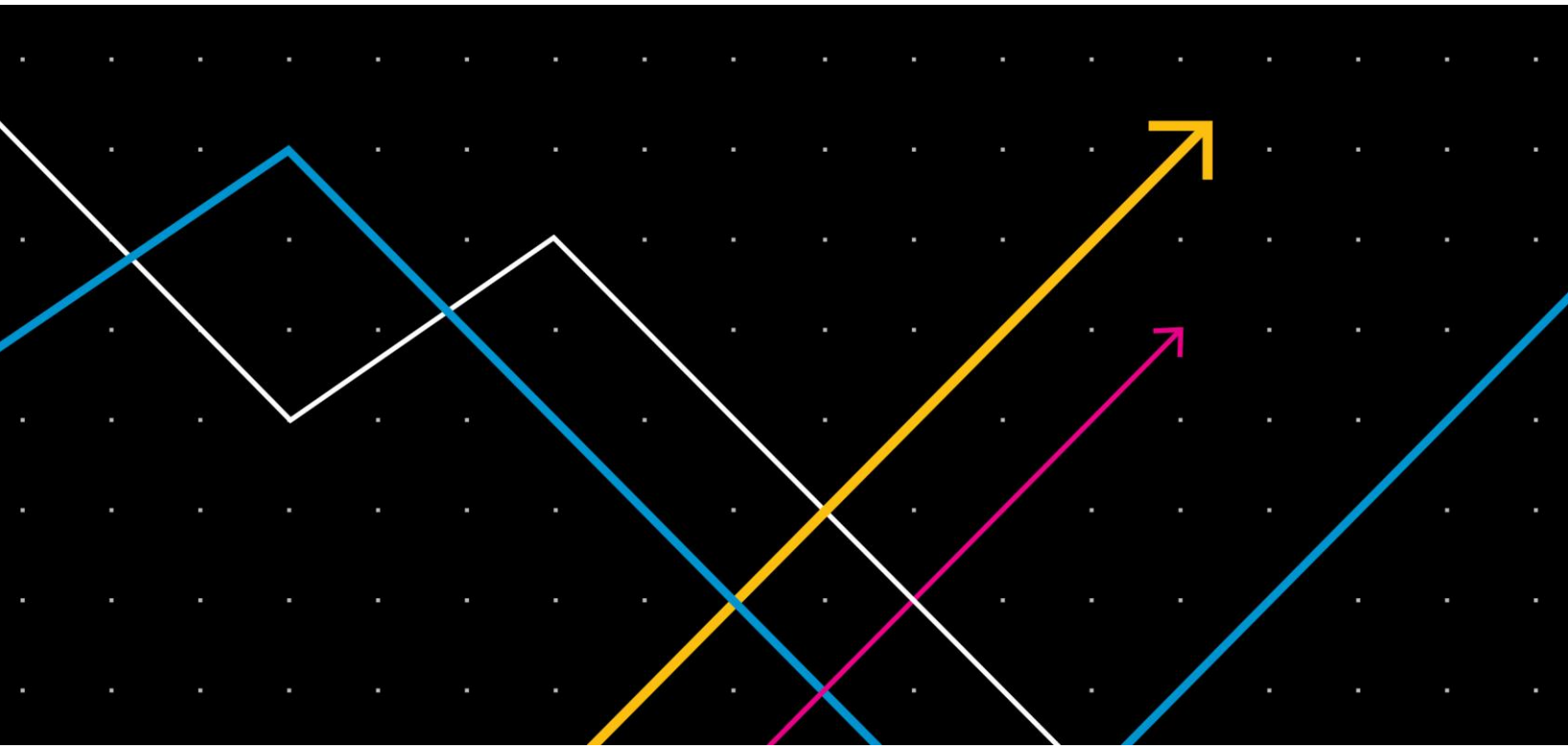

RESEARCH REPORT

When Is a School Segregated?

Making Sense of Segregation 65 Years after *Brown v. Board of Education*

Tomas Monarrez
URBAN INSTITUTE

Brian Kisida
UNIVERSITY OF MISSOURI

Matthew Chingos
URBAN INSTITUTE

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Executive Summary

Sixty-five years after the *Brown v. Board of Education* decision ended legal segregation in US public schools, many students are still enrolled in segregated school systems with unequal access to educational resources. Segregation has proven resilient—difficult to change and complicated to understand. Policymakers and researchers often seek to identify individual schools that are "segregated" based on their racial composition, but as schools have grown more diverse, thinking of individual schools as segregated based on their racial composition can be misleading without information about the pool of students they could potentially enroll. More broadly, segregation can be considered a measure of how students are distributed across schools within school systems (e.g., districts or cities) that draw from the same students.

Considering segregation as a characteristic of school systems, however, offers little guidance to policymakers interested in reducing segregation by focusing on the schools that exacerbate school system segregation. To fill this gap, we have developed a method for measuring an individual school's contribution to system-level racial segregation.

Our Segregation Contribution Index is based on a simple thought experiment that measures what would happen to school system segregation if a school's actual racial composition were replaced with a hypothetical "perfectly integrated" composition corresponding to the entire school system. This index divides the total school segregation of each school system in the country into portions attributable to each school in the system. Individual schools typically contribute only a small percentage to systemwide segregation, but the index shows policymakers which schools make especially large contributions.

Additionally, residential segregation is one of the key constraints on school integration, as transporting students over long distances can be costly and unappealing. We modify our index to account for these constraints by measuring whether systemwide integration would be improved if schools more closely resembled their local neighborhoods. This measure of individual schools' contributions to segregation thus accounts for the composition of the school, system, and neighborhood. Through this analysis, we find the following:

- Most schools resemble their neighborhood in terms of racial composition, but about one-third of schools deviate by more than 10 percentage points.
- In neighborhoods where black and Hispanic students are overrepresented, a school where black and Hispanic students are overrepresented relative to the neighborhood exacerbates

segregation. A school where black and Hispanic students are underrepresented compared with the neighborhood increases integration.

- In neighborhoods where white and other racial groups are overrepresented, the reverse is true: a school where black and Hispanic students are overrepresented compared with the neighborhood increases integration, and a school where white students are overrepresented increases segregation.

Our index can be applied both to individual schools and to groups of schools, such as traditional public, charter, and private schools. Our analysis by sector finds the following:

- Traditional public schools account for 84 percent of total segregation in the average school system because they serve 89 percent of students. In contrast, charter and private schools educate fewer students and tend to be smaller, so they account for a smaller total share of segregation. Holding constant school size, private and charter schools tend to have higher average segregation contributions than traditional public schools.
- Charter schools diverge from their neighborhoods more frequently than traditional public schools in a symmetric fashion. Charter schools are overrepresented among schools that are both significantly more and less black and Hispanic than the surrounding neighborhood. Private schools deviate even more, on average, and in a one-sided fashion. They tend to underrepresent black and Hispanic students relative to their neighborhood.
- In neighborhoods with higher black and Hispanic representation, traditional public, charter, and private schools are equally likely to contribute to segregation. But in neighborhoods with lower black and Hispanic representation, private schools are 30 percentage points more likely than traditional public schools to contribute to segregation. Charter schools in these neighborhoods are also more likely to contribute to segregation than traditional public schools but less so than private schools.

Our results provide a clear picture of school system segregation and the role of individual schools, but the index does not reveal causal relationships. Closing a school that contributes to segregation in our index would not necessarily lead to a more integrated system, as students might systematically sort into other schools in ways that exacerbate segregation. Our Segregation Contribution Index cannot inform policy decision on its own, but it can identify schools that merit scrutiny, especially in neighborhoods where desegregation efforts may be attainable at lower costs. We hope these findings and data can help target efforts that enhance school integration and bring greater equity to schools.

When Is a School Segregated?

May 17, 2019, marks the 65th anniversary of the *Brown v. Board of Education* decision that ended legal segregation in US public schools. This year also marks 123 years since *Plessy v. Ferguson* established the principle of "separate but equal" schools and 151 years since the 14th Amendment to the US Constitution established the equal protection clause. Yet in much of America, many students are enrolled in segregated school systems with unequal access to educational resources. Segregation has proven to be one of America's most resilient problems, difficult to change and complicated to understand.

Racial segregation in schools continues to be of great concern to education stakeholders and policymakers in large part because evidence shows school integration has positive effects. Researchers have documented the long-term benefits in educational attainment, income, and health that black students experienced during the era of court-ordered desegregation (Ashenfelter, Collins, and Yoon 2006; Johnson 2011). This literature has also found that white students are not negatively affected by integration (Angrist and Lang 2004; Guryan 2004; Hanushek, Kaine, and Rivkin 2009). Other studies have shown that the end of court-ordered desegregation efforts was associated with the resegregation of school districts and the deterioration of racial equity gains made during desegregation years (Billings, Deming, and Rockoff 2015; Lutz 2011; Reardon et al. 2012). The evidence showing the importance of integration to the well-being of students of color should compel policymakers to develop new desegregation programs that do not rely on the power of the courts.

There was a time in the United States when the concept of a segregated school was unambiguous. During the years of de jure segregation, a school was segregated as a matter of legal construction. In most cases, schools were either 100 percent black or 100 percent white. During the period of de facto segregation that has followed, however, the terminology is less obvious. In many places, schools have become more diverse, school systems have become fragmented along urban and suburban lines, and new types of schools have emerged that cater to historically marginalized students. These changes complicate the comparisons needed to determine whether an individual school is segregated. Moreover, the underlying causes of school segregation are a complicated blend of historical racist policies that forced neighborhoods to be racially segregated, residential sorting into school attendance zones, and educational policy aimed at addressing these issues. As a result, researchers and the public have had difficulty navigating the concept of segregated schools in a meaningful way for making policy.

Understanding a problem is central to any efforts to address it, yet in many cases, facts about school segregation are clouded by conceptual problems that lead to different conclusions. Assessing whether a school's racial composition contributes to segregation requires context. It does not suffice to ask what share of a school's students are members of particular racial groups. We also need to look at the racial composition of the school's system and its local surroundings, asking what integration *could* look like given these constraints.

In this report, we use school-level data on student racial composition to decompose individual school contributions to the segregation of school systems (e.g., districts, counties, and cities) and to examine how these contributions relate to neighborhoods and different types of schools. We hope that by improving our understanding of segregation, we can discover better ways to address it.

Data and Methods

American schools are becoming increasingly diverse. During the era of court-ordered desegregation, segregation was largely an issue between black and white students. Today, Hispanic and Asian students represent a larger share of students and need to be accounted for when studying school segregation. We argue that desegregation efforts should focus where inequities in student achievement have been documented. The evidence denotes that, on average, black and Hispanic students have persistently scored lower in standardized examinations than white and Asian students (Musu-Gillette et al. 2017). Thus, we measure school segregation as the separation of black and Hispanic students from white and Asian students (and the relatively small share of students from other racial groups).[1]

Other historical aspects of the school desegregation debate complicate how we examine school segregation patterns. Local control of schools is a defining feature of American public education, and it has largely determined school desegregation policy. Defendants in desegregation lawsuits in the 1960s and '70s were almost always local school districts. For better or worse, these local entities have effectively become the government unit responsible for creating integrated school systems. Most school desegregation efforts have been and are administered at the school district level, and between-district desegregation policy has been limited by judicial rulings.[2]

Nevertheless, evidence shows that district-level desegregation orders spurred white flight to suburban school districts and induced the fragmentation of school systems in metropolitan areas at least partially driven by local preferences for school integration. In fact, about two-thirds of total school segregation in metropolitan areas is because of segregation between—rather than within—school

districts (Reardon, Yun, and Eitle 2000; Stroub and Richards 2013). Shifting our definition of a school system to different levels of geography—which is implicit in most segregation indexes—changes our understanding of the most effective way of achieving school integration.

Absolute versus Relative Measures of Segregation

Conceptually, we contend that segregation is best thought of as a phenomenon that applies to school systems. Referring to individual schools as "segregated" only makes conceptual sense relative to other schools within a system (e.g., a district, county, or metropolitan area) that draw from the same students. As such, thinking of individual schools as "segregated" or "integrated" is confusing without information about the school system's composition.

The larger debate about whether the past few decades can be characterized as a period of resegregation largely hinges on whether one defines segregation using exposure (an absolute measure) or unevenness (a relative measure that accounts for the school system's composition) (Reardon and Owens 2014).

Absolute measures quantify how much students from one demographic group are exposed to (or isolated from) another demographic group within individual schools. One common exposure measure is the isolation index, which measures the average composition of schools experienced by the average student from a given racial group (e.g., the average share of black students at schools attended by black students). Other approaches define segregated schools as those with high proportions of similar students by comparing schools with an absolute benchmark, such as defining schools as "hypersegregated" or "intensely segregated" when they enroll more than 90 percent minority students (Frankenberg et al., 2019; Frankenberg, Siegel-Hawley, and Wang 2010; Orfield et al. 2016).

Absolute measures can be descriptively useful but are strongly influenced by the racial composition of students in the local neighborhood or the broader school system (Ritter et al. 2010). Schools in areas with few white students may be labeled "intensely segregated" simply for reflecting the underlying population from which they draw students.

Relative measures of imbalance or unevenness address this drawback by adjusting for the underlying students, making them more comparable across different locations and over time. These measures are also conceptually different in that they show how evenly a given group of students is distributed across an entire school system. This makes intuitive sense, as segregation implies that some

students are segregated from other students, which can happen between schools only relative to an underlying shared pool of potential students.

To be sure, many schools are racially isolated compared with an absolute benchmark. But in an increasingly diverse America where white students are now a minority of all students, measures of exposure or isolation can be misleading indicators of segregation. Rather, we should consider segregation as a property of school systems that unevenly distribute the students that make up that system. To the extent that we identify how segregated schools or types of schools are, we should measure their *contribution to system-level segregation.*

To address this, our Segregation Contribution Index measures an individual school's contribution to system-level segregation using a decomposed measure of unevenness (i.e., the dissimilarity index) that accounts for system-level demographics. A formal definition of the index is available in the appendix. The index measures how much system-level segregation would change if a school's composition were different and everything else stayed equal. This decomposition methodology is in the same spirit as the methods in widely cited studies of segregation (Clotfelter 2004). In our primary approach to generating our index, we define geographical school systems using counties. How we define a school system can affect our findings, so we also provide results for different geographical units—school districts and metropolitan areas—in the appendix.

Data Sources

Our primary data source for this study is the National Center for Education Statistics' Common Core of Data (CCD) School Universe Survey, which details enrollment by race and ethnicity for every US public school. We use the 1995–2015 editions of these files to measure trends but focus on 2015 data when studying school contributions to segregation.[3] To examine the role of private schools in determining segregation, we supplement the 2015 CCD with Private School Universe Survey data for the same school year. The Private School Universe Survey does not cover the entire universe of private schools but, according to documentation, includes 75 percent of US private schools.

When studying school contributions to segregation within school systems (defined below), we focus only on school systems for which there is reasonable chance for integration. We do so by dropping systems that have only one school, enroll less than 200 students, are less than 10 percent black or Hispanic, or have little or no school segregation.[4]

Several of our analyses compare school demographics with the demographics of the surrounding neighborhood. Our preferred approach for measuring neighborhoods is to search for neighboring schools that serve the same grades as the school of interest. This approach is contemporaneous to the year of the school enrollment data we study, and it contains the students that schools are most likely to draw from. To find neighboring schools, we draw a one-mile radius around each school and define school neighborhood composition as the black and Hispanic share of students attending schools within this radius, including the students in the school of interest. For schools with no same-grade neighboring schools within one mile, our algorithm expands the search radius progressively by one mile until a neighboring school is found or 15 miles are reached with no neighbors, at which point we say the school has no neighbors.

We also linked school location data to 2010 definitions of census tracts and census blocks using a standard geographic information system procedure.[5] We measured the census composition of school neighborhoods as the share of school-age children living in the school's tract or in the set of blocks for which the school in question is the closest school.[6] For tracts, we used 2012–16 American Community Survey estimates. For blocks, we used 2010 Census counts. We did this separately for age groups, which roughly correspond with school levels: ages 5 to 9 (grades K–5), ages 10 to 14 (grades 6–8), and ages 15 to 17 (grades 9–12). Using the census tract links, we also included measures of median income and adult educational attainment.

Finally, we group schools into school systems using three geographic definitions: school districts, metropolitan areas, and US counties. We assign schools to these geographies using a geographic information system procedure linking school locations to maps of these geographies. To group schools into districts, we use data on geographic school district boundaries from the 2015 release of the National Center for Education Statistics' Education Demographic and Geographic Estimates. This is especially important for linking charter and private schools to school districts, which do not use the same administrative identifiers as traditional public schools. We group schools into metropolitan areas using the US Census Bureau's 2010 maps of core-based statistical areas, which are defined by the Office of Management and Budget as groups of counties anchored by an urban center (population of at least 50,000) plus adjacent counties that are socioeconomically tied to the urban center by commuting. Finally, we use county identifiers from our primary data sources to group schools into counties.

Given that counties often correspond to school districts in the southern part of the country and that metropolitan areas are groupings of counties, the county is a useful middle ground for measuring school segregation. In the appendix, we report results using school districts and metropolitan areas.

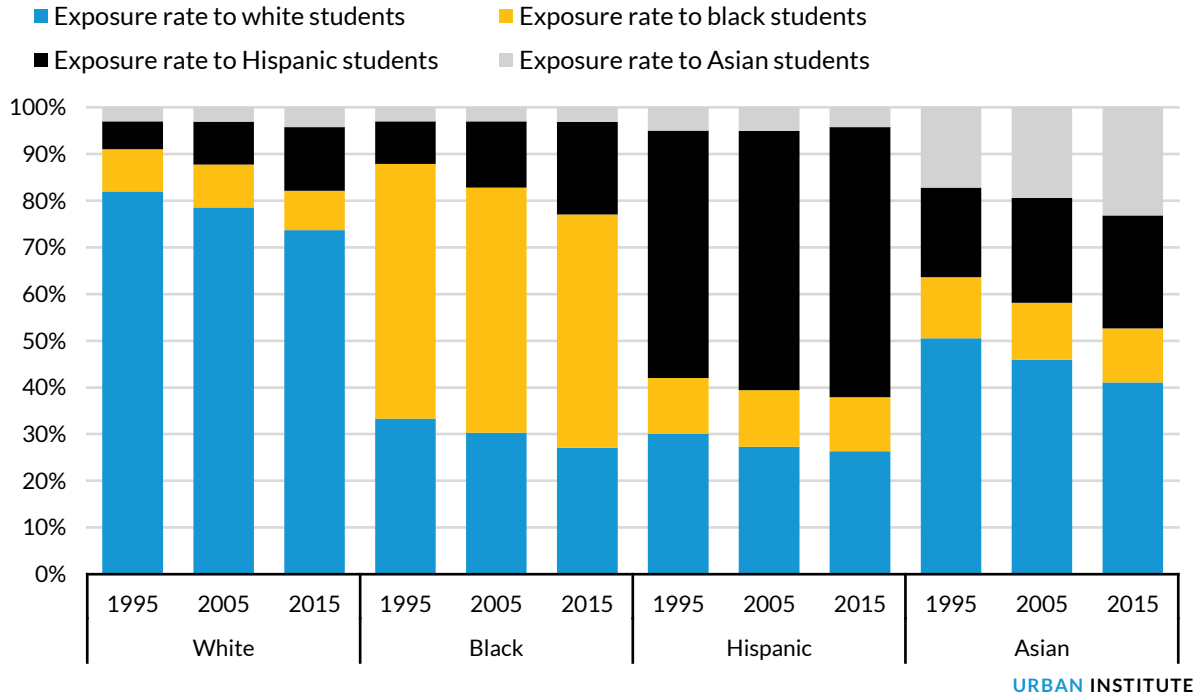
National Segregation Trends

We begin by documenting national trends in public school segregation.[7] First, we document long-run changes in student exposure rates by race or ethnicity. Though interesting, these measures are not the most useful for local policymakers because the measures conflate aggregate changes in student demographics. Second, we present trends in average school district segregation using the dissimilarity index, which adjusts for local demographics. These estimates establish that average school segregation has remained stable over the past 20 years.

Figure 1 plots the exposure rate of the four largest racial and ethnic groups of students as reported by the CCD over two decades. Exposure rates can be interpreted as the average share of school peers from one racial group experienced by a student of a given racial group. For example, the exposure rate of white students to other white students, or the white isolation index, was 82 percent in 1995 and decreased to 70 percent over the next 20 years. This means that the average white student went to a school that was 82 percent white in 1995 and 70 percent white in 2015. Compared with other groups, white students are by far the most isolated group, even though their isolation has declined because of increased exposure to Hispanic students.

FIGURE 1

Exposure Rate to Different Racial and Ethnic Groups in Public Schools



Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey.

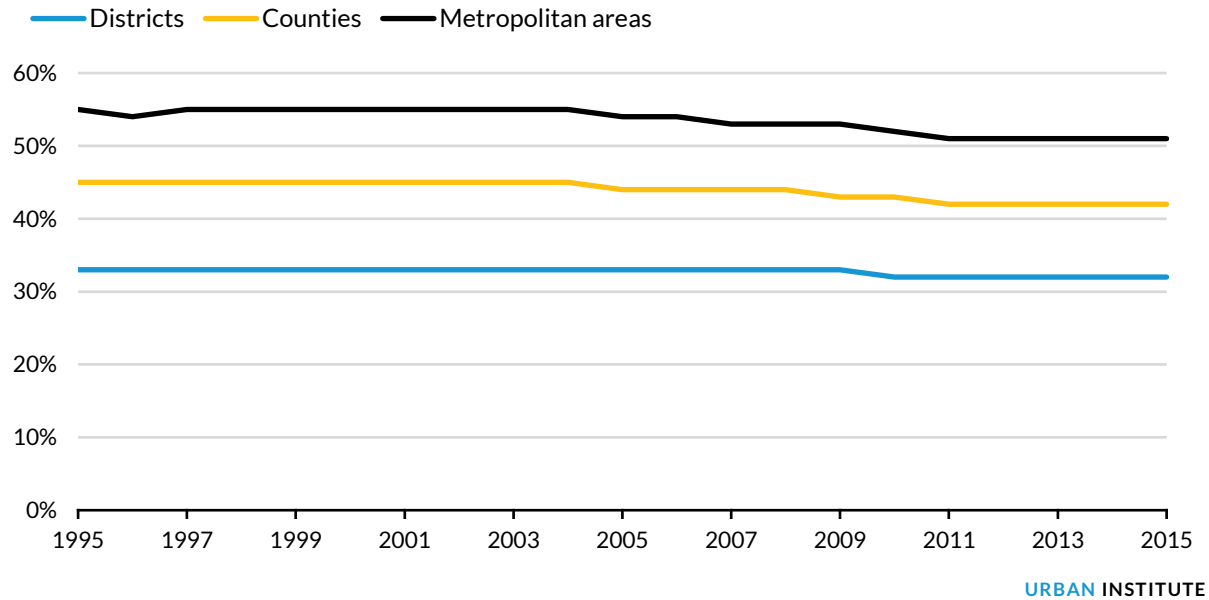
Black students' exposure to white students has decreased, but black isolation has remained stable. The reduction in black students' exposure to white students can be attributed to increased exposure to Hispanic students. These shifts are driven by increases in the overall share of Hispanic students. All four groups have experienced increased exposure to Hispanic students. Notably, however, Asian students are considerably more likely to be exposed to white students than black or Hispanic students. This provides additional motivation for using a binary categorical definition of race and ethnicity of black and Hispanic versus white and Asian (and other groups) to measure segregation.

Using exposure rates to measure segregation is complex and conflates the role of shifting demographics among students nationally. By measuring segregation relative to systemwide composition, relative measures of segregation, such as the dissimilarity index, are potentially more relevant to policymakers.

Nationally, the trend in the segregation of black and Hispanic students for the average school district have been largely flat over the past two decades. Figure 2 shows the dissimilarity index, which is commonly interpreted as the share of black and Hispanic students in a district that would need to change schools to achieve perfect integration.[8] Since 1995, this index has been about 32 percent, and it has varied by about 1 percentage point over the past 20 years.

FIGURE 2

National Trends in Public School Segregation



Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey.
Note: Metropolitan areas are defined by 2010 US Census Bureau core-based statistical areas.

Looking at segregation by metropolitan area shows a different picture. First, metropolitan areas are more segregated than school districts. In 1995, black and Hispanic segregation was 55 percent in the average metropolitan area, almost double the figure for school districts. This is evidence of significant patterns of segregation between districts that are more severe than within districts. Second, metropolitan area school segregation was flat between 1995 and 2003 and has had a slight downward trend since then. By 2015, metropolitan area segregation had fallen to 50 percent.[9]

Measuring school segregation at the county level (between school districts and metropolitan areas) results in a similarly flat trend between 1995 and 2015. Counties tend to be more segregated than school districts but less segregated than metropolitan areas, averaging about 44 percent.

Public school segregation has remained stable over the past two decades, regardless of the level of aggregation. But even when exploring broad national trends in school segregation, deciding at what level to measure segregation (i.e., how to define the school system) affects conclusions. School segregation at the district level is lower and more stable than school segregation at the metropolitan level, and counties fall in between.

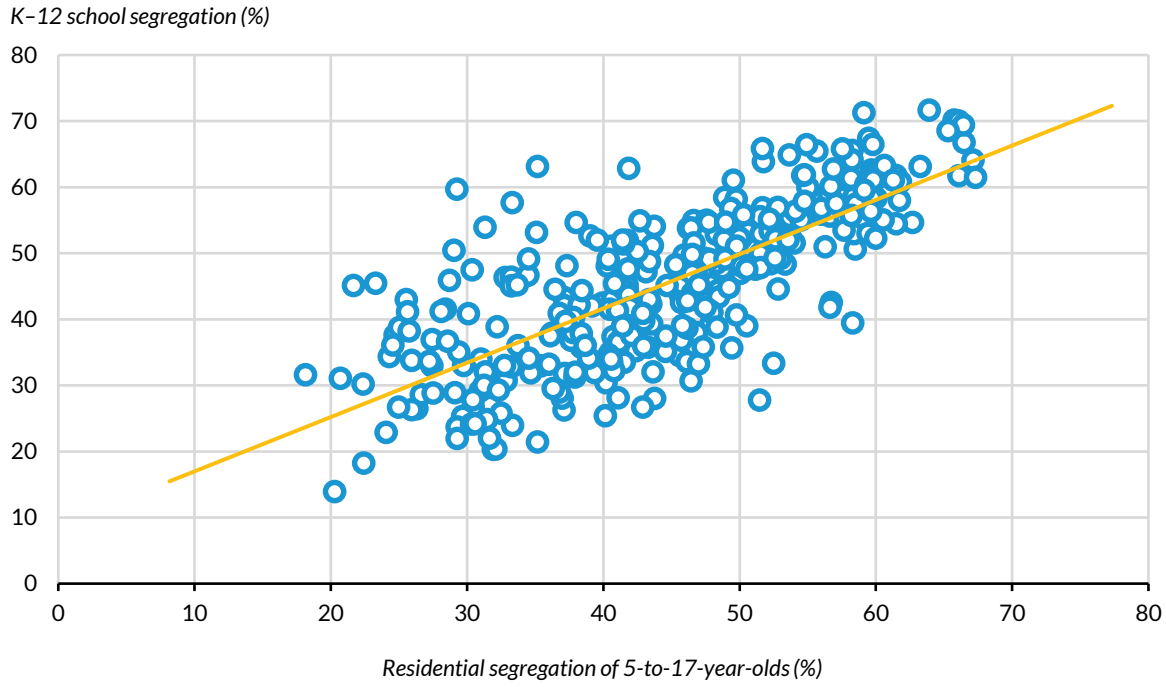
Segregation of Neighborhoods versus Schools

Another important facet of school segregation is the role of residential segregation. Because many cities are highly segregated residentially and because students largely attend schools close to home (Whitehurst et al. 2017), residential segregation partly determines school segregation. Figure 3 shows a metropolitan area–level scatterplot of total K–12 segregation in 2015, including both public and private schools against total residential segregation of 5-to-17-year-olds using census tract estimates. For reference, we also plot the ordinary least squares linear predictor of school segregation using residential segregation.

The figure shows that school and residential segregation are highly correlated. For every percentage-point increase in residential segregation, school system segregation is predicted to increase 0.82 percentage points, on average. Metropolitan areas vary considerably regarding this relationship because of several factors, including school enrollment policies (e.g., school attendance boundaries), parental preferences over school transfers, and differences in the penetration of charter and private schools.[10] Still, variation in residential segregation between metropolitan areas explains more than half the observed variation in school segregation.[11] In the second part of our analysis, we account for the influence of these residential segregation patterns when assessing schools' contributions to segregation.

FIGURE 3

Correlation between School and Residential Segregation across Metropolitan Areas



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Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey, the Private School Universe Survey for the 2015–16 school year, and census tract estimates from the 2012–16 American Community Survey.
Note: Metropolitan areas are defined by 2010 US Census Bureau core-based statistical areas.

Decomposing School Contributions to Segregation

Considering segregation as a trait defined for a school system, not for individual schools, we developed a method for measuring individual schools' contributions to systemwide racial segregation. We first construct a simple measure that treats all schools in a system equally before turning to a nuanced measure that accounts for the composition of schools' surrounding neighborhoods.

Our Segregation Contribution Index (SCI) is based on a simple thought experiment: how much would segregation decrease if an individual school perfectly reflected the school system's (i.e., the district, county, or metropolitan area) racial composition and everything else stayed equal?[12] Specifically, we replace each school's actual racial composition with the composition of the entire county, and then we recalculate segregation using the dissimilarity index. This hypothetical level of segregation is then compared with the actual level of segregation in proportional terms. The SCI is

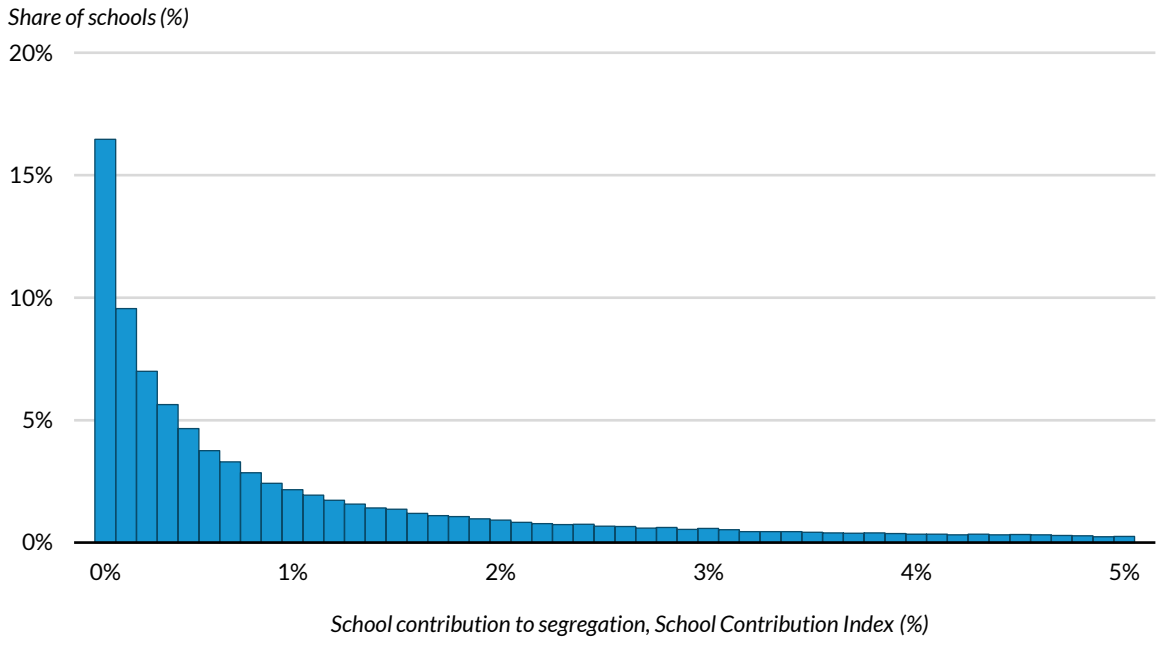
therefore defined as the percentage decrease in segregation that would take place if the school reflected the county's composition perfectly. In the appendix, we report parallel results for school districts and metropolitan areas. The main conclusions of our analysis hold regardless of how we define school systems.

More than half of US schools contribute less than 1 percent to their system's racial segregation (figure 4). But many schools contribute a lot more, with the top 10 percent contributing at least 7.7 percent to their system's segregation (for exposition purposes, we have cut the right tail of the distribution at 5 percent in the figure). Because of these outliers, we estimate that the average school in the country explains 2.9 percent of the racial segregation in its school system, with the median school contributing only 0.69 percent.

The SCI is defined within school systems, and one must be cautious when comparing the index across them. Such comparisons will be nonsensical unless the schools compared are in school systems of similar size and demographics. For instance, all else equal, a school system with more schools will mechanically have lower school-level contributions. This makes sense—in large urban areas, changing the racial composition of a single school does little to address aggregate levels of segregation.

FIGURE 4

National Distribution of the Segregation Contribution Index



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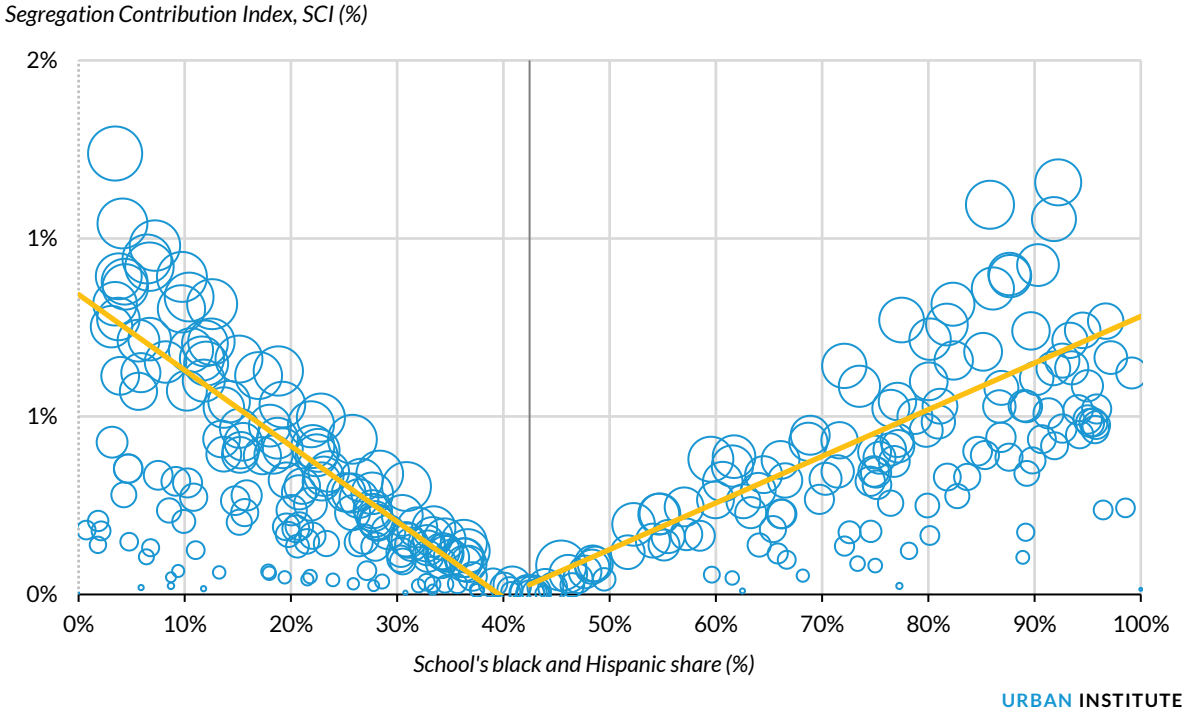
Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.

Deviation between school and system composition is the primary determinant of schools' contribution to segregation. For example, about 43 percent of K–5 students attending school in Alameda County, California, in 2015–16 were black or Hispanic. Segregation of these students from students of other groups was 0.54, meaning that 54 percent of black and Hispanic students would have to change schools to achieve perfect integration.

Figure 5 plots Alameda County schools' racial composition against their contribution to segregation. The SCI increases as schools' racial compositions deviate further from the system average (43 percent black and Hispanic) in either direction, resulting in the V-shaped relationship seen in the figure. Importantly, school-level segregation indexes based solely on black and Hispanic isolation would flag only schools that predominantly enrolled students from these groups and would miss predominantly white and Asian schools, which have SCIs just as large or larger.

FIGURE 5

Alameda County K–5 Schools' Black and Hispanic Shares and Their Contribution to Segregation



Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: Observations are weighted for enrollment.

School size is a secondary determinant of contribution to segregation. Holding constant school racial composition (i.e., focusing on a vertical slice of figure 5), schools with larger enrollment contribute

more to segregation. For example, large schools that are about 80 percent black and Hispanic contribute more to Alameda County's segregation than smaller schools of similar composition. Larger schools count more because they affect more students. Similarly, schools in smaller systems will mechanically have larger school contributions to segregation. These measures should be compared only across systems of similar size and composition or by restricting national analyses to focus on within-system variation (as we do below).

By identifying the schools that segregate the system most, policymakers can use our SCI to target desegregation efforts at schools where the returns will be largest. For example, table 1 lists the 10 schools that most contribute to K–5 segregation in Alameda County. It reports the share of students that are black or Hispanic, the school's SCI, the cumulative contribution (the sum of all contributions for schools ranked the same or higher), and total enrollment. All else equal, making James Leitch Elementary (Alameda County's top segregating elementary school) reflect the racial composition of the county (43 percent black and Hispanic) would reduce total school segregation 1.2 percent. Even though the school has little black and Hispanic isolation, it is the top contributor because its black and Hispanic representation (3.4 percent) is so much lower than the county's composition and because it enrolls more than 1,000 K–5 students. The second-highest contributor is Achieve Academy, a charter elementary school, which is highly black and Hispanic isolated (92 percent) and has large K–5 enrollment (746 students). If both James Leitch Elementary and Achieve Academy were racially balanced relative to the rest of the county, segregation would fall 2.4 percent. Following the same logic, if the top 10 segregating schools were perfectly integrated, segregation in Alameda County would fall 10 percent. This is remarkable given that 301 schools serve K–5 students in Alameda County.

TABLE 1

Top 10 Schools Contributing to the Segregation of Alameda County's K–5 Schools

School	Rank	Black and Hispanic share	Segregation contribution (SCI)	Cumulative contribution	Enrollment
James Leitch Elementary	1	3.4%	1.2%	1.2%	1,018
Achieve Academy	2	92.2%	1.2%	2.4%	746
Burbank Elementary	3	85.8%	1.1%	3.5%	810
Cherryland Elementary	4	91.8%	1.1%	4.5%	685
Forest Park Elementary	5	4.1%	1.0%	5.6%	872
John Green Elementary	6	7.1%	1.0%	6.6%	891
Ardenwood Elementary	7	6.4%	0.9%	7.5%	839
Cox Academy	8	90.3%	0.9%	8.4%	620
Donlon Elementary	9	6.7%	0.9%	9.4%	825
Colonial Acres Elementary	10	87.6%	0.9%	10.3%	639

Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: SCI = Segregation Contribution Index. Alameda County enrolled 121,044 students in grades K–5 in 2015–16.

Another useful feature of decomposing segregation into school-level components is that it allows researchers to study whether certain groups of schools contribute more to segregation than others. Two types of questions can be explored in this context: (1) On average, do certain types of schools tend to have higher individual contributions to segregation than others? (2) Does a certain group of schools account for a larger share of total segregation in the school system? Both questions are relevant. For instance, a school system may comprise hundreds of public schools but only a handful of private schools. If these private schools are racially unbalanced, they will have high average contributions, but given how few there are, integrating private schools will not substantially influence the system's total segregation levels.

We estimate a statistical model of the SCI as a function of school characteristics to study whether certain schools tend to have higher segregation contributions, on average. Figure 6 presents our estimates using our national sample of 119,479 schools and restricting attention to patterns within school systems. The first model, in blue, estimates raw correlations controlling for the school system by grade-level fixed effects, meaning that the correlations come from comparisons within school systems among schools serving the same grade levels. These estimates measure the raw average relationship between school characteristics and segregation contributions in a school system, but differences in contribution to segregation are also partly driven by school size. Within counties, urban schools have a higher average SCI than rural and small-town schools, with suburban schools landing in the middle. Moreover, private and charter schools have lower SCIs than traditional public schools. Magnet schools contribute to segregation at an average rate not statistically different from traditional public schools.

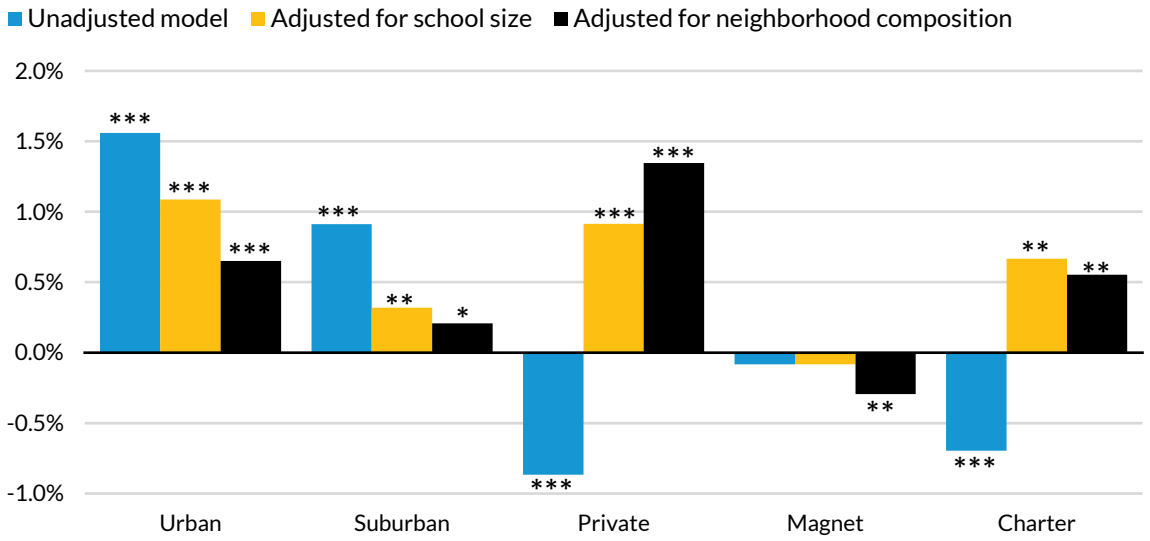
The second model in figure 6, in yellow, controls for school size, restricting comparisons with schools in the same system and of similar enrollment. Because urban schools tend to be larger than suburban and rural schools, the positive association between urbanicity and the SCI, while still present, is attenuated when controlling for school size. Similarly, because private and charter schools tend to enroll fewer students than traditional public schools (see the appendix for summary tables by school type), the relationship of charter and private schools and the SCI also changes. Once we control for school size, the sign of their relationship to the SCI flips from negative to positive, suggesting that they tend to contribute to segregation more than similarly sized traditional public schools. This implies that private schools, while smaller, are more racially unbalanced than traditional public schools. Charter schools are also more racially imbalanced than traditional public schools but to a lesser extent.

The third model in figure 6, in black, adds a control for neighborhood racial composition in addition to controls for school size and system-grade fixed effects. Therefore, this model restricts comparisons to schools in the same system serving the same grade, that are similarly sized, and that are located in

neighborhoods that have a similar racial composition. The association between urbanicity and the SCI continues to diminish but maintains statistical significance, while the difference between suburban and rural schools is now indistinguishable from zero. This means that, on average, urban schools contribute more to segregation than rural or suburban schools, and this cannot be explained by school size or by differences in neighborhood composition.

FIGURE 6

Contribution to Segregation by School Type, Relative to Traditional Public Schools within the Same County



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Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Notes: Figure reports coefficients from a regression of the Segregation Contribution Index on school characteristics and county-by-grade fixed effects. Observations are weighted by school enrollment. Standard errors are clustered at the county level.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

The estimated difference for private schools grows as controls for neighborhood composition are added, which suggests that compared with traditional public schools of similar size and located in similar neighborhoods, private schools contribute significantly more to the system's segregation patterns. In contrast, the difference between charter and traditional public schools is attenuated by including neighborhood controls, continuing to be positive, though only marginally statistically significant. This suggests that a portion of charter schools' higher contribution to segregation is driven by differences in the neighborhoods in which charter schools tend to be located, a topic we explore in the next section. These results suggest that urban schools and charter schools contribute more to

segregation than suburban schools and traditional public schools, but these effects pale in comparison with the average contribution of similarly sized private schools.[13]

The results presented in figure 6 apply to school systems defined by county boundaries. We report results for identical models using school district, county, and metropolitan area aggregations of school segregation in appendix table A.5. Most of the results carry through these different definitions. Regardless of school system definition, controlling for neighborhood composition and school enrollment, we estimate that private schools contribute more to segregation than any other type of school. Results for charter schools are also largely consistent with the analysis in figure 6—measured at the school district and county level, charter schools contribute more to segregation than traditional public schools. But the sign of the relationship between the SCI and charter schools is negative when we define systems at the metropolitan area level. This suggests that there may be factors between school districts that influence our estimates for charter schools in metropolitan areas.[14]

If certain types of schools contribute more, on average, to a school system's segregation, this does not necessarily imply that desegregating these schools would eliminate segregation. On one hand, the analysis presented here is correlational, not causal. To assess the causal impact of certain types of schools on segregation, it is necessary to control for unobserved factors that may drive segregation dynamics, well beyond the scope of this analysis. We present a causal analysis in our report *Charter School Effects on School Segregation*, where we found that charter schools have caused small increases in the school district segregation (Monarrez, Kisida, and Chingos 2019). On the other hand, even if some schools have large SCI's, on average, they will not account for a large share of total segregation if there are too few of these schools or if their enrollment share in the school system is small.

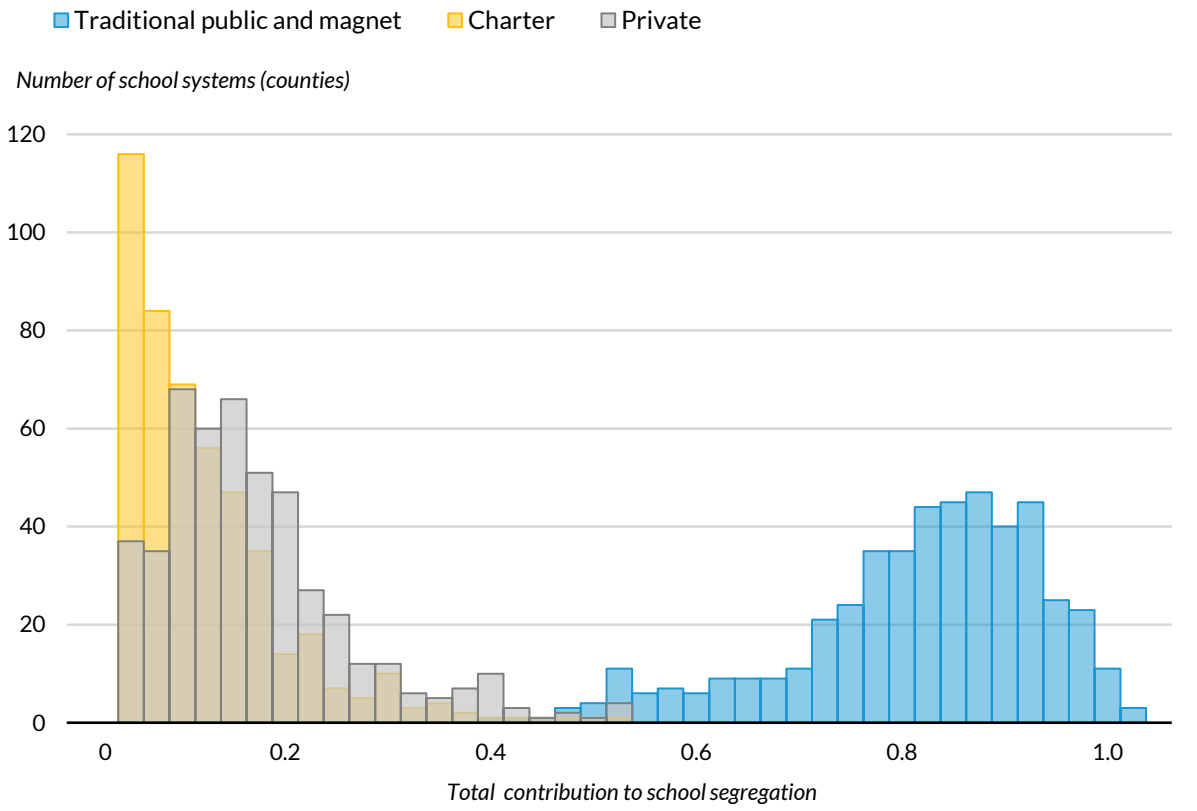
To assess whether a certain group of schools drives the bulk of total segregation, we need to add up all their contributions and observe which group accounts for a larger share of total segregation. Figure 7 shows a histogram of the share of total system segregation that can be attributed to each of these groups of schools for all K–5 schools in counties that have at least one charter, private, and traditional public or magnet school (for brevity, we group traditional public and magnet schools here).

Among counties with both charter and private schools, traditional public schools serve, on average, 81 percent of K–5 students and account, on average, for 76 percent of segregation. Charter and private schools tend to account for a smaller average share of segregation (9 percent and 15 percent, respectively) because these sectors educate a smaller share of students, on average (8 percent attend charter schools, and 11 percent attend private schools). Private schools account for a larger share of total segregation than one would expect given its enrollment share, but this is not the case for charter

schools. This is congruent with the previous set of results. Although private school desegregation would generate the largest marginal decreases in segregation in most school systems, total segregation is unlikely to budge significantly unless the traditional public schools become integrated as well.

FIGURE 7

Total Contribution to Countywide Segregation by School Type



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Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: Total contribution to segregation is defined as the sum of the Segregation Contribution Index within each county, by school sector.

The Role of Neighborhood Composition

In the previous section, we defined a school's contribution to segregation relative to the composition of the entire school system. Holding school size constant, a school whose racial composition significantly deviates from systemwide composition will have a high segregation contribution score. Nevertheless, insurmountable constraints may impede a school from enrolling a body of students representative of

the school system. For instance, student commuting times may become too long if the only way to make a school fully representative is to transport students from one side of a city to the other.

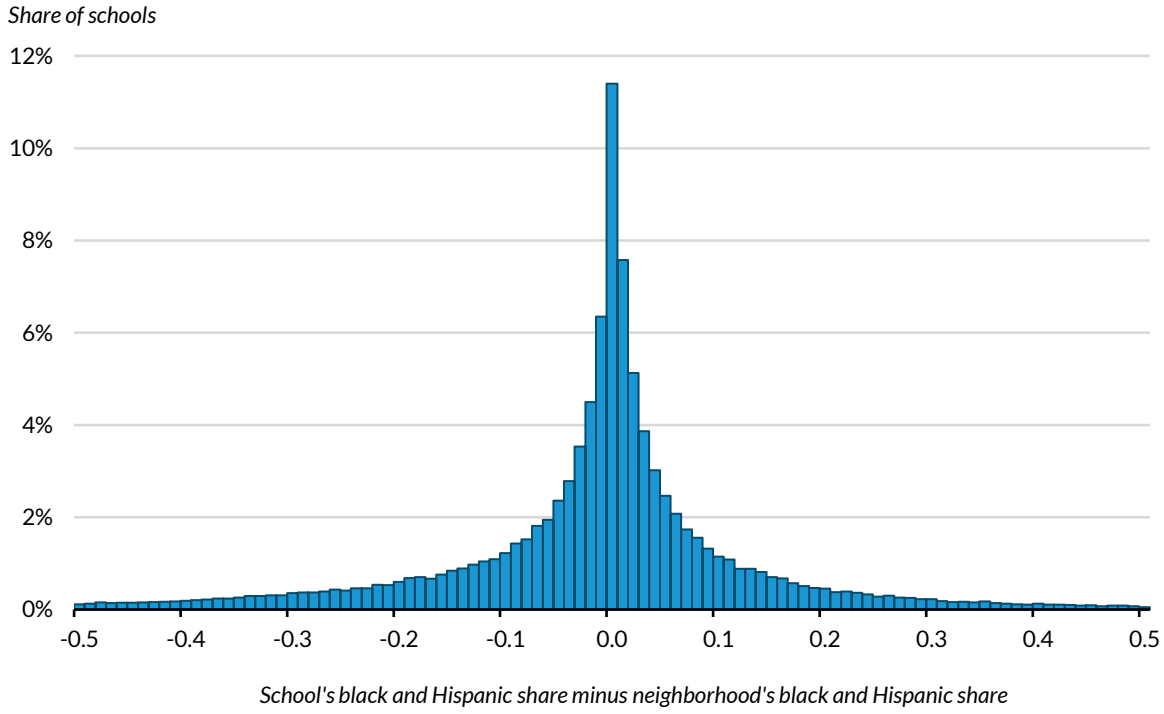
One way of accounting for these constraints is to hold residential segregation constant and measure the integration that could be achieved if schools closely resembled their neighborhoods, which could be achieved at a low cost. In this case, the resulting measure of school contribution to segregation will depend on both the racial composition of the school and of its surrounding neighborhood.

On one hand, a desegregation policy that makes schools representative of their neighborhoods would be arguably less burdensome (at least in terms of commuting cost) than a policy that attempts to integrate schools relative to the entire school system or city. On the other hand, neighborhoods themselves tend to be severely racially segregated, which drives a large share of observed school segregation patterns (figure 3). Therefore, making schools representative of their neighborhood would lead to substantially less integration than a systemwide desegregation plan could achieve. Still, identifying a subset of schools for which neighborhood representativeness would generate greater racial balance and marginal improvements to integration is useful for policymakers. It can highlight instances when school enrollments deviate from the local community in a way that has perverse effects on segregation and that could be rectified at a low cost. It also can highlight schools that are actually integrating the school system by deviating from their neighborhood's racial composition.

Many schools are not representative of their neighborhoods. Building on work by Whitehurst and coauthors (2017), we plot the gap between school and neighborhood composition for all schools in the data (figure 8).[15] The distribution is centered around zero, meaning that the median school in the country tends to be representative of the surrounding neighborhood. But the distribution also features long left and right tails, implying that a large share of schools tends to deviate from neighborhood composition. A third of schools deviate from their neighborhood's composition by more than 10 percentage points. There is also slight excess mass to the left of zero in this distribution, suggesting that, among schools that do not represent their neighborhood, it is more common to find schools whose black and Hispanic share is lower than the surrounding neighborhoods. As such, the average school in the data has a black and Hispanic share 1.4 percentage points lower than would be expected given the neighborhood's black and Hispanic share.

FIGURE 8

Distribution of Compositional Differences between Schools and Surrounding Neighborhoods



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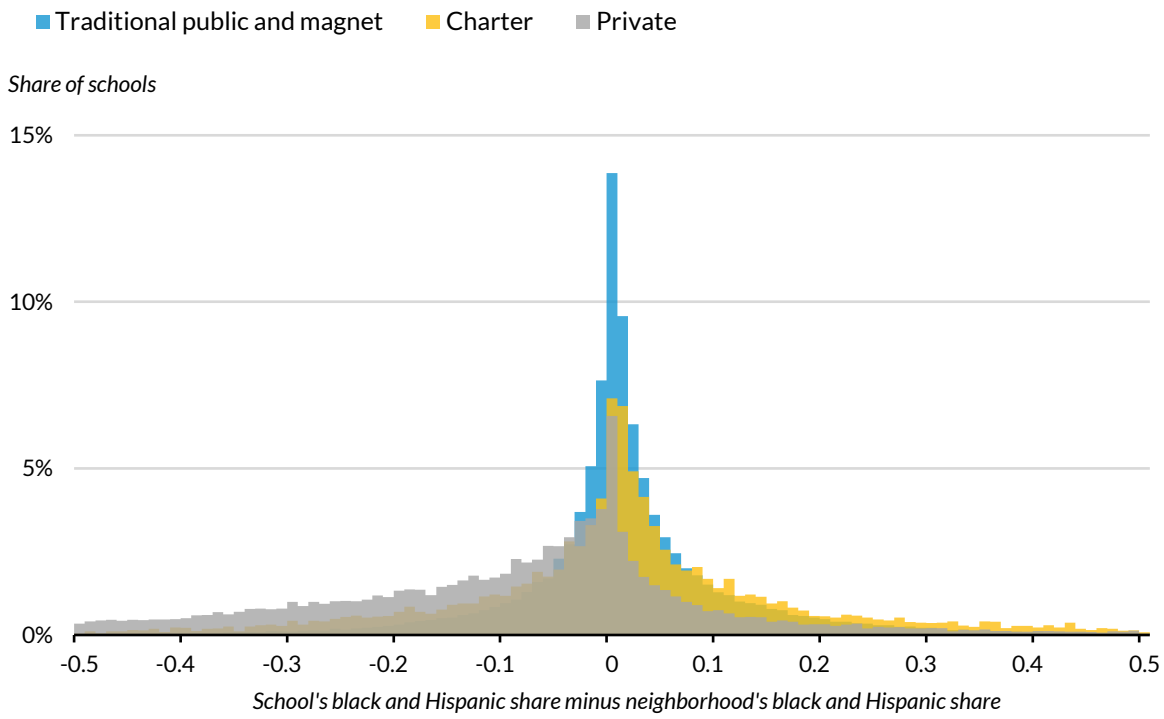
Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: Compositional difference is the share of a school's enrollment that is black or Hispanic minus the same share for the school's surrounding neighborhood, which is defined as the enrollment of students attending the same grade in schools within one mile (distance is adjusted upward in less densely populated areas; see the Data and Methods section for details).

Certain types of schools tend to deviate from neighborhood composition more than others. Figure 9 plots the same histogram by school type: traditional public or magnet schools, private schools, and charter schools. Traditional public and magnet schools have neighborhood differentials with higher density near zero and thinner tails. They are more likely to resemble the racial composition of their neighborhood than private or charter schools.

Private schools are more likely than traditional public, magnet, and charter schools to have lower black and Hispanic representation than their neighborhood. Charter schools, on the other hand, have a distribution centered around zero, similar to traditional public and magnet schools, suggesting that they resemble their neighborhood, on average. But the charter distribution has thick tails, meaning that charter schools are more likely to have neighborhood-school compositional divergence than traditional public and magnet schools.

FIGURE 9

Distribution of School-Neighborhood Compositional Differences by School Type



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Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: Compositional difference is the share of a school's enrollment that is black or Hispanic minus the same share for the school's surrounding neighborhood, which is defined as the enrollment of students attending the same grade in schools within one mile (distance is adjusted upward in less densely populated areas; see the Data and Methods section for details).

Which schools would be more integrated if they resembled their neighborhood? This depends on neighborhood composition relative to the system's. It also depends on school composition relative to the neighborhood. In some cases, making a school resemble its neighborhood will result in lower segregation, but in others, it will lead to higher segregation. Therefore, the SCI relative to neighborhoods is centered around 0, ranging from -1 to 1. Negative values mean that a school resembles the system more than its neighborhood does, so segregation would increase if they resembled their neighborhood. We call these "integrating schools" because they integrate the system relative to what would be expected given their neighborhood. Positive values of the neighborhood-based SCI mean that the school's neighborhood resembles the system more than the school's enrollment does, so segregation would decrease if the school resembled its neighborhood. These "segregating schools" contribute to system segregation relative to their neighborhood, hence their SCI is positive.

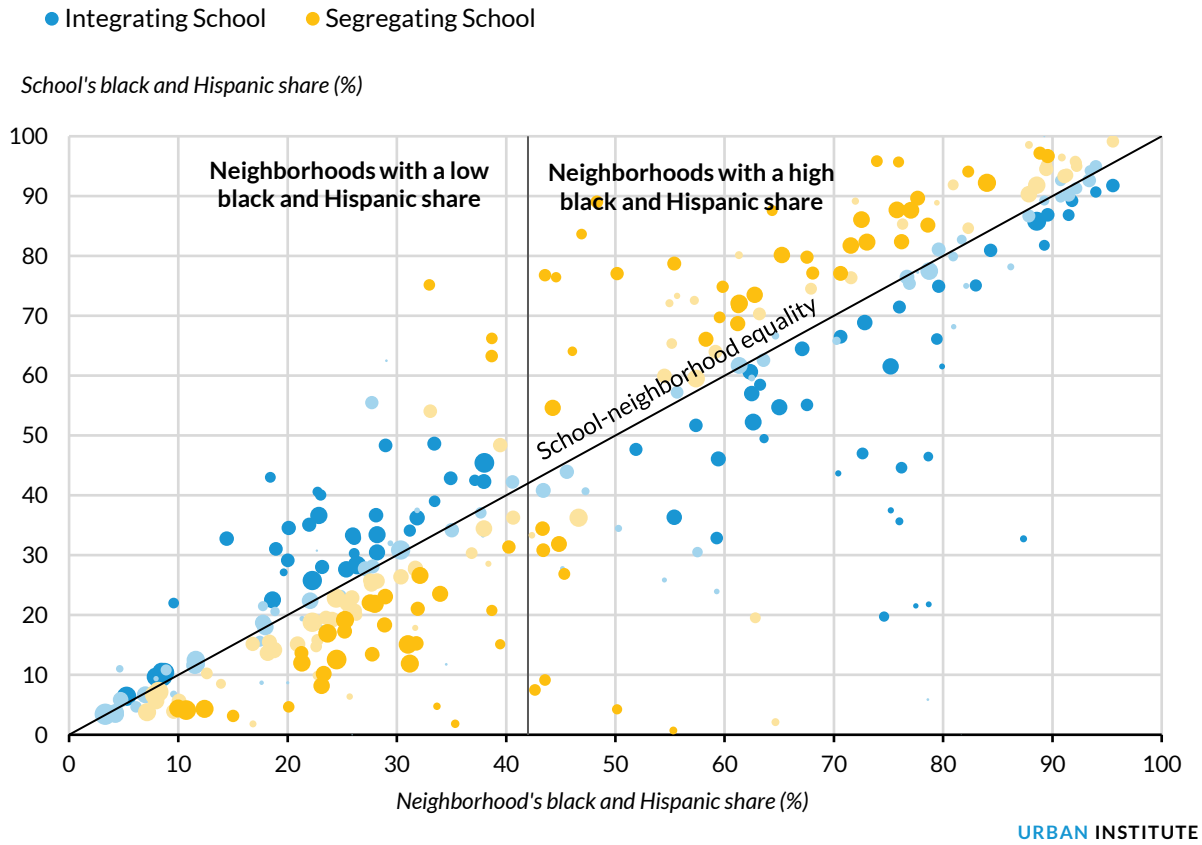
Figure 10 illustrates these relationships by plotting the neighborhood's black and Hispanic share (horizontal axis) against the school's black and Hispanic share (vertical axis) for K–5 schools in Alameda County. The diagonal line is the line of equality (45 degrees) between school and neighborhood racial composition. The vertical line denotes this county's overall composition, 43 percent black and Hispanic—perfect integration. Schools in neighborhoods that are more black and Hispanic than the system are to the right of this line. Among these schools, having a black or Hispanic share higher than the neighborhood share segregates the system. These schools, in yellow, could aid integration by looking more like their neighborhood. In contrast, schools in neighborhoods with a high share of black and Hispanic students that have a lower share than their neighborhood tend to integrate the system. If these schools, in blue, resembled their neighborhood, system segregation would be worse. Here, darker shades of color represent larger contributions.

To the left of the line are schools in neighborhoods with low black and Hispanic representation. Among these, a student body with a black and Hispanic share lower than the neighborhood share leads to more segregation. The system would be more integrated if these schools more closely resembled their neighborhood, so they are segregating schools. On the other hand, if schools in these neighborhoods have a black and Hispanic share higher than the neighborhood, integration improves. This holds only up to a threshold, however. If the school's black and Hispanic share becomes too high, this will result in higher segregation, regardless of neighborhood composition.

Thus, for each level of black and Hispanic representation in a given neighborhood, there is an associated range of school compositions that would result in integration. In any vertical slice of figure 10—such that we focus only on schools with similar neighborhood composition—there is a middle range of school compositions with blue shading corresponding to integration. The range is tighter in neighborhoods that are representative of the school system. Schools in representative neighborhoods that deviate significantly in any direction increase segregation. In contrast, schools in nonrepresentative neighborhoods have a wide range of school compositions that would result in integration. Neighborhoods with high black and Hispanic representation need to enroll fewer black and Hispanic students to make gains in integration but only up to a threshold that depends on neighborhood composition. Similarly, neighborhoods with low black and Hispanic representation would have to make schools more black and Hispanic than the surroundings to tilt the system toward integration but only up to a certain point, which is a function of neighborhood and systemwide composition.

FIGURE 10

Integrating and Segregating Schools Relative to Neighborhood Composition in Alameda County K–5 Schools



Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.

Using the SCI relative to neighborhoods, we can now explore whether certain types of schools are more likely to deviate from their neighborhood composition in a way that leads to more segregation. In other words, we test whether some school types are more likely to land in the range denoted in yellow in figure 10. We estimate differences in the probability of being a segregating school, restricting comparisons within school systems and grade levels and controlling for school size. We estimate these relationships separately for schools in neighborhoods whose black and Hispanic share is higher than the county and schools in neighborhoods with low black and Hispanic representation (figure 11).

Among schools in neighborhoods with high black and Hispanic representation, urban schools are more likely than small-town and rural schools to segregate the system. The same goes for suburban schools but to a lesser extent. In neighborhoods with low black and Hispanic representation, the relationship to urbanicity is similar, albeit weaker and only marginally statistically significant. Urban

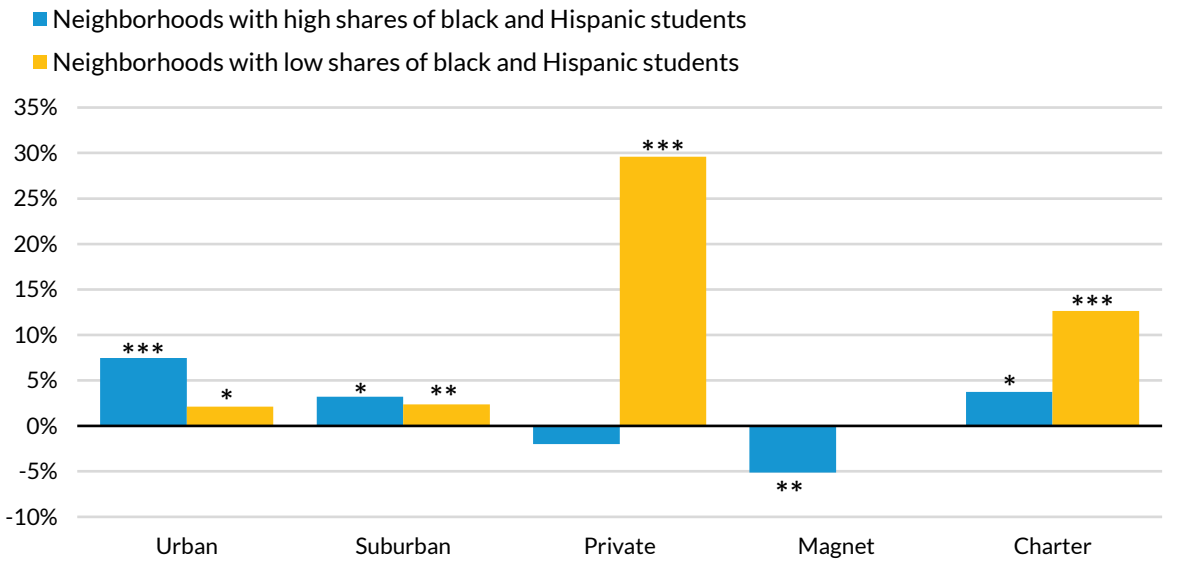
schools in areas with high black and Hispanic representation are more likely to enroll an even larger share of black and Hispanic students, thus exacerbating school segregation.

Comparing the neighborhood-based SCI between traditional public, magnet, private, and charter schools across different types of neighborhoods reveals interesting patterns. In neighborhoods with high black and Hispanic representation, traditional public, private, and charter schools are similarly likely to segregate county schools. Interestingly, magnet schools in these neighborhoods are less likely to segregate than traditional public schools. Magnet schools in mostly black and Hispanic neighborhoods tend to be more racially balanced than others, as many magnet schools were strategically located to draw white and Asian students into black and Hispanic neighborhoods, a legacy of the earlier desegregation era. Nonetheless, unlike other results presented here, these correlations are somewhat sensitive to our definition of a school system (appendix table A.6).

The pattern of results is strikingly different among schools in neighborhoods with low black and Hispanic representation. In these neighborhoods, traditional public schools have a 51 percent probability of being a segregating school, which implies that roughly half enroll too few black and Hispanic students given the students nearby. Private schools are, on average, 30 percentage points more likely than traditional public schools to segregate the school system relative to their neighborhood. In the average US school system, 81 percent of private schools in neighborhoods with low black and Hispanic representation have an even smaller share of black and Hispanic students than the surrounding neighborhoods, thus exacerbating segregation. Charter schools in these neighborhoods are also more likely to be segregators but are only 12 percentage points more likely than traditional public schools to segregate the system. Finally, magnet schools in these neighborhoods are statistically identical to traditional public schools in this regard. These results hold regardless of the level at which segregation in measured (see appendix table A.6).

FIGURE 11

Probability of Being a Segregating School Compared with Traditional Public Schools, by Neighborhood and School Type



Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: This figure reports coefficients from a regression of the Segregation Contribution Index on school characteristics and county-by-grade fixed effects. Observations are weighted by school enrollment. Standard errors are clustered at the county level. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Focusing school integration efforts on schools that segregate the school system relative to their neighborhood may offer an effective, low-cost way of achieving gains in systemwide racial integration. In areas with high black and Hispanic representation, there is little to no systematic difference between school types and segregation relative to neighborhood composition. Efforts to achieve more integration would need to focus equally on all sectors. In neighborhoods with low black and Hispanic representation, charter schools and private schools contribute to segregation more than their neighborhoods would suggest. Desegregation attempts in these localities would thus benefit from bringing attention to the private and charter school sector.

Conclusion

Our results provide a clear picture of school system segregation and the role of individual schools. By measuring a school's contribution to the segregation of school systems, we avoid the pitfalls of absolute measures that fail to account for important demographic differences across school systems. There are,

however, important caveats and cautionary points worth mentioning. First, our index does not demonstrate causal relationships. Identifying a school that contributes to segregation does not mean that if the school closed students would be randomly dispersed in a way that integrates the school system. Students might instead systematically sort into other schools in ways that exacerbate segregation. As such, our results should not be used to assign blame to individual schools or entire types of schools. Rather, our intent is to shed light on which schools are large contributors so policymakers can address segregation more effectively by implementing desegregation policies that focus in areas where the problem is most severe. These policies must be thought out carefully so they do not have unintended consequences that could result in even more segregation than before.

Any attempts to desegregate school systems must address traditional public schools, as they account for the lion's share of enrollment and segregation. At the same time, after accounting for their size and location, charter schools tend to contribute to segregation at a marginally higher rate than similarly sized public schools. Nevertheless, private schools tend to contribute more to segregation than similar charter or traditional public schools. This presents a dilemma, as private schools are subject to less scrutiny and oversight. Strategies that engage private school operators in the goals of integration could be especially promising.

In many cases, perfectly integrating schools relative to their school system's demographic composition is infeasible because of student transportation costs. We thus also present a Segregation Contribution Index that compares schools with their neighborhoods. This allows policymakers to identify schools that would generate integration gains were they to enroll a student body resembling local community demographics. In this analysis, we find that private and charter schools in neighborhoods with fewer minority students tend to have enrollments with even lower minority representation. Again, private schools fit this pattern to a greater extent than charter schools. If these schools were to engage more students from the local community, school integration would tick upward.

For all sectors of K–12 education, this work sheds light on the schools that contribute most to segregation and areas where integration gains may be attainable at lower costs. We hope these findings and underlying data can aid in targeted efforts that enhance school integration and bring greater equity to our schools.

Appendix

Defining the Segregation Contribution Index

Evenness segregation indexes are statistics that aggregate deviations of school racial composition from systemwide racial composition. A natural way of decomposing system segregation into school-level components is to posit that a school has a different composition than it has and then observing how much system segregation changes under such a counterfactual. By computing these counterfactuals for each school in the system, we can construct measures of school-level contributions to system segregation.

Formally, we define the dissimilarity index between white students and black and Hispanic students for a given school system as

$$Seg = \sum_{i=1}^{N} \frac{p_i|m_i - M|}{2PM(1-M)}$$

where $i = 1, \ldots, N$ indexes schools; p_i is the number of students enrolled in school i; m_i is the share of school i's students that are black or Hispanic; M is the share of students that are black or Hispanic in the system as a whole; and P is the total number of students in the system. Measured using the dissimilarity index, segregation can be interpreted as the share of black and Hispanic students that would need to change schools to create a perfectly integrated school system, relative to the share that would have to move to achieve the same goal but starting from a perfectly segregated school system.

Consider a counterfactual scenario in which school i has a black and Hispanic share equal to $m_i^o \neq m_i$, with everything else in the system constant. Under this scenario, segregation would equal

$$Seg_i^o = \sum_{-i} \frac{p_{-i}\,|m_{-i} - M|}{2PM(1-M)} + \frac{p_i|m_i^o - M|}{2PM(1-M)}$$

The first term of the equation corresponds to segregation caused by every school except for school i (schools that are not i are indexed by $-i$). The second term is school i's component of system segregation, which is 0 when the school is perfectly integrated relative to the system—that is, if $m_i^o = M$. The percentage change in segregation that results from changing the racial composition of school i is then equal to

$$\phi_i = \frac{Seg - Seg_i^o}{Seg} = \frac{p_i(|m_i - M| - |m_i^o - M|)}{\sum_i p_i |m_i - M|}$$

ϕ_i is the proportional contribution of school i to system segregation, which we call the Segregation Contribution Index (SCI). When $m_i^o = M$, contributions are bounded between 0 and 1. Each school contributes to integration at least a little unless it perfectly reflects systemwide racial composition, in which case its contribution is 0. Moreover, when the counterfactual is systemwide composition, the sum of these components must necessarily equal 1. Adding the segregation contribution of every school results in the system's actual segregation level.

But when $m_i^o \neq M$, the SCI ϕ_i need not be positive. In other words, using a school composition counterfactual such as neighborhood composition will result in some schools having positive contributions (they increase segregation) and others having negative contributions (they decrease segregation). Additionally, when the counterfactual is not systemwide composition, the sum of the ϕ_i need not equal 1.

Empirical Framework

For each school in our sample (see the Data and Methods section for details on sample construction), we compute the SCI using three definitions of a school system: school districts, counties, and metropolitan areas. The definition of a school system has a large impact on overall levels of segregation (figure 2) and the SCI. We write the SCI for a given school i in a given school system j as ϕ_{ij}.

No matter how they are defined, school systems differ greatly in segregation levels, population, number of schools, and overall racial composition. We must control for such differences when we study which school characteristics are correlated with schools' SCIs. Schools' SCIs may be correlated with school characteristics for spurious reasons. For instance, charter schools have a larger presence in urban school districts than in rural ones. Because the SCI is population weighted, SCIs tend to be larger in rural districts simply because these are less populous and each individual school accounts for a large share of the student population. Thus, in a national-level comparison, a charter school indicator will be spuriously negatively correlated with the SCI because of this mechanism.

We control for differences in SCIs between school systems using the following econometric specification:

$$\phi_{ij} = \alpha_j + \beta X_{ij} + \epsilon_{ij}$$

where α_j is a school system fixed effect; X_{ij} is school-level characteristics including total enrollment, urbanicity, and charter, magnet, or private school status; and ϵ_{ij} is a school-level error term representing unobserved determinants of schools' SCIs. We use this econometric specification in the regression models presented in figures 6 and 11 in the main text and tables A.5 and A.6 in the appendix. Because our dataset measures SCIs by school grade level, the fixed effect used in the estimation is a system-by-grade-level fixed effect.

TABLE A.1

System Summary Statistics, Geographic School Districts

	Grades K–5		Grades 6–8		Grades 9–12	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Demographics						
Schools	19.31	45.56	18.15	40.90	14.30	31.19
Students	7,582	19,195	5,507	12,766	10,146	18,943
B/H share	0.41	0.25	0.41	0.24	0.43	0.23
Segregation						
Dissimilarity	0.32	0.15	0.34	0.16	0.33	0.16
Isolation	0.48	0.25	0.49	0.25	0.50	0.24
Variance ratio	0.14	0.13	0.16	0.15	0.16	0.15
Observations	2,409		1,605		806	

Sources: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: B/H = black and Hispanic; SD = standard deviation.

TABLE A.2

System Summary Statistics, Counties

	Grades K–5		Grades 6–8		Grades 9–12	
	Mean	SD	Mean	SD	Mean	SD
Demographics						
Schools	43.56	91.74	34.34	73.14	21.14	33.99
Students	16,236	38,443	9,943	22,440	14,446	28,916
B/H share	0.35	0.20	0.33	0.19	0.32	0.18
Segregation						
Dissimilarity	0.39	0.15	0.40	0.16	0.38	0.15
Isolation	0.46	0.22	0.45	0.21	0.43	0.21
Variance ratio	0.19	0.15	0.20	0.16	0.18	0.14
Observations	1,359		1,188		921	

Sources: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: B/H = black and Hispanic; SD = standard deviation.

TABLE A.3

System Summary Statistics, Metropolitan Areas

	Grades K–5		Grades 6–8		Grades 9–12	
	Mean	SD	Mean	SD	Mean	SD
Demographics						
Schools	215.48	941.53	162.18	819.66	84.49	468.38
Students	75,038	242,511	41,927	132,782	49,519	159,490
B/H share	0.35	0.18	0.33	0.18	0.33	0.18
Segregation						
Dissimilarity	0.47	0.12	0.46	0.12	0.42	0.13
Isolation	0.52	0.19	0.49	0.18	0.47	0.19
Variance ratio	0.27	0.13	0.25	0.13	0.22	0.13
Observations	328		321		317	

Sources: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.
Note: B/H = black and Hispanic; SD = standard deviation.

TABLE A.4

School Summary Statistics

	All		Traditional Public		Private		Magnet		Charter	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
School enrollment										
Population	404.58	412.55	501.50	425.72	214.25	254.70	684.87	630.90	278.26	341.48
B/H share	0.47	0.34	0.51	0.32	0.30	0.31	0.64	0.27	0.61	0.34
CCD neighborhood										
Population	1,596	1,779	1,611.09	1,663.45	1,529.86	2,016.64	1,725.74	1,427.65	1,649.48	1,820.10
B/H share	0.48	0.30	0.49	0.29	0.41	0.28	0.61	0.26	0.60	0.30
Neighboring schools	3.28	4.25	3.19	4.15	3.27	4.21	2.98	2.79	3.98	5.21
Neighborhood radius (miles)	1.66	1.51	1.82	1.77	1.46	1.04	1.43	0.86	1.36	1.05
2010 Census neighborhood										
Total school-age population (tract)	377	269	411.57	290.00	324.37	220.58	318.10	216.84	345.43	250.53
B/H share	0.39	0.26	0.38	0.26	0.36	0.25	0.52	0.27	0.50	0.27
Total school-age population (block Voronoi zone)	447	390	485	397.32	373.69	343.64	523.81	488.28	401.52	393.18
B/H share	0.39	0.26	0.38	0.26	0.35	0.25	0.52	0.26	0.50	0.27
Contribution to segregation										
Contribution (%)	0.06	0.09	0.06	0.09	0.05	0.09	0.04	0.07	0.03	0.07
Observations	87,382		50,572		24,899		3,301		8,610	

Sources: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.

Note: B/H = black and Hispanic; CCD = Common Core of Data; SD = standard deviation.

TABLE A.5

Correlates of School Contribution to Segregation Relative to School Systems

	Geographic school districts			Counties			Metropolitan areas		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Urban	0.008**	0.006*	0.003	0.016***	0.011***	0.007***	0.011***	0.008***	0.006***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Suburban	0.009***	0.005**	0.003	0.009***	0.003**	0.002*	0.006***	0.003***	0.002**
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Private	0.004***	0.029***	0.035***	-0.009***	0.009***	0.013***	-0.006***	0.001	0.003***
	(0.001)	(0.004)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Magnet	0.002	0.000	-0.002	-0.001	-0.001	-0.003**	0.000	0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Charter	-0.006	0.013***	0.013***	-0.007***	0.007**	0.006**	-0.006***	-0.001	-0.002***
	(0.003)	(0.004)	(0.004)	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
ln(school enrollment)		0.038***	0.039***		0.025***	0.026***		0.009***	0.010***
		(0.004)	(0.004)		(0.002)	(0.002)		(0.001)	(0.001)
Neighborhood B/H share			0.036***			0.029***			0.011***
			(0.005)			(0.003)			(0.002)
System by grade-level fixed effects	X	X	X	X	X	X	X	X	X
R^2	0.537	0.582	0.585	0.579	0.620	0.628	0.562	0.587	0.593
N	87,340	87,340	87,142	119,479	119,479	118,763	111,137	111,137	110,796

Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.

Note: B/H = black and Hispanic.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

TABLE A.6

Correlates of School Contributions Relative to Neighborhoods

	Geographic School Districts		Counties		Metropolitan Areas	
	(1)	(2)	(3)	(4)	(5)	(6)
	Neighborhoods with a high B/H share	Neighborhoods with a low B/H share	Neighborhoods with a high B/H share	Neighborhoods with a low B/H share	Neighborhoods with a high B/H share	Neighborhoods with a low B/H share
Urban	0.058***	0.030	0.075***	0.021*	0.049***	0.031***
	(0.018)	(0.019)	(0.015)	(0.011)	(0.015)	(0.010)
Suburban	0.042***	0.015	0.032*	0.024**	0.012	0.021***
	(0.014)	(0.014)	(0.017)	(0.009)	(0.014)	(0.007)
Private	0.039***	0.343***	-0.020	0.296***	-0.055***	0.286***
	(0.009)	(0.014)	(0.015)	(0.017)	(0.015)	(0.016)
Magnet	-0.046**	0.006	-0.051**	0.001	-0.057***	-0.028
	(0.018)	(0.023)	(0.020)	(0.022)	(0.017)	(0.031)
Charter	0.048**	0.123***	0.037*	0.126***	0.016	0.105***
	(0.024)	(0.023)	(0.021)	(0.021)	(0.022)	(0.022)
ln(school enrollment)	0.027***	-0.002	0.038***	-0.009	0.035***	-0.008*
	(0.005)	(0.009)	(0.005)	(0.006)	(0.007)	(0.004)
System by grade-level fixed effects	X	X	X	X	X	X
R^2	0.160	0.223	0.093	0.127	0.043	0.079
N	44,634	42,201	57,401	61,863	50,202	60,931

Source: Authors' calculations using the National Center for Education Statistics' Common Core of Data School Universe Survey and the Private School Universe Survey for the 2015–16 school year.

Note: B/H = black and Hispanic.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Notes

[1] Reardon, Yun, and Eitle (2000) estimate that "on average, 80 percent of multiracial public-school segregation in the 217 metropolitan areas [they studied] is due to segregation between whites and members of other groups; 20 percent is due to segregation among the other groups. This implies that we can make a greater overall impact on multiracial segregation by addressing the segregation between white and minority students." But our analysis will not be revealing in geographies with significant shares of students from other groups (e.g., Native Hawaiian and Alaska Natives). Also, our analysis is limited by the data's inability to disaggregate within broad racial and ethnic categories.

[2] Milliken v. Bradley, 433 U.S. 267 (1975).

[3] All years refer to the fall of the academic year (e.g., 2015 is the 2015–16 school year).

[4] We drop systems with a dissimilarity index lower than 0.1, about 1 percent of the counties that clear our other restrictions. These sample restrictions do not appear to drive our main results. Tables replicating our analysis without any sample restrictions are available upon request.

[5] We take schools' latitude and longitude locations and test whether it lands inside the geographic polygon defining census tracts and blocks as reported by the US Census Bureau's TIGER/Line shapefiles.

[6] This is known as the Voronoi diagram, a partitioning of a plane into regions based on distance to points (school locations). We compute the distance between the centroid of all blocks and all school locations in a given school system. We then pick the school closest to each block as a member of the school's neighborhood.

[7] We cannot document trends in both public and private school segregation because the Private School Universe Survey data are reported only every two years.

[8] The precise definition is the share of the minority population that would need to move schools to achieve perfect integration, relative to the share that would have to move starting from a perfectly segregated school system.

[9] These qualitative patterns hold when segregation is measured using the variance ratio index instead of dissimilarity. The variance ratio index is an isolation index adjusted to account for school system demographics.

[10] Deviations between residential and school segregation in this plot are also partly because of measurement error in both variables.

[11] The R^2 in the regression model is 0.57, implying that 57 percent of the observed variation in school segregation between metropolitan areas can be explained using the ordinary least squares predictor using residential segregation. In a previous feature, we reported this share was about 76 percent (see Tomas Monarrez, "Segregated Neighborhoods, Segregated Schools?" Urban Institute, last updated November 28, 2018, https://www.urban.org/features/segregated-neighborhoods-segregated-schools). The discrepancy is because of three factors. First, we use the variance ratio index of segregation instead of the dissimilarity index in the feature (using variance ratio in the current dataset gives an R^2 of 72.3 percent). Second, we use updated versions of the American Community Survey tract estimates (2012–16), instead of the 2011–15 estimates used in the feature. Third, our definition of metropolitan areas changed slightly, as we now use geographic information system procedures to match both schools and tracts to 2010 metropolitan areas. The previous feature used older crosswalks reported by the National Bureau of Economic Research.

[12] This simple counterfactual is motivated by our desire to make these calculations easy to understand. In practice, changing the racial composition of one school will generally change the composition of other schools. We abstract from this complexity to make our analysis straightforward. Although we do not account for such general equilibrium effects, we believe our estimates are relevant for targeting schools that contribute most to segregation.

[13] The OLS regression coefficients in figure 6 regarding private schools are robust to different parametrizations of the control variables. But our results regarding charter schools are sensitive to the way in which control for school size. Our main specification controls for the natural log of school enrollment. The coefficient on charter school is not significant when controlling linearly for school size, but it regains significant when we instead control for five indicators of quantiles of school size. Tables showing estimates with different parametrizations of the controls are available upon request.

[14] The sign of this charter school relationship flips when segregation is measured at the metropolitan area level (column 9 in appendix table A.5), indicating that they contribute less at this level of aggregation. But the magnitude of this negative relationship is close to zero. This suggests that there are factors that differ between school districts that influence our estimates for metropolitan areas.

[15] A key distinction between Whitehurst et al. (2017) and our work is that we add private schools to the analysis.

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About the Authors

Tomas Monarrez is a research associate in the Center on Education Data and Policy at the Urban Institute.

Brian Kisida is an assistant professor in the Truman School of Public Affairs at the University of Missouri.

Matthew Chingos is vice president for education data and policy at the Urban Institute.

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