook combination to apply labels to each question response across the full set of interviews.



Codebook

School Culture & Norms

Label	Sub-Dimension	Description
Cultivates Family Belonging	external	Evidence of shared school-family community identity across families or public cultural integration.
Open & Welcoming Access	external	Open, walk-in access signals families can informally use school spaces; welcoming, shared facilities.
Personal & Enduring Relationships	external	Personalized care showing educators know families beyond academics; trust-building, power-balancing behaviors.
Recognition and Incentives Systems	external	Formal systems that publicly incentivize or recognize students or family participation.
Responsive to Family Needs	external	Support provided in direct response to a family's expressed need or barrier.
Same Team	external	School and families as co-owners of student success; assets and partnership emphasized.
School-Initiated Outreach & Relationship-Building	external	Proactive outreach from school to build trust before families raise concerns.
Family-as-Staff Integration	internal	Families embedded weekly in school life through paid or recurring volunteer roles.
Reflective Growth Mindset	internal	Staff reflect on data and feedback to self-assess and improve family engagement practices.
Staff stability and retention	internal	Mentions of staff stability or turnover and effects on engagement, trust, or climate.
Teamwork / collaborative engagement	internal	Family engagement is shared across roles with aligned routines and coordination, not one liaison.

Family-School Interactions (Part 1)

Label	Sub-Dimension	Description
Unscheduled 1:1, in-person	Mutual	Unplanned, in-person check-ins like hallway chats or pickup/drop-off conversations.
Unscheduled 1:1, remote	Mutual	One-to-one digital/phone contact about a specific student or family issue.
Unscheduled feedback from parents	Mutual	Family views informally shared via networks or social media.
Classroom involvement	School-led	Parents assisting in classrooms as helpers or volunteers.
Family Groups and Committees	School-led	Standing councils/committees where families collaborate with staff on school improvement.
Home visits	School-led	Teachers or staff making home visits.
Mass push communication	School-led	Broadcast updates to many families without personalization.
Parent Portal / Resource Hub	School-led	School-run portals where families access student information/resources; primarily pull, not dialogue.

Family-School Interactions (Part 2)

Label	Sub-Dimension	Description
Parent workshops / training	School-led	Workshops that build academic, technology, or parenting skills.
Resource / Services Provision	School-led	School directly supplies food, clothing, or other basics.
Scheduled 1:1 meeting	School-led	Scheduled conferences or calls about individual students, including IEPs.
Scheduled parent feedback	School-led	Structured methods for gathering family input, like surveys or focus groups.
School event	School-led	Families attending performances, open houses, or similar events.
Student-mediated interaction	School-led	Student-led conferences or engagement through student work and projects.
Volunteering beyond the classroom	School-led	Parents helping with school activities outside class, such as field trips, lunchroom duty, parent patrols, or school events.

Interactions Content (Part 1)

Label	Sub-Dimension	Description
Logistical (RSVPs) or administrative info	Info shared by families	Parents return forms such as RSVPs and permissions.
Parent perspectives, needs, ideas	Info shared by families	Families contribute concerns, goals, ideas, stories, or strengths.
Support for student	Info shared by families	Family shares context or feedback about their child's needs or supports.
Classroom-level learning	Info shared by staff	Whole-class updates about learning activities, not individual progress data.
Event/program logistics	Info shared by staff	Announcements about upcoming programs or events.
Extracurricular activities	Info shared by staff	Information on after-school or out-of-school opportunities.

Interactions Content (Part 2)

Label	Sub-Dimension	Description
Family Assistance	Info shared by staff	Guidance or referrals to community wraparound resources and services.
Student academic information	Info shared by staff	Personalized student performance data with interpretation.
Student attendance information	Info shared by staff	Information about individual student attendance and absenteeism.
Student behavior information	Info shared by staff	Reports on behavior, social-emotional status, or discipline.
Support for learning at home	Info shared by staff	Recommendations of learning tools or strategies families can use at home.
Transition Support	Info shared by staff	Support for key transitions: grade changes, high school entry, or postsecondary planning.

Interactions Quality

Label	Sub-Dimension	Description
Consistent	Communication style	Communications issued on a predictable cadence.
Multilingual	Communication style	Information provided in families' preferred languages via translation or bilingual staff.
Persistent follow-through	Communication style	Persistent, varied follow-ups until contact is made.
Positive / Strength-based	Communication style	Messages that highlight student or family strengths, growth, or successes.
Proactive-Timely	Communication style	Early, anticipatory outreach so families receive usable information in time to act.

Support for Educators

Label	Sub-Dimension	Description
Clear expectations	All school staff	Leaders set expectations and hold staff accountable for family engagement.
Dedicated staff time for engagement	All school staff	Scheduled time dedicated to staff-family engagement work.
Dedicated staff to support families	All school staff	Staff roles dedicated to family outreach and support.
Organizing school events	All school staff	Central office assists schools with events and family recruitment.
Resources, tools, and training	All school staff	Professional learning and resources that build staff family-engagement skills.
Vision and inspiration	All school staff	Clear messaging that explains the importance of family engagement.

Measuring Success

Label	Sub-Dimension	Description
Communications logged	Family measures	Counts of school-home communications measuring outreach volume or reach.
Participation at events	Family measures	Headcounts of attendance at school events.
Personal recognition from families	Family measures	Families express appreciation to staff, sometimes with gifts or invitations.
Survey results	Family measures	Survey measuring family-school partnership perceptions or experience.
Alumni engagement	Student measures	Alumni remain connected and engaged after graduation.
Student outcomes: academic or behavioral	Student measures	Improved academic or behavior outcomes credited to family partnerships.
Student outcomes: attendance	Student measures	Improved attendance attributed to strong family partnerships.

Barriers

Label	Sub-Dimension	Description
Cultural differences	Mutual	Cultural differences create misunderstandings or hesitation between families and staff.
Digital Access	Mutual	Limited access or comfort with technology hinders family communication and involvement.
Language Access & Translation Support	Mutual	Language barriers limit communication; translation capacity is insufficient.
Distance & Transportation	Parent-side	Distance or transportation barriers prevent families from attending on-site activities.
Negative past experiences	Parent-side	Past negative experiences with institutions make families wary of engaging.
Time and work conflicts	Parent-side	Work schedules or time demands limit families' ability to participate.
Educator capacity	School-side	Staff capacity constraints—time, training, confidence, knowledge, resources—limit engagement efforts.
Educator interest	School-side	Some staff show low initiative or belief in engaging families.

Software Citations

Gen AI Tools and R packages used in the analysis

Generative AI

- Snowflake Inc. (n.d.). COMPLETE (SNOWFLAKE.CORTEX). Snowflake SQL function documentation. <<https://docs.snowflake.com/en/sql-reference/functions/complete-snowflake-cortex>>.
- Anthropic PBC (2024). Claude 3.5 Sonnet. Large language model (invoked via SNOWFLAKE.CORTEX.COMPLETE as `claude-3-5-sonnet`). <<https://www.anthropic.com/news/claude-3-5-sonnet>>.
- Mistral AI team (2024). Large Enough (Mistral Large 2). Large language model (invoked via SNOWFLAKE.CORTEX.COMPLETE as `mistral-large2`). <<https://mistral.ai/news/mistral-large-2407>>.
- Meta (2024). Meta Llama 3.1 405B. Model card (invoked via SNOWFLAKE.CORTEX.COMPLETE as `llama3.1-405b`). <<https://huggingface.co/meta-llama/Llama-3.1-405B>>.

R Packages

- R Core Team (2023). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. <<https://www.R-project.org/>>.
- Wickham H (2021). babynames: US Baby Names 1880-2017. R package version 1.0.1, <<https://CRAN.R-project.org/package=babynames>>.
- Robinson D, Hayes A, Couch S (2025). broom: Convert Statistical Objects into Tidy Tibbles. R package version 1.0.8, <<https://CRAN.R-project.org/package=broom>>.
- Fox J, Weisberg S, Price B (2024). car: Companion to Applied Regression. R package version 3.1-3, <<https://CRAN.R-project.org/package=car>>.
- Maechler M, Rousseeuw P, Struyf A, Hubert M (2024). cluster: "Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.. R package version 2.1.8, <<https://CRAN.R-project.org/package=cluster>>.
- Wilke C (2024). cowplot: Streamlined Plot Theme and Plot Annotations for 'ggplot2'. R package version 1.1.3, <<https://CRAN.R-project.org/package=cowplot>>.
- Cui B (2024). DataExplorer: Automate Data Exploration and Treatment. R package version 0.8.3, <<https://CRAN.R-project.org/package=DataExplorer>>.
- R Special Interest Group on Databases (R-SIG-DB), Wickham H, Müller K (2024). DBI: R Database Interface. R package version 1.2.3, <https://github.com/r-dbi/DBI>, <<https://dbi.r-dbi.org>>.
- Wickham H, François R, Henry L, Müller K, Vaughan D (2023). dplyr: A Grammar of Data Manipulation. R package version 1.1.4, <https://github.com/tidyverse/dplyr>, <<https://dplyr.tidyverse.org>>.
- Ueyama K (2022). educationdata: Retrieve Records from the Urban Institute's Education Data Portal API. R package version 0.1.3, <<https://CRAN.R-project.org/package=educationdata>>.
- Wickham H (2023). forcats: Tools for Working with Categorical Variables (Factors). R package version 1.0.0, <<https://CRAN.R-project.org/package=forcats>>.
- Robinson D (2020). fuzzyjoin: Join Tables Together on Inexact Matching. R package version 0.1.6, <<https://CRAN.R-project.org/package=fuzzyjoin>>.
- Campitelli E (2025). ggnewscale: Multiple Fill and Colour Scales in 'ggplot2'. R package version 0.5.2, <<https://CRAN.R-project.org/package=ggnewscale>>.
- Wickham H, Chang W, Henry L, Pedersen T, Takahashi K, Wilke C, Woo K, Yutani H, Dunnington D, van den Brand T (2024). ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics. R package version 3.5.1, <https://github.com/tidyverse/ggplot2>, <<https://ggplot2.tidyverse.org>>.
- Iannone R, Cheng J, Schloerke B, Hughes E, Lauer A, Seo J, Brevoort K, Roy O (2025). gt: Easily Create Presentation-Ready Display Tables. R package version 1.0.0, <<https://CRAN.R-project.org/package=gt>>.
- Müller K (2020). here: A Simpler Way to Find Your Files. R package version 1.0.1, <https://github.com/r-lib/here>, <<https://here.r-lib.org/>>.
- Müller K (2023). hms: Pretty Time of Day. R package version 1.1.3, <https://github.com/tidyverse/hms>, <<https://hms.tidyverse.org/>>.

R Packages

- Firke S (2024). janitor: Simple Tools for Examining and Cleaning Dirty Data. R package version 2.2.1, <<https://CRAN.R-project.org/package=janitor>>.
- Ooms J (2025). jsonlite: A Simple and Robust JSON Parser and Generator for R. R package version 2.0.0, <<https://CRAN.R-project.org/package=jsonlite>>.
- Csárdi G (2023). keyring: Access the System Credential Store from R. R package version 1.3.2, <<https://CRAN.R-project.org/package=keyring>>.
- Bates D, Maechler M, Bolker B, Walker S (2025). lme4: Linear Mixed-Effects Models using 'Eigen' and S4. R package version 1.1-37, <<https://CRAN.R-project.org/package=lme4>>.
- Spinu V, Grolemond G, Wickham H (2024). lubridate: Make Dealing with Dates a Little Easier. R package version 1.9.4, <<https://CRAN.R-project.org/package=lubridate>>.
- Bache S, Wickham H (2022). magrittr: A Forward-Pipe Operator for R. R package version 2.0.3, <https://github.com/tidyverse/magrittr>, <<https://magrittr.tidyverse.org>>.
- Bates D, Maechler M, Jagan M (2024). Matrix: Sparse and Dense Matrix Classes and Methods. R package version 1.6-5, <<https://Matrix.R-forge.R-project.org>>.
- Hester J, Wickham H, Gjoneski O (2025). odbc: Connect to ODBC Compatible Databases (using the DBI Interface). R package version 1.6.1, <<https://CRAN.R-project.org/package=odbc>>.
- Gohel D, Moog S, Heckmann M (2025). officer: Manipulation of Microsoft Word and PowerPoint Documents. R package version 0.6.8, <<https://CRAN.R-project.org/package=officer>>.
- Schauburger P, Walker A (2025). openxlsx: Read, Write and Edit xlsx Files. R package version 4.2.8, <<https://CRAN.R-project.org/package=openxlsx>>.
- Rinker T, Kurkiewicz D (2019). pacman: Package Management Tool. R package version 0.5.1, <<https://github.com/trinker/pacman>>.
- Csardi G (2023). prettyunits: Pretty, Human Readable Formatting of Quantities. R package version 1.2.0, <<https://github.com/r-lib/prettyunits>>.
- Wickham H, Henry L (2025). purrr: Functional Programming Tools. R package version 1.0.4, <https://github.com/tidyverse/purrr>, <<https://purrr.tidyverse.org/>>.
- Wickham H, Hester J, Bryan J (2024). readr: Read Rectangular Text Data. R package version 2.1.5, <https://github.com/tidyverse/readr>, <<https://readr.tidyverse.org>>.
- Wickham H, Bryan J (2025). readxl: Read Excel Files. R package version 1.4.5, <https://github.com/tidyverse/readxl>, <<https://readxl.tidyverse.org>>.
- Ushey K, Wickham H (2025). renv: Project Environments. R package version 1.1.4, <https://github.com/rstudio/renv>, <<https://rstudio.github.io/renv/>>.
- Henry L, Wickham H (2025). rlang: Functions for Base Types and Core R and 'Tidyverse' Features. R package version 1.1.5, <<https://CRAN.R-project.org/package=rlang>>.
- Wickham H, Pedersen T, Seidel D (2023). scales: Scale Functions for Visualization. R package version 1.3.0, <https://github.com/r-lib/scales>, <<https://scales.r-lib.org>>.
- Waring E, Quinn M, McNamara A, Arino de la Rubia E, Zhu H, Ellis S (2022). skimr: Compact and Flexible Summaries of Data. R package version 2.1.5, <https://github.com/ropensci/skimr/>, <[https://docs.ropensci.org/skimr/%20\(website\)](https://docs.ropensci.org/skimr/%20(website))>.
- van der Loo M (2025). stringdist: Approximate String Matching, Fuzzy Text Search, and String Distance Functions. R package version 0.9.15, <<https://CRAN.R-project.org/package=stringdist>>.
- Gagolewski M (2025). stringi: Fast and Portable Character String Processing Facilities. R package version 1.8.7, <<https://CRAN.R-project.org/package=stringi>>.
- Wickham H (2023). stringr: Simple, Consistent Wrappers for Common String Operations. R package version 1.5.1, <https://github.com/tidyverse/stringr>, <<https://stringr.tidyverse.org>>.
- Müller K, Wickham H (2023). tibble: Simple Data Frames. R package version 3.2.1, <https://github.com/tidyverse/tibble>, <<https://tibble.tidyverse.org/>>.
- Wickham H, Vaughan D, Girlich M (2024). tidyr: Tidy Messy Data. R package version 1.3.1, <https://github.com/tidyverse/tidyr>, <<https://tidyr.tidyverse.org>>.
- Robinson D, Silje J (2024). tidytext: Text Mining using 'dplyr', 'ggplot2', and Other Tidy Tools. R package version 0.4.2, <<https://CRAN.R-project.org/package=tidytext>>.
- Wickham H (2023). tidyverse: Easily Install and Load the 'Tidyverse'. R package version 2.0.0, <<https://CRAN.R-project.org/package=tidyverse>>.
- Pashouwer D, Firke S, Orr S, Talcott S (2024). tntpr: Data Analysis Tools Customized for TNT. R package version 1.2.1, <<https://CRAN.R-project.org/package=tntpr>>.
- Ooms J (2025). writexl: Export Data Frames to Excel 'xlsx' Format. R package version 1.5.3, <<https://CRAN.R-project.org/package=writexl>>.
- Kuhn M, Vaughan D, Hvitfeldt E (2025). yardstick: Tidy Characterizations of Model Performance. R package version 1.3.2, <<https://CRAN.R-project.org/package=yardstick>>.