



The Contributions of School and Neighborhood Factors to Student Attendance Following the COVID-19 Pandemic

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Student attendance remains well below pre-COVID pandemic levels, yet districts lack evidence about which levers are most influential. Whether school and neighborhood contexts still account for meaningful variation in attendance, especially for students with weaker attendance histories, is an open question. Using a longitudinal database of over 360,000 Chicago Public Schools students in grades 6-11 before and after the pandemic, we estimate the relative contributions of school, neighborhood, and individual factors using cross-nested hierarchical linear models. We find that school-level differences in attendance substantially outweigh those observed between neighborhoods, and school context matters more for students who had lower attendance in the past. Teacher-parent trust in the school shows a particularly strong relationship with attendance in high schools. The findings indicate that schools retain meaningful leverage over attendance in the post-pandemic era, including for the students furthest from regular attendance, and point to where districts can most efficiently direct limited resources.

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**The Contributions of School and Neighborhood Factors to Student Attendance Following
the COVID-19 Pandemic**

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Abstract

Student attendance remains well below pre-COVID pandemic levels, yet districts lack evidence about which levers are most influential. Whether school and neighborhood contexts still account for meaningful variation in attendance, especially for students with weaker attendance histories, is an open question. Using a longitudinal database of over 360,000 Chicago Public Schools students in grades 6-11 before and after the pandemic, we estimate the relative contributions of school, neighborhood, and individual factors using cross-nested hierarchical linear models. We find that school-level differences in attendance substantially outweigh those observed between neighborhoods, and school context matters more for students who had lower attendance in the past. Teacher-parent trust in the school shows a particularly strong relationship with attendance in high schools. The findings indicate that schools retain meaningful leverage over attendance in the post-pandemic era, including for the students furthest from regular attendance, and point to where districts can most efficiently direct limited resources.

Keywords: attendance, chronic absenteeism, school contexts, neighborhood contexts, school climate

The Contributions of School and Neighborhood Factors to Student Attendance Following the COVID-19 Pandemic

In the aftermath of the COVID-19 pandemic, student attendance dropped sharply. Nationally, rates of chronic absenteeism, missing 10% or more of school days, jumped to over 28% of students in 2022, compared to about 15% of students in years just prior to the pandemic (Malkus, 2024), and were still high in the 2024-25 school year, estimated to be about 22% (Diliberti et al., 2025). Extensive research has linked chronic absenteeism to lower academic achievement, and lower high school graduation rates (Aucejo & Romano, 2016; Kirksey, 2019; Klein & Sosu, 2024; May et al., 2025; Ready, 2010; Smerillo et al., 2018). It is essential to know how to efficiently target the limited time and resources cities, districts, and states have for improving attendance in the post-COVID years. Yet districts have little guidance on whether the most promising leverage points lie inside schools, in the neighborhoods where students live, or in students' individual circumstances.

The context in which families make daily decisions about attendance also changed through the onset of the COVID-19 pandemic and the years that followed. The pandemic and concurrent changes in the economy had uneven impacts on students and families based on their background and neighborhood, with inequities widening (Gee et al., 2023). Working from home became commonplace (Barrero et al., 2021), and more students and adults reported mental health challenges (Naff et al., 2022). Technology became integrated in teaching and learning in new ways, making it easier to get and receive assignments remotely, access learning videos and modules, and communicate with peers and teachers (Jacob, 2024; Johnson et al., 2023). Because these shifts did not land evenly across students, families, schools and neighborhoods (Hatef et

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al., 2020), it is not known whether schools and neighborhoods shape attendance in the same ways they did before the pandemic.

We lack evidence, particularly in a post-COVID context, on the *relative* contributions of school and neighborhood contexts to attendance, and on whether these contributions differ for students with different prior or baseline attendance histories. Disentangling school and neighborhood context is not possible in most districts, where students from the same neighborhood largely attend the same schools. Chicago Public Schools is an exception: widespread school choice means that neighborhood of residence and school attended are only loosely coupled. We use pre- and post-pandemic data from the district to estimate the contribution of each context. We further look for moderation effects to determine whether context is more influential for students with low or high baseline attendance rates, and identify school and neighborhood factors that show the strongest relationships among students with different levels of baseline attendance.

We focus on the middle grades (6-8) and high school grades (9-11), times when attendance tends to decline relative to students' attendance in prior grades, analyzing post-pandemic years separately from pre-pandemic years. We use cross-nested hierarchical models that account for differences across neighborhoods when estimating school-level variation and vice versa, and extensive controls for student background, including students' own attendance and test scores in prior years, so that estimates compare students to peers with similar histories. Together, these features let us determine how much leverage schools retain over attendance in the post-pandemic period, and for which students.

Background and Conceptual Framing

School attendance is an ecological issue, shaped by a complex interplay of multiple individual, family, school, and neighborhood factors (Kearney et al., 2023; Lenhoff & Singer, 2025; Lenhoff et al., 2022). The bioecological model (Gottfried & Gee, 2017) situates attendance within interconnected systems that both constrain and support students. This perspective underscores that exposure to multiple stressors compounds negative outcomes, while supportive environmental conditions can buffer students against such risks. Social inequalities at the individual or family level interact with structural factors at the school and neighborhood level (e.g., policies, practices, and resources) to influence school attendance in ways that can reinforce or ameliorate those inequities. It is beyond the scope of this manuscript to examine all possible family, community, and school factors that might affect attendance. This manuscript focuses on contextual factors in schools and neighborhoods, acknowledging the interplay among individual and family factors, context, and specific policies, practices, and resources.

Student and Family Factors

Student attendance reflects a combination of family circumstances and the structural and neighborhood conditions in which families live, and these are often difficult to separate. A large array of individual and family factors influence students' ability to attend school, including health, chronic illnesses, disabilities, and mental health (Forrest et al., 2011; Kearney, 2008), as well as parental education, income, and employment status (Balfanz & Byrnes, 2018; Ehrlich et al., 2018). Structural conditions that families navigate, such as access to reliable transportation and healthcare (Aucejo & Romano, 2016; Garcia & Weiss, 2018), housing instability, and eviction (Collinson et al., 2025), further shape attendance outcomes. The COVID-19 pandemic highlighted, and sometimes exacerbated, these barriers, along with inconsistent health support

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and food insecurity, further compounding the challenges to consistent school attendance (Attendance Works & Healthy Schools Campaign, 2015; Chang & Balfanz, 2016). Thus, we may find that differences across students, schools, and neighborhoods widened after the pandemic, and that these differences are strongly tied to students' backgrounds.

Neighborhood Factors

Neighborhoods are often highly segregated by race, ethnicity, and economic status, which shapes the opportunity structures available to residents. Residential segregation is correlated with access to jobs, services, and education (Logan & Parman, 2025). Neighborhoods can potentially shape students' attendance and engagement with schooling through mechanisms such as access to institutional resources such as libraries, community centers, and health services; collective socialization through adult role models and community supervision; peer effects; perceptions of safety; and housing stability (Balfanz & Byrnes, 2018; Jencks & Mayer, 1990; Leventhal & Brooks-Gunn, 2000).

A growing body of research links neighborhood violence to diminished academic outcomes. Burdick-Will (2016) demonstrates that children from more violent neighborhoods fall progressively behind their peers from safer areas as they move through school, with effects comparable in magnitude to those of socioeconomic disadvantage. More recently, Burdick-Will et al. (2024) find that students from more violent neighborhoods are less likely to choose their closest school, even when it is listed, ranking it lower than students from safer neighborhoods do, a pattern suggesting that strategic school avoidance is an additional mechanism through which violence shapes educational opportunity, attendance, and achievement.

Both the material (e.g., socioeconomic status, infrastructure) and social (e.g., support networks, local norms) components of neighborhoods contribute to disparities in attendance and

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academic achievement (Chetty et al., 2016). It can be difficult to separate the influence of neighbors and neighborhood from family characteristics such as resources and preferences. Low-income neighborhoods often exhibit higher concentrations of unemployment, greater exposure to environmental pollutants, and reduced access to adequate medical, dental, and vision care (Berliner, 2009). These poverty-induced health problems, ranging from untreated illness to attention disorders also are known to interfere with regular school attendance (Berliner, 2009; Castillo & Singer, 2026). Using fixed effects to better isolate neighborhood characteristics from family factors, Gottfried (2014a) found significant relationships between school attendance and the characteristics of families in the neighborhood, including poverty, family structure, homeownership status, and race.

The COVID-19 pandemic underscored and intensified existing neighborhood-level challenges. Pandemic-related disruptions heightened material insecurity including food, housing, and healthcare access, which hit low-income and marginalized neighborhoods especially hard (Gonzalez et al., 2023). Community organizations, social support networks, and local institutions faced significant strain, sometimes reducing their capacity to mitigate these challenges (Chetty et al., 2016). Temporary school closures, transitions to remote learning, barriers to accessing technology, and fluctuating public health guidance disproportionately affected students in under-resourced neighborhoods (Ferren, 2021). Thus, investments in neighborhood resources or community-wide strategies for supporting families could help to improve attendance in particular neighborhoods. At the same time, how much community investment would improve attendance, relative to better supports in schools, remains unclear.

School Factors

The bioecological model (Gottfried & Gee, 2017) highlights that many factors influencing attendance are beyond the reach of the school and suggests a need for support across multiple social sectors, supports that vary for individual students and families (Kearney et al., 2023). Different schools face different challenges, and the ability of school staff to address barriers external to school may seem limited. Nonetheless, the bioecological model also highlights the interactions among different spheres of influence, where support in one sphere can protect or cancel risks in others. This suggests the school context might potentially accentuate or ameliorate individual, family, and neighborhood circumstances that influence attendance. We organize the school-level mechanisms that prior research links to attendance into three groups: structural characteristics of schools, school practices, and school climate.

Structural-organizational factors include features of a school's composition that shape the aggregate level of needs for supporting attendance by school staff. In larger schools, it may be harder for adults to notice and respond to the absences of individual students, and a body of work finds higher absenteeism and lower participation in school activities in larger schools (Jones et al., 2008; Kuziemko, 2006; Leithwood & Jantzi, 2009). Schools serving high percentages of students from low-income families face compounding challenges. More of their families are contending with the health, housing, transportation, and work-schedule barriers that keep students home (Garcia & Weiss, 2018). Furthermore, when many classmates are frequently absent, attendance norms weaken and students themselves become less likely to attend through peer effects (Gottfried, 2014b). Crime in the area surrounding a school may also depress attendance by making the trip to and from school feel unsafe (Bryk et al., 2010).

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The practices and policies schools use to promote development and engagement in school form a second group of factors to consider. There are many different ways in which schools monitor and promote attendance that have shown improvements in attendance, including tracking daily attendance and flagging students at risk, home visits, prompt and personalized communication with families, recognition of good attendance, and mentoring or other school-based supports (Balfanz & Byrnes, 2018; Sheldon & Epstein, 2004; Singer et al., 2026; Smythe-Leistico & Page, 2018). We do not have measures of the many different practices schools might use to promote attendance to include in our study; we describe them here to make clear that this set of factors exists alongside the structural and climate factors we do examine. The exception in this study is disciplinary practices for which we have data in both pre-pandemic and post-pandemic years. Decisions about the use of exclusionary discipline are often not considered part of a school's attendance policy, but suspensions reduce attendance directly by removing students from school and are a driver of racial disparities in attendance (Owens & McLanahan, 2020; Singer, 2025). Schools that have reduced exclusionary discipline while strengthening relationships with students have documented improvements in attendance (Anderson, 2021; Balfanz, 2023; Hinze-Pifer & Sartain, 2018).

The final group of school factors concerns school climate: students' and teachers' perceptions of safety, relationships, academic press, and connectedness. A positive climate, characterized by a shared sense of safety, belonging, academic support, academic rigor, high-quality teacher relationships, and a collaborative staff culture, has consistently been linked to stronger attendance, while climates perceived as unsafe or marked by bullying can drive students away from school (Bryk et al., 2010; Gottfried, 2014b; Hart et al., 2020). Welcoming school cultures and active learning environments are likewise correlated with improved attendance

outcomes (Balfanz et al., 2024; Finn & Voelkl, 1993). In fact, schools with more positive teacher-parent trust prior to the pandemic demonstrated significantly better attendance and achievement outcomes in the years that followed (Learning Heroes & TNTP, 2023).

The Intersection of School, Neighborhood, and Family Factors

In this study, we translate the ecological perspective into an empirical strategy that decomposes variation in attendance across students, schools, and neighborhoods and examines how these patterns changed from the pre- to the post-pandemic period. Our goal is to move from a broad ecological framework to concrete estimates of how context matters, for whom, and what the driving factors are at the neighborhood and school levels.

Besides looking at all students together, we examine school and neighborhood influences separately for students with different baseline attendance histories. This distinction matters for practice, since school staff may feel there is little they can do for students who face the most serious barriers outside of school. Students with low attendance in the early grades tend to continue to struggle with attendance as they progress through school (Chang & Romero, 2008). Yet, whether school and neighborhood context matters less for these students is an open question. If attendance is shaped primarily by external barriers, supportive school climates and practices may have limited impact for students who have been chronically absent. If it emerges from the interaction of school and external factors, those contexts may matter most for exactly those students. A third possibility is that different features matter for different groups, so that what sustains a student who has always attended regularly may not be what re-engages a student who has been chronically absent, and estimates averaged across all students would obscure that difference. Therefore, we estimate the magnitude of school and neighborhood variation, and the associations of specific contextual features, separately for students at each level of baseline

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attendance and by grade level as factors that drive attendance in middle school could be very different from those in high school. Quantifying the contributions of key factors identified in broad frameworks can help policy and practice focus on those areas that are likely to have the largest impact on improving attendance.

This leads us to ask the following research questions:

RQ1: To what extent do school and neighborhood contexts account for variation in student attendance in the post-COVID-19 period, and how does this compare to the pre-pandemic period?

RQ2: Does school and neighborhood context matter more, or less, for students with low baseline attendance than students with high baseline attendance in post-pandemic years, and are the same schools and neighborhoods associated with stronger student attendance at every level of baseline attendance?

RQ3: How strongly are specific features of school and neighborhood context associated with student attendance in the post-COVID period, and do these associations differ for students with different baseline attendance?

Data, Variables, and Methods

Data and Variables

The analytic sample in this study is drawn from administrative records maintained by Chicago Public Schools, of all students enrolled in grades 6 through 11 during the years 2016–17 through 2018–19 (pre-pandemic) and 2021–22 through 2023–24 (post-pandemic). We exclude 2019-20 and 2020-21, when instruction was remote for at least part of the year. Students in

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twelfth grade were not included in the analytic sample because early graduation timing makes their attendance data inaccurate. In addition, we perform the following sample restrictions keeping: 1) only students with attendance data (99.8% of cases); 2) a minimum enrollment of 20 days in a school year, aligned with how CPS collects student enrollment data (99.7% of cases); 3) schools that have more than 10 students to reliably estimate school effects (98.8% of cases); 4) removing students in fully-remote academies, option schools, and alternative schools (maintaining 95.3% of cases) as their attendance requirements might be different. After these restrictions, there are 896,363 student observations in the analytic sample representing 365,509 unique students.

The characteristics of student observations are shown in Table 1. Students in pre-pandemic years were similar to students in post-pandemic years in terms of their gender, race, ethnicity, and socio-economic status variables. There were more students classified as English learners in post-pandemic years (e.g., 22 percent of students in grades 6-8 in post-pandemic years compared to 12 percent in pre-pandemic years). Almost half of middle grade students and over three-fourths of high school students attended a school other than their zoned neighborhood school in both time periods, and slightly fewer attended their zoned neighborhood school in post-pandemic years than in pre-pandemic years. The average distance that students lived from their school was about one mile in the middle grades and two miles in high school, but there was considerable variation across students in how far they traveled, with standard deviations of about 2 miles at both grade levels.

The primary dependent variable for most models was the continuous attendance rate, the percentage of the number of days a student attended school divided by the number of days enrolled. The average attendance rate in grades 6-8 was 95% in pre-pandemic years and 91% in

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post-pandemic years; in high schools, average attendance rates were 90% in pre-pandemic years and 84% in post-pandemic years. The decline in attendance rates was more pronounced for high school students.

Statistical models include controls for students' background, baseline attendance and test scores to control for selection of students into schools and neighborhoods. For middle grade students, the baseline year for attendance was fifth grade; for high school students it was eighth grade. Because average attendance rates were recorded differently during the years of the pandemic, models also included controls for the time-period in which the baseline attendance was recorded among post-pandemic students which could be before, during or after the pandemic years. Table 1 shows the percentage of students by their baseline timing.

In addition, the model included controls for prior test scores (students' average reading and math scores in grades 3 through 5 for middle grades analyses and grades 6 through 8 for high school analyses), gender, race, English learner status, whether identified for special education services and type, whether students were in temporary living situation, whether they were attending their neighborhood school, the distance from their residence to school, whether they changed residences, and two socio-economic indicators based on the census block group where students live. One indicator called concentration of poverty combined and reversed coded the percentage of families above the poverty line, and the percentage of men employed in the block group. The second one, social status, combined the average level of education among adults over age 21, and the percent of adults in the block group employed as managers or executives. The variables were standardized across all block groups in Chicago, including those with few children enrolled in the district.

[Table 1 goes here]

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Neighborhood-level data were mainly drawn from the American Community Survey at the census tract level, capturing the broader economic and social compositional context of neighborhoods based on household composition. Census tracts represent a well-established unit of geographic analysis in neighborhood research, as their boundaries are delineated in consultation with local communities and are designed to reflect meaningful physical and social divisions such as major streets, railroads, and ethnic or socioeconomic boundaries (Leventhal & Brooks-Gunn, 2000). With populations typically ranging from 3,000 to 8,000 residents, tracts are small enough to capture local variation in neighborhood conditions.

We created variables on neighborhood conditions across four areas. Crime rate, across all crime categories defined by the Chicago Police Department was calculated using the total number of reported crimes divided by the estimated population, based on U.S. Census/ACS population estimates (Chicago Police Department, n.d.) and it captures residents' exposure to safety risks. Housing affordability, measured as the percentage of households spending more than 30% of income on housing costs, reflects the material insecurity that prior research and the COVID-19 pandemic context have shown to fall disproportionately on low-income and marginalized communities. Housing stability, the percentage of owner-occupied households, reflects residential stability and collective investment in a neighborhood. Finally, health insurance coverage, measured as the percentage of households covered under Medicare only, Medicaid only, or carrying no coverage, captures access to healthcare as an indicator of neighborhood health vulnerability. While the mechanism linking attendance to health insurance operates most directly at the family level, neighborhoods with a concentration of residents with limited access to healthcare have higher number of untreated chronic illness, and greater

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likelihood that children might be sick more often or that family caregiving responsibilities may fall on children (Berliner, 2009).

School variables were divided into structural characteristics/discipline and school climate, as described earlier. Structural/discipline variables include total school enrollment and the percentage of students qualifying for free or reduced-price lunch (FRPL). We also include the suspension rate as a measure of exclusionary disciplinary practices; it is constructed as the proportion of students in the school who are ever suspended (either in-school or out-of-school) during the school year. Crime in the area surrounding the school captures the extent to which unsafe conditions on routes to and from school may affect attendance, a different dimension from crime in the neighborhoods where students live. Variables that capture the school climate dimension are drawn from the 5Essentials survey, a validated instrument with high reliability and predictive validity (Hart et al., 2020). School-level measures are computed as precision-weighted means in each year from individual level Rasch measures. The survey response rates range from 71% to 82% among students and 72% to 81% among teachers in the years studied. The measures included are safety, school connectedness, student-teacher trust, peer support for academic work, academic press, and teacher-parent trust. Reliabilities at the individual and school levels range from 0.64 to 0.96 (see Appendix Table A2 for reliabilities and questions that comprise the survey measures).

Table 2 shows descriptive statistics on neighborhood and school variables, averaged across the three post-pandemic years. The analytic sample included 792 census tracts, 472 schools serving grades 6-8, and 140 schools serving grades 9-11. On average, census tracts were characterized by having 0.1 crimes per person, 60% of households spending more than 30% of their income in housing and with 46% of households being owner occupied. When it comes to

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health insurance, 6% of households were on Medicare, 20% were on Medicaid and 10% were uninsured. There was a range of variation across census tracts described by the standard deviations of these indicators, with greater variability in terms of crime exposure ($SD=0.1$) and the percent of households covered by Medicaid ($SD=15\%$). Compared with middle-grade schools, high schools were substantially larger (563 versus 188), enrolled slightly higher proportions of students eligible for free or reduced-price lunch (84% versus 80%), had higher proportion of students suspended (13% versus 6%), and were in areas with more crimes per person (0.16 versus 0.12). Students in high schools also reported lower average school climate, including safety, connectedness, student-teacher trust, peer academic support, and academic press, as well as teacher reports on teacher-parent trust.

[Table 2 goes here]

Methods

To estimate the relative contributions of schools relative to neighborhood and individual factors, we employed cross-nested hierarchical linear modeling (HLM), allowing students to be simultaneously nested within both a school and a residential census tract. Chicago Public Schools operates an extensive school choice system through which students and families can apply to attend schools across the city. As a result, students living in the same neighborhood frequently attend different schools, and the same school may draw students from many different neighborhoods across the city. This allows us to estimate how much of the variation in attendance is associated with schools and how much with neighborhoods simultaneously.

Differences between neighborhood and school could arise from selection, with students and families who have different resources, opportunities, and beliefs attending specific schools and living in specific neighborhoods. To support attention to school and community policies, we

need evidence that differences in attendance across schools and neighborhoods are not solely a reflection of the individual characteristics of students and their families but are influenced by the broader context in which they live and go to school. The estimation of the variation in attendance must account for this sorting. To do this, we examine the degree to which there are differences across students in how much their attendance changes in the middle and high school years relative to their baseline attendance and net of their backgrounds using a rich set of student covariates. Baseline attendance, in particular, controls for myriad characteristics that are specific to individuals and families that influence attendance in earlier years.

To answer the first research question, we build toward a fully adjusted model in stages, so that each source of variance in students' attendance rates can be examined by itself. We begin with unconditional models with only random intercepts to establish baseline estimates of the total variance in attendance across schools and neighborhoods. We first estimate separate two-level models: nesting students within schools (model 1a) and within neighborhoods (model 1b):

$$Y_{ij} = \beta_{0j} + u_{0j} + e_{ij} \quad (\text{model 1a})$$

$$Y_{ik} = \beta_{0k} + v_{0k} + e_{ik} \quad (\text{model 1b})$$

where Y_{ij} (or Y_{ik}) is the attendance rate for student i in school j (or neighborhood k); the β_0 parameters are the estimated means; $u_{0j} \sim N(0, \tau_{00}^s)$ is the school random effect; $v_{0k} \sim N(0, \tau_{00}^n)$ is the neighborhood random effect; and $e \sim N(0, \sigma^2)$ is the student-level residual. These models yield intraclass correlations (ICCs) for schools and neighborhoods separately.

Next we estimate a cross-nested unconditional model that includes both random effects:

$$Y_{ijk} = \beta_0 + u_{0j} + v_{0k} + e_{ijk} \quad (\text{model 2})$$

where student i attends school j and resides in neighborhood k , and the school and neighborhood random effects are assumed independent. This model partitions total variance into between-

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school (τ_{oo^s}), between-neighborhood (τ_{oo^n}), and within student-level (σ^2) components. Comparing Models 1a, 1b, and 2 reveals how much of the apparent school or neighborhood variance in the two-level models is confounded by the geographic overlap between school attendance areas and residential neighborhoods. To understand whether there were changes pre-vs.-post-pandemic years in RQ1, we estimate models 1a, 1b, and 2 separately for pre-pandemic and post-pandemic school years and for students in grades 6-8 and grades 9-11 separately.

Next, we obtain variance estimates of school and neighborhood context net of student characteristics. First, we introduce students' baseline attendance rate (model 3). Rather than entering baseline attendance as a continuous linear covariate, we construct six mutually exclusive dummy variables capturing baseline attendance rate categories: (1) missing baseline data, (2) below 85%, (3) 85–90%, (4) 90–95%, (5) 95–98%, and (6) 98–100% (the reference group). Baseline attendance was measured in earlier grades (fifth or eighth), when attendance rates tend to be higher than in the grades studied. This categorization allows for nonlinear relationships between prior and subsequent attendance and provides benchmarks aligned with common chronic-absence thresholds. For the models using data in the post-pandemic years, we also include two dummy variables indicating whether the baseline year fell during the pre-COVID-19 pandemic years, during the pandemic years, or post-pandemic (as the reference group), given large shifts in attendance in these years. Grade-level dummy variables capture differences by grade. Grade-level dummies and baseline attendance period dummies were grand mean centered. This model is as follows:

$$Y_{ijk} = \beta_0 + \sum_{m=1 \text{ to } 5} \beta_m(\text{Baseline Attendance Group}_{mi}) + \sum \beta_g(\text{Grade}_{gi}) + \beta_{t1}(\text{Pre-Pandemic Year}_i) + \beta_{t2}(\text{Pandemic Year}_i) + u_{0j} + v_{0k} + e_{ijk} \quad (\text{model 3})$$

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The reduction in τ_{00^s} and τ_{00^n} relative to the prior model indicates how much of the school and neighborhood variation in attendance is attributable to compositional differences in students' baseline attendance rather than to the contexts themselves.

Finally, we add a set of student-level demographic and background covariates to complete the fully adjusted decomposition (model 4). These covariates include gender, race and ethnicity (through sets of dummy variables), concentration of poverty (transformed into a set of five dummy variables plus one representing missingness), social status (transformed into a set of five dummy variables plus one representing missingness), English learner status, special education status included as a set of seven different categories (behavioral, cognitive, intellectual, learning, physical, speech or language or visual or hearing impairment, and multiple), whether the student was in a temporary living situation, whether student attended their assigned neighborhood school, whether the student changed residential address (and a dummy variable representing students with missing data), distance from the student's home to school (transformed into a set of five dummy variables plus one representing missingness), and prior test scores (transformed into a set of nine dummy variables to capture nonlinearity plus one representing missingness). All variables are grand mean centered.

Together the student-level controls are intended to capture the family and individual circumstances that could lead both to school selection and to attendance issues. It is possible that there are additional factors that originate solely with the family and students—not the school or neighborhood—that we do not control. For example, a family member may develop an illness between the baseline year and current year that influences attendance. These events would need to systematically differ by school or neighborhood to influence estimates of the contribution of schools and neighborhoods to attendance. The reduction in each variance component across

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successive models indicates the proportion of school- or neighborhood-level variance explained by the predictors added at that stage. And at each stage we compute intraclass correlations (ICC) for schools and neighborhoods to compute the proportion of variance explained by differences between schools and neighborhoods.

To address RQ2, we extend model 4 by allowing the coefficients for all six baseline attendance groups to vary randomly across schools and neighborhoods (model 5). The model is parameterized without an intercept, so that each prior-attendance group has its own mean and its own random deviation at both the school and neighborhood levels:

$$Y_{ijk} = \sum_m \gamma_m(\text{Baseline Attendance Group}_{mi}) + \sum_g \beta_g(\text{Grade}_i) + \beta_{t1}(\text{Pre-Pandemic Year}_i) + \beta_{t2}(\text{Pandemic Year}_i) + \sum_x \beta_x X_i + \sum_m (u_{mj} \cdot \text{Baseline Attendance Group}_{mi}) + \sum_m (v_{mk} \cdot \text{Baseline Attendance Group}_{mi}) + e_{ijk} \quad (\text{model 5})$$

where γ_m is the average attendance rate for students in baseline attendance group m (net of other covariates with X_i representing a set of student covariates); u_{mj} is the deviation of school j from the average school for group m ; and v_{mk} is the analogous neighborhood deviation. The random effects u_{mj} and v_{mk} follow multivariate normal distributions with means zero and covariance matrices T_u and T_v respectively.

For RQ2a, whether context matters more for students with low baseline attendance, we compare the sizes of estimated random variances from model 5 across prior-attendance groups. Larger variance in u_{mj} or v_{mk} for the low baseline attendance groups (e.g., <85%) than for the high baseline attendance groups (e.g., 98–100%) indicate that schools and neighborhoods contribute more to attendance variation among students with low baseline attendance than those with strong baseline attendance. To answer RQ2b, whether the same schools and neighborhoods are effective across all prior-attendance levels, we examine the correlations among the estimated

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random effects across groups. High positive correlations indicate that schools (or neighborhoods) with stronger attendance among students with high baseline attendance also show stronger attendance among students with low baseline attendance. Low or negative correlations indicate the school or neighborhood contexts are associated with better attendance for one type of student more than another.

To answer RQ3, we include school- and neighborhood-level predictors (all standardized and grand mean centered) to determine how much of the variance is explained by the contextual variables. Next, we use the estimates of the school, and/or neighborhood random effects ($\hat{u}_{mj}$ and/or $\hat{v}_{mk}$) from model 5 to show how strongly specific school and neighborhood characteristics correlate with school and neighborhood effects adjusted for students' baseline attendance and all other student covariates. School- and neighborhood-level variables are shown in Table 2.

Finally, for each school- and neighborhood-level variable, we estimate a simple OLS regression with the estimated residual effects as the outcome and one school or neighborhood characteristic at a time as the sole predictor, allowing us to estimate the relationship of each characteristic with the school or neighborhood attendance effects and how those relationships are similar or different for students with different prior baseline attendance. School and neighborhood variables were standardized to have mean of 0 and standard deviation of 1 to allow for easy comparisons of their relationship with attendance.

Results

RQ1: To what extent do school and neighborhood contexts account for variation in student attendance in the post-COVID period, and how does this compare to the pre-pandemic period?

There is significant variation in attendance rates across schools and census tracts in both time periods. At the same time, in both periods, there is much less variation by census tract than by school, and most of the variation is at the individual level (within schools and census tracts). The first panel of Table 3 shows unconditional 2-level models nesting students within schools or within census tracts, separately. When nested within schools, 15.3% of the variation in high school attendance rates post-pandemic is between-schools (see the right side of the first set of rows). A one standard deviation difference across high schools is a difference of 6.8 percentage points. About five percent of the variation in attendance in grades 9-11 in post-pandemic years is associated with students' census tracts; a one standard deviation across census tracts is a difference of 4.0 percentage points. Variability in attendance is systematically smaller for middle grades than high school grades. In post-pandemic years, 6.7% of the variance in middle grade is between schools, and 3.7% is between census tracts. A one standard deviation difference across schools serving middle grades is 2.4 percentage points, while a one standard deviation across census tracts is 1.8 percentage points in post-pandemic years.

[Table 3 goes here]

All variance components are larger in post-pandemic years than in pre-pandemic years. This means that there are larger differences across schools and neighborhoods in their average attendance rates in post-pandemic years, and there are larger differences in attendance rates among students relative to their peers attending the same schools and living in the same

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neighborhoods. The percentage of variance associated with school or census tract is smaller in post-pandemic years only because the individual-level variance in post-pandemic years grew more. Thus, factors associated with individual students and families became more prominent post-pandemic, while school and neighborhood differences in average attendance also grew.

The next set of rows (panel 2) in Table 3 show the variance components from models that cross-nest students simultaneously in their school and their census tract. The school-level variation declines only slightly after accounting for the census tracts in which their students live, relative to the prior two-level models (e.g., a one SD in attendance rates declines from 6.8 to 6.4 percentage points among high school students in post-pandemic years, comparing panel 2 to panel 1, and from 2.4 to 2.2 percentage points among middle school students in post-pandemic years). The census tract variation declines considerably (e.g., from a standard deviation of 4.0 to 2.2 percentage points in the high school grades in post-pandemic years, and from 1.8 to 1.0 percentage points in the middle grades in post-pandemic years, comparing panel 2 to panel 1). This is true at both grade levels and in both time periods. It suggests that a substantial portion of the variation by census tract is driven by differences in which schools students attend. At the same time, only a little of the variation in attendance rates by school is driven by differences in which census tracts their students live. This suggests that school-based factors drive much of the differences observed in attendance rates across census tracts.

Comparing Students with Similar Baseline Attendance and Backgrounds

The next models (panel 3 of Table 3) control students' baseline attendance. The total variance (the sum of the squared school, census tract, and student-level SDs in Table 3) declines by about a fifth; for example, in high school grades in post-pandemic years it falls from 299 ($6.4^2 + 2.2^2 + 15.9^2$) to 238 ($5.2^2 + 2.0^2 + 14.4^2$), showing the importance of baseline attendance as a

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predictor of current attendance rates. At the middle grade level, this results in little census tract-level variation (a standard deviation of 0.7 percentage points in post-pandemic years), with twice as much variation at the school level (a standard deviation of 1.4 percentage points in post-pandemic years). At the high school level, baseline attendance reduces school-level standard deviations by over a percentage point, but there is still considerable variation by school (with a standard deviation across schools of 5.2 percentage points). Tract-level variation shrinks slightly at the high school level (with a standard deviation of 2.0 in post-pandemic years).

The final models (panel 4 of Table 3) include prior test scores and other student covariates (race, ethnicity, gender, census block group poverty and social status, mobility, temporary housing status, and distance from school). In the middle grades, all variance components but one change by less than 0.1 percentage points; these other control variables explain little after controlling for students' attendance rates in fifth grade. At the high school level, the variance components for schools and census tracts are further reduced. School-level standard deviations decline from 5.2 to 4.5 in post-pandemic years, indicating that there may be changes in the circumstances of individual students and families from eighth grade to high school grades, captured by the covariates, that influence attendance that also are associated with which school students attend. Tract-level variance also declines by about 0.7 percentage points (from 2.0 to 1.3 in post-pandemic years), which also likely indicate changes in family conditions that are captured in the covariates. Because these covariates include economic conditions in students' block group, these may over-control some of the neighborhood influences that operate through the overall economic resources of families in students' neighborhoods.

Changes in level 1 variance are minimal in models that control for student backgrounds (panel 4), relative to the models that just control baseline attendance (panel 3). It is not just that

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these variables are correlated with baseline attendance; models available from the authors that include only these variables (no baseline attendance) show that they only explain 2-3 percent of student-level variance at both grade levels and time periods. Baseline attendance is by far the strongest predictor of student-level variance among the variables in this study, mattering more than prior achievement, race, ethnicity, or economic status, and indicating that differences among students in the same school or neighborhood stem from specific student and family circumstances that standard measures of demographics, income, and achievement capture poorly.

There is still significant variation across schools in their attendance rates after controlling baseline attendance and student and family factors. School differences are present in both time periods, although they are larger in post-pandemic years than in pre-pandemic years, with standard deviations across schools of 1.3 percentage points in the middle grades and 4.5 percentage points in the high school grades in post-pandemic years. All the student, family, and neighborhood factors explain about a quarter of the total variation in school attendance rates. Comparing panel 4 with panel 2 of Table 3, and calculating total variance as above, the total falls from 299 to 215 in high school grades ($6.4^2 + 2.2^2 + 15.9^2$ compared with $4.5^2 + 1.3^2 + 13.9^2$) and from 83 to 63 in middle grades in post-pandemic years.

RQ2: Does school and neighborhood context matter more, or less, for students with low baseline attendance than students with high baseline attendance in post-pandemic years?

We build on the full models to discern the influence of context for students with different levels of baseline attendance, but otherwise similar background characteristics. In the top half of Table 4, panel 1 shows the variance components from cross-nested models in which students' baseline attendance rates are allowed to vary by school and census tract. For simplicity, we focus on post-pandemic years. These models show whether the amount that students' attendance

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changes over time differs systematically by school or neighborhood context, relative to other students that started out with similar baseline attendance. The sample is constrained to observations for which we have school and census tract information, so both panels in Table 4 can be compared. The model shown in Table 4, panel 1 was run with the full sample and the results were similar (available from authors).

[Table 4 goes here]

Overall, school and neighborhood context seem to matter much more for students with low baseline attendance than for students with strong baseline attendance. At the middle grade level, a standard deviation difference among schools is 1.4 percentage points or less for students who attended school 90 to 95 percent of days in fifth grade, 2.3 percentage points for students who attended school 85-90% of days in fifth grade, and 3.9 percentage points for students who attended school 85% of days or less in fifth grade. At the high school level, school-level standard deviations are 3.4 percentage points for students with 98% attendance or higher in eighth grade, and 6.8 for students who had attended eighth grade less than 85% of school days.

Variation by census tract is also much larger for students who had lower baseline attendance than those with high baseline attendance. In fact, among students who had 95 percent or higher attendance in fifth grade, there was no significant tract-level variation in middle grade attendance. Yet, there was significant tract-level variation among middle grade students with low baseline attendance.

We examined correlations among the school- and tract-level residuals to discern the degree to which the same schools and census tracts showed stronger attendance for students with high baseline attendance as those with low baseline attendance (see Table 5). At the high school level, there were strong correlations among the school residuals, ranging from 0.67 to 0.93,

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indicating that high schools that fostered strong attendance rates for students with low baseline attendance were generally the same schools that had higher attendance rates for students with high baseline attendance. At the middle grade level, the correlations were all positive, but smaller, ranging from 0.22 to 0.61. This suggests some consistency in which middle grade schools promoted attendance for students of varying baseline attendance levels, but also some differences in which schools provided stronger contexts for students with strong baseline attendance than those with weak baseline attendance. Overall, high schools were more consistent than middle grade schools in their relative effectiveness regardless of students' baseline attendance.

[Table 5 goes here]

There was much less consistency in which census tracts were stronger contexts for students' attendance across students with different levels of baseline attendance. At the middle grade level, the correlations among tract-level residuals varied from 0.01 to 0.09, and at the high school level the correlations were 0.04 to 0.26. As with the school-level residuals, there was more similarity among the residuals for students with more similar baseline attendance than those with dissimilar baseline attendance. However, the weak correlations suggest there may have been idiosyncratic differences in particular neighborhoods that led to these patterns rather than systematic qualities in some neighborhoods versus others.

RQ3: How strongly are specific features of school and neighborhood context associated with student attendance in the post-COVID period, and do these associations differ for students with different baseline attendance?

Adding school-level variables to the models leads high-school level standard deviations to decline by 0.3 to 1.2 percentage points (see Table 4). For example, for students with baseline

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attendance of 95-98%, it declines from 4.0 in Panel 1 of Table 4 to 3.2 in Panel 2 (declining by 0.8 percentage points). At the middle grade level, school-level standard deviations declined by 0.1 percentage points for students whose baseline attendance was 85-95 percent, but do not change for students with either very low or high baseline attendance. Thus, the school variables in these final models account for part of the differences among high schools, but much of school variation remains unexplained.

Tract-level standard deviations decline by 0.1 or less for each group when tract-level variables are included at the high school level. In the middle grades, there is not much residual tract-level variance to explain, and the census tract variables included in the model do not reduce it much further. Differences across census tracts may instead reflect idiosyncratic factors that these variables do not capture. Because there is so little tract-level variance, and what exists is not well explained by the variables we include, we focus the rest of the analysis on school-level factors, discussing the relationships of specific school factors below. For reference, Table A3 in the Appendix reports correlations of the neighborhood variables and school variables with attendance residuals from model 5; this allows for comparison of the size of the relationships of each neighborhood and school variable with attendance, adjusted for students' prior attendance and background characteristics.

The specific relationships between school variables and school residual attendance rates (removing differences due to student backgrounds and neighborhoods) are shown in Table 6. Figure 1 shows the same coefficients visually, and Table A4 in the Appendix reports the corresponding correlations between the school variables and the adjusted school attendance residuals. Three patterns stand out. First, particular school climate variables are related to attendance rates as strongly as, or more strongly than, school structural factors such as %FRPL

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and suspension rates. Second, these relationships are often, though not always, larger for students with lower baseline attendance. Third, the school context variables that matter most are not the same across students with different levels of baseline attendance. Note that the axes in Figure 1 are not the same for middle grades and high school, corresponding with larger school-level variance at the high school level.

[Table 6 and Figure 1 go here]

At the middle grade level, all the school climate measures show significant relationships with attendance across most of the prior-attendance groups. The relationships are especially large for students who were chronically absent in the baseline year (attending 90% or less) in terms of student reports of academic press, peer support for academic work, and school connectedness; for these groups the increase in attendance associated with a one standard deviation increase in these aspects of school climate ranges from 0.44 percentage points to 0.86 percentage points in the middle grades. In other words, for students who struggled the most with attendance in fifth grade, middle grade attendance is significantly better in schools where they feel connected and where the academic focus is rigorous, and lower in schools where students report feeling less connected or pressed less to work hard, relative to other students with the same baseline attendance. For students with moderate attendance in fifth grade—who were not chronically absent but attended just 90-95 percent of days (just over the threshold for chronic absence)—those school factors also matter, as well as school safety, student-teacher trust, and teacher-parent trust. Differences in attendance rates range from 0.28 to 0.42 percentage points if students attended schools that were one standard deviation higher in these elements compared to an average school. For students with high fifth grade attendance (98% or higher), school climate

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was also significantly related to higher attendance, but the differences were smaller than for students who missed more school in the past.

Some of the school structural factors showed significant relationships with attendance in the middle grades, but the relationships were much smaller than observed with school climate measures. As would be expected, %FRPL and suspension rates showed negative relationships with most of the groups of students who were not chronically absent in fifth grade.

Unexpectedly, neither showed a negative relationship for students who had been chronically absent in fifth grade, and among students with the lowest fifth grade attendance, %FRPL and crime rates around the school were positively related to attendance. We revisit this surprising pattern later.

At the high school level, teacher reports of trust of parents emerge as particularly strongly related to attendance for students at all levels of baseline attendance, and especially for students who had lower levels of baseline attendance. In high schools that were one standard deviation above the mean on teacher-parent trust, attendance rates were two to three percentage points higher than at average schools, even after controlling for eighth grade attendance and many student background characteristics. High school students' reports of safety in and around the school also showed large relationships with attendance across all prior-attendance groups, ranging from 0.8 to 1.5 percentage points higher for each standard deviation increase in students' reports of feelings of safety at their school.

As observed in the middle grades, students' reports of higher academic press were associated with higher attendance rates for students who were chronically absent in eighth grade (with attendance less than 90%); each standard deviation increase in students' reports of academic press in their school is associated with about one percentage point higher attendance

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rate. School connectedness also shows significant relationships with attendance for students with baseline attendance between 85 and 98 percent. Student-teacher trust shows a significant relationship only with students who had very strong baseline attendance in the past (98% or more).

Two structural features of schools show large relationships with attendance at the high school level. School suspension rates show significantly negative relationships with attendance for all groups, including students with the lowest baseline attendance levels, while %FRPL is significantly negative for all groups except the lowest. Thus, unlike in the middle grades, suspension rates remain strongly related to attendance except among students with extremely low baseline attendance, while the relationship with %FRPL disappears for that group.

Limitations

Though the study benefits from the size and richness of the CPS data, its generalizability may be limited to similar large, urban districts with comparable data systems. Administrative data, while comprehensive, may not fully capture all dimensions of student attendance associated with students and families that cluster by school or neighborhood context. While the use of students' baseline attendance as a control provides more confidence around school and neighborhood influence, unmeasured, time-varying shocks at the student or family level cannot be ruled out as confounders, although they would affect our estimates of school and neighborhood influence only to the extent that these events cluster by school/neighborhood.

Discussion

Declining attendance following the pandemic was driven by individual/family factors, but the influence of schools also increased

After the COVID-19 pandemic, attendance rates not only declined, but the variation in attendance rates across students increased. The largest increases in variation were associated with the circumstances of individual students and families—not shared broadly by all or most students in a child’s school or neighborhood. This highlights that students and families have unique circumstances that are consequential for whether students come to school. These potential individual factors are numerous, from specific health issues affecting students or family members, specific transportation issues, interpersonal conflict at school, safety concerns, and so on. This does not mean there is nothing that school or district policies can do, but it has implications for the most effective strategies. It may be impossible to design programs to address the specific needs of individual students, but it is possible to design systems that engage individual students and families to learn about and address their specific needs. That may be why attendance rates differ significantly between schools that do and do not emphasize relationships with students and families.

While individual and family factors matter most, differences in attendance rates across schools and neighborhoods also grew in post-COVID years, and these differences were not fully explained by students’ backgrounds. In other words, the neighborhood students lived in mattered slightly more, and the school students attended, mattered even more than before the pandemic. They also mattered most for students who had struggled with attendance in prior years. This suggests an interaction between context and individual circumstances, such that individual

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factors matter considerably, but the context that students are in can ameliorate or amplify those differences.

These differences are particularly notable across schools. In post-COVID years, at the middle grade level, a two-standard deviation range of school attendance rates is 2.6 percentage points, after controlling for students' baseline attendance and other covariates, for an average student. At the high school level, that range is 9.0 percentage points, after removing differences that could be explained by students' baseline attendance, student and family covariates and neighborhoods. While these may seem small when considered out of 100 percentage points, remember that the difference between perfect attendance and being chronically absent is 10 percentage points, and what seem like small differences are consequential for students' later outcomes.

The school context particularly matters for students who faced barriers to attendance in the past

A district policymaker wondering how and where to target resources to address attendance may wonder whether they should use a neighborhood- or school-based approach, given that factors in both schools and neighborhoods influence attendance. The fact that there is little variance at the neighborhood level suggests that school-based strategies are likely to have larger impact than strategies targeted at specific residential neighborhoods. A large proportion of the differences in attendance by census tract comes from students in particular neighborhoods attending schools that have particularly high or low attendance. This suggests supporting strategies in those schools where attendance rates are low would have greater leverage for improving attendance in these neighborhoods than would specific neighborhood-based strategies.

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While school staff may feel there is little they can do to support attendance among students who face the most barriers, the consistency across school effects for students with different levels of baseline attendance suggest that school efforts for some students can help others. Effects were more strongly correlated among students with similar baseline attendance, suggesting that some practices work especially well for particular groups. But overall, the schools that are more effective with one group are more effective with others.

School climate matters more than school structure: connectedness, academic press, and teacher–family trust

For students that were chronically absent in the past, schools where more students report strong academic press, school connectedness, and peer support for academics emerge as particularly important. The stronger relationships of academic press and support for academics for students with low baseline attendance may reflect the fact that they are more likely to be subject to low expectations. One consequence of chronic absence is that teachers may lower expectations, and this can lead to a negative cycle of students feeling it is not necessary to come to school. Also, when peers see others not attending, they are less likely to attend. If there is not a pressure to work hard, students may feel like attendance is not necessary. Likewise, connectedness and positive relationships provide motivation to come to school. Especially for students who face barriers to attendance, or for whom other obligations seem pressing, it may be important to feel that if they do not come to school, they will miss something, whether it is falling behind in school or missing out on connections with others.

Teachers' relationships with parents seem particularly critical at the high school level. High school is a time when students have more responsibilities to get themselves to school. These findings suggest that trust and communication between teachers and families is still

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important, and especially critical for students who have had low attendance in the past. These relationships can go two ways—teachers who are in contact with families may be more likely to see students’ needs rather than assuming that students don’t care and ignoring their absences, while families may be more likely to hear from teachers about the implications of missing school for their students and how much it matters. These findings are consistent with those from a study of a large array of school practices in Michigan that found significant relationships with frequent use of practices that focus on deep family engagement (e.g., home visits), personalized communication to families (e.g., text messages), and efforts to address out-of-school barriers (e.g., homelessness, transportation) (Singer et al., 2026). It could be precisely because attendance is so strongly influenced by personal and family factors that school-level strategies to increase communication with families influence school attendance rates.

Likewise, systems for providing systematic individual support to students have shown success in studies, including monitoring attendance data through attendance teams (Singer et al., 2026), or assigning students success mentors (Balfanz & Byrnes, 2018). These are strategies that lead school personnel to reach out and learn students’ individual situations, and figure out solutions with them and their families. In this study, we do not look at specific school policies around attendance, communication and messaging, partnerships and resources, and those may matter considerably and should be a focus of future research.

Structural characteristics normally associated with lower attendance show weaker or no relationships among students with extremely low baseline attendance—%FRPL at both grade levels, and suspension rates in the middle grades, though high school suspension rates remain significantly negative for this group. It is not clear why we do not see the same relationship of these contextual variables for students who have struggled with attendance in the past. These

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may be students with the most barriers at home who need especially strong supports around attendance. It is possible that schools that serve many students with greater needs around attendance may pay more attention to those needs and be more likely to have supports in place. Future research should investigate this unexpected finding. At the same time, for most students, suspension rates did show strongly negative relationships with attendance, highlighting the impact of school practices around discipline.

Conclusion

Overall, this study provides evidence that what schools do matters considerably for student attendance, and even more in post-pandemic years. Furthermore, the schools students attend matter more than the neighborhood in which they live. This doesn't mean that neighborhoods don't matter, but that schools are ultimately more consequential. This study identifies the unique circumstances of individual students and families as the primary drivers of attendance, suggesting that strategies that foster communication of school staff with students and families may be most effective. Concentrated investments in school climate, engagement with families, and student support systems are essential for mitigating absenteeism and promoting engagement, particularly as schools continue to adapt to pandemic-driven changes and enduring inequalities.

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Tables

Table 1

Characteristics of Analytic Sample (Means and Standard Deviations for Continuous Variables)

	Grades 6-8		Grades 9-11	
	<i>Pre Pandemic</i> (241,626 obs)	<i>Post Pandemic</i> (212,439 obs)	<i>Pre Pandemic</i> (226,569 obs)	<i>Post Pandemic</i> (215,729 obs)
Male	51%	51%	50%	50%
White	10%	11%	9%	10%
Black	36%	36%	36%	33%
Latino	49%	48%	50%	52%
Asian/Pacific Islander	4%	4%	4%	4%
Native American	<1%	<1%	<1%	<1%
Multiracial	1%	1%	1%	1%
Concentration of poverty	0.24 (0.82)	0.22 (0.84)	0.25 (0.80)	0.22 (0.81)
Social Status	-0.44 (0.89)	-0.40 (0.90)	-0.45 (0.89)	-0.42 (0.90)
In Temporary Living Situation	3%	4%	5%	5%
Special education	16%	16%	15%	15%
English language learner	12%	22%	9%	18%
Attending neighborhood school	57%	52%	24%	19%
Distance home-to-school (miles)	0.93 (1.99)	0.92 (1.88)	2.33 (2.64)	2.21 (2.49)
Changed residences	6%	7%	9%	10%
3-year baseline test score	0.01 (0.98)	-0.01 (0.97)	0.04 (0.97)	0.01 (0.97)
Attendance rate in current grade	95%	91%	90%	84%
Baseline attendance (% students)				
98-100%	37%	31%	28%	27%
95-98%	30%	24%	31%	25%
90-95%	19%	21%	22%	21%
85-90%	5%	8%	6%	8%
<85%	3%	10%	3%	9%
Not available	5%	6%	10%	10%
Baseline attendance timing				
- Pre-pandemic	-	11%	-	10%
- During pandemic	-	52%	-	50%
- Post-pandemic	-	37%	-	40%

Note. Counts of missing observations for each variable are reported in the Appendix Table A1.

The baseline timing represents how many observations of the baseline attendance were recorded in the pre-pandemic, during pandemic and post-pandemic years.

Table 2*Characteristics of Census Tracts and Schools: Average Over the Three Post-Pandemic Years*

	<i>n</i>	Mean	SD
Census Tracts (792)			
Total crime (number of crimes per person)	790	0.1	0.1
Housing Affordability			
% households with housing costs >30% income	792	60%	12%
Housing stability			
% households that are owner-occupied	792	46%	16%
Health insurance coverage			
Medicare only	792	6%	4%
Medicaid only	792	20%	15%
No coverage	792	10%	6%
Schools with grades 6-8 (n=472)			
School size	472	188	265
Percent FRPL	472	80%	22%
Suspension rate (% students suspended)	472	6%	6%
Total crime around school (number of crimes per person)	460	0.12	0.10
Safe in/around school	468	0.12	1.0
School connectedness	458	0.07	1.0
Student-teacher trust	468	0.11	1.0
Peer support for academic work	468	0.18	0.9
Academic press	468	0.17	1.0
Teacher-parent trust	470	0.23	0.9
Schools with grades 9-11 (n=140)			
School size	140	563	527
Percent FRPL	140	84%	14%
Suspension rate (% students suspended)	140	13%	11%
Total crime around school (number of crimes per person)	132	0.16	0.17
Safe in/around school	139	-0.41	0.89
School connectedness	139	-0.25	0.89
Student-teacher trust	139	-0.37	0.85
Peer support for academic work	139	-0.60	0.95
Academic press	139	-0.58	0.93
Teacher-parent trust	136	-0.81	0.77

Note. Census variables in this table are not standardized so the units are interpretable, but

standardized versions of all variables are used in the models.

FACTORS CONTRIBUTING TO STUDENT ATTENDANCE

Table 3

Variance Components From Cross-Classified Linear Models Predicting Attendance Rates

	Grades 6-8				Grades 9-11			
	<u>Pre Pandemic</u>		<u>Post Pandemic</u>		<u>Pre Pandemic</u>		<u>Post Pandemic</u>	
1. Two-level Unconditional								
<u>Nested in Schools</u>								
School <i>SD</i> (ICC)	1.4	(5.4%)	2.4	(6.7%)	5.6	(18.6%)	6.8	(15.3%)
Level 1 <i>SD</i>	5.8		8.9		11.8		16.1	
<u>Nested in Census Tracts</u>								
Census Tract <i>SD</i> (ICC)	0.7	(1.6%)	1.8	(3.7%)	2.3	(3.3%)	4.0	(5.3%)
Level 1 <i>SD</i>	5.8		9.0		12.4		16.9	
2. Cross-nested Unconditional								
School <i>SD</i> (ICC)	1.4	(5.2%)	2.2	(5.9%)	5.4	(17.1%)	6.4	(13.7%)
Census Tract <i>SD</i> (ICC)	0.5	(0.8%)	1.0	(1.3%)	1.3	(1.0%)	2.2	(1.6%)
Level 1 <i>SD</i>	5.7		8.8		11.7		15.9	
3. Cross-nested Controlling Baseline Attendance								
School <i>SD</i> (ICC)	1.0	(4.2%)	1.4	(3.2%)	4.5	(14.9%)	5.2	(11.5%)
Census Tract <i>SD</i> (ICC)	0.3	(0.3%)	0.7	(0.7%)	1.4	(1.4%)	2.0	(1.6%)
Level 1 <i>SD</i>	5.0		7.9		10.7		14.4	
4. Cross-nested Controlling Baseline Attendance & Other Student Covariates								
School <i>SD</i> (ICC)	1.1	(4.4%)	1.3	(2.9%)	3.9	(12.1%)	4.5	(9.2%)
Census Tract <i>SD</i> (ICC)	0.3	(0.3%)	0.6	(0.6%)	0.9	(0.7%)	1.3	(0.8%)
Level 1 <i>SD</i>	4.9		7.8		10.5		13.9	
Number of observations	241,626		212,439		226,569		215,729	
Number of schools	480		472		139		140	
Number of census tracts	797		792		800		792	

Note. Student covariates include variables for grade level, gender, race/ethnicity, concentration of poverty and social status at the block level, whether a student is in a temporary living situation, special education status and type, English learner status, whether a student attends their neighborhood school, distance from home census block group to school census block group, whether a student moved to a new residence, and baseline test scores. All variables were grand mean centered. Baseline attendance is calculated in fifth grade for middle-grade students, and eighth grade for high school students. Standard deviations (SD) represent attendance rate in percentage points.

Table 4*School and Census Tract Variation in Attendance (in SD) by Students' Baseline Attendance*

		Grades 6-8		Grades 9-11	
		School	Census Tract	School	Census Tract
1. With Student Covariates					
<i>Baseline</i>	98% -100%	0.9	-	3.4	1.1
<i>Attendance</i>	95%- 98%	1.0	-	4.0	1.3
	90%-95%	1.4	0.9	4.4	1.8
	85% - 90%	2.3	2.2	5.3	3.5
	Less than 85%	3.9	4.1	6.8	5.8
	Not Available	2.9	2.3	6.0	2.7
2. With Student, School and Census Tract Covariates					
<i>Baseline</i>	98% -100%	0.9	-	3.1	1.0
<i>Attendance</i>	95%- 98%	1.0	-	3.2	1.2
	90%-95%	1.3	0.9	3.5	1.7
	85% - 90%	2.2	2.2	4.3	3.4
	Less than 85%	3.9	4.1	5.7	5.8
	Not Available	2.8	2.3	4.8	2.6
Number of observations		196,703		203,611	
Number of schools		446		127	
Number of census tracts		790		790	

Note. Variance is displayed in standard deviation units. Table includes post-pandemic years only.

Cells with an insignificant amount of variance ($p > .05$) are not displayed. Variance components come from no-intercept cross-nested models with baseline attendance entered as a series of dummy variables at level 1. The models included student-level covariates for grade level, gender, race/ethnicity, block group concentration of poverty and social status, temporary living situation, special education services and type, English learner status, whether attending the neighborhood school, distance from home to school, residential mobility, and prior test scores. Baseline attendance is calculated in fifth grade for middle-grade students, and in eighth grade for high school students. School and census tract covariates are listed in Table 2. Panel 1 results are similar with the full sample, available from authors, but shown with only cases with full data on school and census block variables to be consistent with Panel 2.

FACTORS CONTRIBUTING TO STUDENT ATTENDANCE

Table 5

Correlations Among Adjusted Neighborhood Residuals and Among Adjusted School Residuals

Estimated for Students With Different Levels of Baseline Attendance in Post-Pandemic Years

	Baseline Attendance Rates				
	98% - 100%	95%- 98%	90%- 95%	85% - 90%	Less than 85%
School Residuals, Grades 6-8					
98% -100%	1				
95%- 98%	.61***	1			
90%-95%	.51***	.61***	1		
85% - 90%	.22***	.35***	.42***	1	
Less than 85%	.29***	.36***	.43***	.42***	1
School Residuals, Grades 9-11					
98% -100%	1				
95%- 98%	.88***	1			
90%-95%	.82***	.93***	1		
85% - 90%	.73***	.85***	.87***	1	
Less than 85%	.67***	.77***	.81***	.79***	1
Census Tract Residuals, Grades 6-8					
98% -100%					
95%- 98%					
90%-95%			1		
85% - 90%			.06	1	
Less than 85%			.01	.09*	1
Census Tract Residuals, Grades 9-11					
98% -100%	1				
95%- 98%	.26***	1			
90%-95%	.17***	.26***	1		
85% - 90%	.10**	.14***	.10**	1	
Less than 85%	.04	.09**	.10**	.09*	1

* $p < .05$. ** $p < .01$. *** $p < .001$.

FACTORS CONTRIBUTING TO STUDENT ATTENDANCE

Table 6*Relationships of School Context Variables with Adjusted School Attendance Residuals*

		Baseline Attendance Rates				
		98%- 100%	95%- 98%	90%- 95%	85%- 90%	Less than 85%
Structural/ Discipline	School Grades 6-8					
	School size	-0.02	0.03	-0.01	-0.04	0.00
	Percent FRPL	0.01	-0.12***	-0.18***	-0.01	0.40*
	Suspension rate	-0.15***	-0.18***	-0.24***	-0.03	0.25
	Crime around school	-0.08**	-0.11**	0.00	0.24**	0.56**
Climate	Safe in/around school	0.08**	0.14***	0.32***	0.25**	0.14
	School connectedness	0.09**	0.13***	0.37***	0.41***	0.52**
	Student-teacher trust	0.11***	0.13***	0.33***	0.27**	0.33*
	Peer support for academics	0.11**	0.13***	0.42***	0.52***	0.77***
	Academic press	0.04	0.08*	0.35***	0.56***	0.86***
	Teacher-parent trust	0.12***	0.22*	0.28***	0.10	0.03
	<i>n = 446</i>					
Structural/ Discipline	School Grades 9-11					
	School size	0.24	0.27	0.09	0.10	-0.53
	Percent FRPL	-1.00*	-1.38**	-1.72**	-1.81**	-0.77
	Suspension rate	-0.89***	-1.15***	-1.16**	-1.26*	-1.35**
	Crime around school	-0.38	-0.25	-0.37	-0.12	0.34
Climate	Safe in/around school	0.81*	1.19**	1.42**	1.46**	1.40*
	School connectedness	0.57	0.81*	0.85*	0.99*	1.12
	Student-teacher trust	0.77*	0.75	0.68	0.63	0.30
	Peer support for academics	0.50	0.64	0.69	0.85	0.81
	Academic press	0.38	0.61	0.73	0.96*	1.20*
	Teacher-parent trust	2.01***	2.40***	2.52***	2.79***	3.22***
	<i>n = 127</i>					

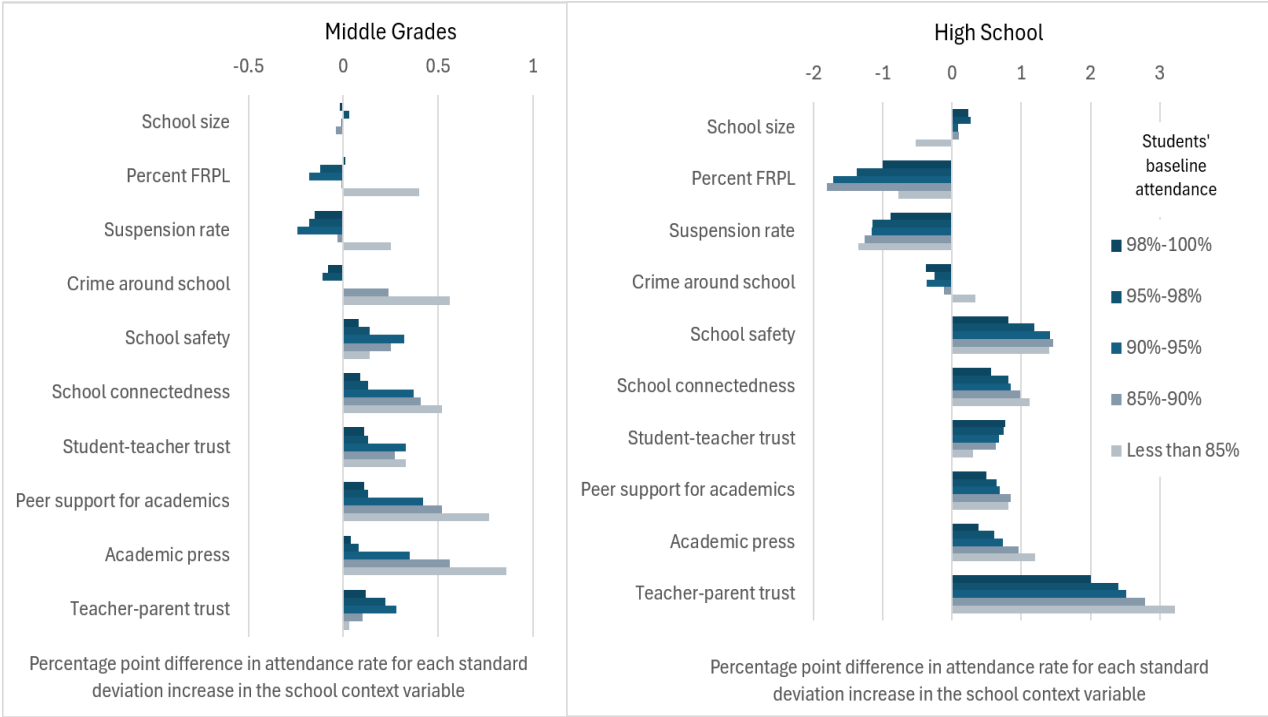
Note. Coefficients show the percentage point change in attendance rates for a one standard deviation increase in the school variable. They come from models that predict school residual attendance rates after controlling for student background characteristics and the census tract in which students live.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figures

Figure 1

Relationships of School Context Variables with Adjusted School Attendance Residuals



Note. See Table 6 for specific coefficient values. Models control for baseline attendance, student background characteristics, and census tract.

Appendix

Table A1

Number of Observations Missing Data by Variable and Sample

	Grades 6-8 Pre-Pandemic (241,626)	Grades 6-8 Post-Pandemic (212,439)	Grades 9-11 Pre-Pandemic (226,569)	Grades 9-11 Post-Pandemic (215,729)
Total number of cases				
Number of missing cases				
Concentration of poverty	5	1,246	7	998
Social status	5	1,246	7	998
Distance home-to-school (miles)	503	3,845	614	8,405
Changed residences	611	218	614	661
3-year baseline test score	14,566	19,004	23,164	26,965

Note. Cells report the number of student-year observations missing each variable. Variables not listed had no missing observations.

Table A2*Individual and School-Level Reliabilities and Content of Survey Measures*

Survey measure	Individual (Rasch)	High school (School-level)	Middle school (School-level)
Peer support	.63	.80	.80
Academic press	.70	.66	.66
Safety in and around school	.73	.91	.85
School connectedness	.78	.87	.85
Student-teacher trust	.78	.94	.82
Teacher-parent trust	.85	.67	.96
Peer support	How many students in your class: Feel it is important to attend school every day? Feel it is important to pay attention in class? Think doing homework is important? Try hard to get good grades?		
Academic press	How much do you disagree or agree with the following statements about your Target class? This class really makes me think. I'm really learning a lot in this class. Expects everyone to work hard. Expects me to do my best all the time. Wants us to become better thinkers, not just memorize things. In your target class, how often Are you challenged? Do you have to work hard to do well? Does the teacher ask difficult questions on tests? Does the teacher ask difficult questions in class?		
Safety in and around school	How safe do you feel In the hallways of the school? In the bathrooms of the school? Outside around the school? In your classes?		
School connectedness	How much do you disagree or agree with the following? I feel like a real part of my school. People here notice when I'm good at something. Other students in my school take my opinion. People at this school are friendly to me. I'm included in lots of activities at school. I'm excited to go to school everyday.		
Student-teacher trust	How much do you disagree or agree with the following statements? I feel safe with my teachers at this school I feel comfortable with my teachers at this school. My teachers always keep their promises. My teachers always listen to students' ideas. My teachers treat me with respect.		
Teacher-parent trust	How many teachers at this school feel good about parents'/guardians' support for their work? For the students you teach this year, how many of their parents/guardians. Support your teaching efforts? Do their best to help their children learn? To what extent do you feel respected by the parents/guardians of your students? Please indicate the extent to which you disagree or agree with the following: Teachers and parents/guardians at this school think of each other as partners in educating children. Staff at this school work hard to build trusting relationships with parents/guardians.		

Note. Individual reliability estimates come from Rasch models of 2024 data, take into account both standard errors and misfit, and range from zero to one. School-level reliabilities come from 3-level HLMs with measure standard error at level 1, students at level 2, and schools at level 3.

FACTORS CONTRIBUTING TO STUDENT ATTENDANCE

Table A3

Correlations of Neighborhood Factors with Adjusted Census Tract Attendance Residuals for Students with Different Levels of Baseline Attendance

	Baseline Attendance Rates				
	98% - 100%	95%- 98%	90%- 95%	85% - 90%	Less than 85%
Grades 6-8					
Total crime rate	-	-	.01	.03	-.01
Housing Affordability % households with housing costs >30% income	-	-	.01	-.09*	.00
Housing stability % households that are owner- occupied	-	-	.07*	-.00	.05
Health insurance coverage Medicare only	-	-	.00	-.01	-.03
Medicaid only	-	-	-.02	.08*	.06
No coverage	-	-	-.03	-.03	-.04
<i>n</i> = 790					
Grades 9-11					
Total crime rate	-.20***	-.15***	-.13***	-.03	.01
Housing Affordability % households with housing costs >30% income	.05	.18***	.10**	.05	.05
Housing stability % households that are owner- occupied	.13***	.21***	.14***	.09*	.03
Health insurance coverage Medicare only	.03	.02	.02	.03	.03
Medicaid only	-.08*	-.20***	-.11**	-.06	-.06
No coverage	.10**	-.07*	-.05	-.07	-.08*
<i>n</i> = 790					

Note. Census tract residuals come from model 5.

* $p < .05$. ** $p < .01$. *** $p < .001$.

FACTORS CONTRIBUTING TO STUDENT ATTENDANCE

Table A4

Correlations of School Factors with Adjusted School Attendance Residuals

	Baseline Attendance Rates				
	98% - 100%	95%- 98%	90%- 95%	85% - 90%	Less than 85%
Grades 6-8					
School size	-.03	.02	-.00	-.01	.00
Percent FRPL	.02	-.16***	-.17***	-.01	.12*
Suspension rate	-.18***	-.17***	-.16**	-.01	.05
Total crime around school	-.11*	-.12**	.00	.11**	.13**
Safe in/around school	.12**	.18***	.27***	.13**	.04
School connectedness	.14**	.16***	.32***	.22***	.15**
Student-teacher trust	.17***	.16***	.28***	.14**	.09*
Peer support for academic work	.15**	.15**	.33***	.26***	.20***
Academic press	.05	.10*	.28***	.28***	.23***
Teacher-parent trust	.17***	.25***	.22***	.05	.01
<i>n</i> = 446					
Grades 9-11					
School size	.10	.11	.03	.03	-.12
Percent FRPL	-.21*	-.25**	-.28**	-.25**	-.08
Suspension rate	-.38**	-.42**	-.38**	-.35*	-.28***
Total crime around school	-.16	-.09	-.12	-.03	.07
Safe in/around school	.22*	.28**	.29***	.26**	.19*
School connectedness	.16	.20*	.18*	.18*	.16
Student-teacher trust	.21*	.17	.14	.11	.04
Peer support for academic work	.15	.17	.16	.17	.12
Academic press	.11	.16	.17	.19*	.18*
Teacher-parent trust	.48***	.49***	.46***	.43***	.38***
<i>n</i> = 127					

Note. School level residuals come from model 5. This table is included for comparison with Table A3, and to provide standardized values that correspond to the coefficients in Table 6 which are reported in percentage points.

* $p < .05$. ** $p < .01$. *** $p < .001$.