Racial Segregation and School Poverty in the United States, 1999–2016

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Abstract

Research over the past decade suggests that racial segregation appears to have the largest implications for students' achievement when linked to racial differences in exposure to school poverty. This paper provides a summary and update to prior literature describing patterns and trends of racial differences in school poverty rates from the 1998–1999 through 2015–2016 school years. We describe black-white and Hispanic-white differences in school poverty rates within U.S. school districts, metropolitan areas, states, and the nation over this nearly 20-year period. We find that while exposure to poverty in schools has risen dramatically, racial differences in exposure to school poverty have been relatively stable during this time. These average trends, however, belie meaningful variability among places. Places serving large proportions of minority students have larger but declining average racial differences in exposure to school poverty. Large school districts also have larger average racial differences in exposure and have been experiencing increases in this measure over time.

Keywords Racial segregation · School segregation · Exposure to poverty

Introduction

There is a long history of research describing the extent of segregation in schools and in neighborhoods in the U.S., as well as its link to observed educational inequalities both descriptively and causally. Trends in school racial segregation in the decades following Brown v. Board of Education (1954) are especially well documented. For example,

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black-white segregation rates declined substantially between 1968 and the mid-1970s and decreased modestly throughout most of the 1980s. Trends in racial segregation since the 1980s are less clear. One's conclusions about how segregation has changed depends largely on the measure of segregation used. Racial sorting of students among schools (unevenness) has been relatively stable over the last 25 years, while the racial/ethnic composition of the average student's school (exposure) has changed substantially (Reardon and Owens 2014).

Research is beginning to focus more on the intersection of race and income (aka. "double segregation", Orfield et al. 2016), acknowledging the systematic link between the two (Reardon and Owens 2014; Quillian 2012). There are stark racial differences in exposure to school poverty. Nationally, the average black and Latino students attend schools with higher percentages of poor classmates than white peers (Orfield and Lee 2005). In the 2014–2015 school year, approximately 45% of black and Latino students were in high poverty schools—schools where more than 75% of students were eligible for the Federal free and reduced-price lunch (FRPL) program—relative to only 8% of white students (McFarland et al. 2017). This emerging body of research further shows that the aspect of segregation most predictive of black-white and Hispanic-white achievement

gaps is the *racial difference in exposure to school poverty* (Reardon 2016).

A systematic analysis of how racial differences in exposure to school poverty have changed over the past 20 years across the U.S. is important and timely. During this period, the student body served by U.S. public schools has become increasingly racially and ethnically diverse. In fall 1995, the student body was 65% white, 17% black, 14% Hispanic, 4% Asian/Pacific Islander, and 1% Native American. As of fall 2015, the percentage of white students declined to 49%, while the percentage of Hispanic students increased dramatically to 26% (Snyder et al. 2019, Table 203.50). During this period, there was also a marked rise in school poverty (Orfield et al. 2016). From fall 2000 to fall 2015, the percentage of students eligible for FRPL increased from 38 to 52% (Snyder et al. 2019, Table 204.10), and the percentage of students in high poverty schools (where 75% or more students were eligible for FRPL) doubled to 24% (McFarland et al. 2017; Aud et al. 2013).

Understanding how these changing demographics have impacted modern segregation—as measured by racial differences in exposure to school poverty—is imperative to inform ongoing policy debates. Racial segregation is attracting significant media and political attention. It was a central topic at the 2019 democratic presidential candidate debates[1] and in new proposals to combat alarming rates of segregation in New York City public schools.[2]

The goal of this paper is to establish a comprehensive picture of how students' exposure to school poverty and the racial differences in that exposure have changed over the past 18 years. We look at these measures both nationally and within school districts, metropolitan statistical areas (MSAs), and states to provide information about the extent and variation of segregation within a series of policy-relevant units. We find that while exposure to poverty has increased for all students, racial differences in exposure to school poverty have remained large and relatively stable over our sample period. There is evidence, however, that differences in exposure to poverty, and their trends, meaningfully vary among places—meriting further exploration.

Background

Racial Differences in Exposure to School Poverty

There is clear evidence that minority students face higher average rates of school poverty than white peers in the

U.S. Orfield and Lee (2005) use the Common Core of Data (CCD) from 2002–2003 school year to describe exposure to school poverty by race in the U.S. They find that, nationally, "black and Latino students are more than three times as likely as whites to be in high poverty schools and 12 times as likely to be in schools where almost everyone is poor" (Orfield and Lee 2005, p. 18). The student body in high and extreme poverty schools is more than 60% minority students. This holds true in most regions of the U.S. The exception is in the Border states (Delaware, Kentucky, Missouri, Oklahoma, and West Virginia) where white students represent the majority (approximately 60% or more) of students in high and extreme poverty schools. This anomaly is likely the result of the concentration of predominantly white populations in economically depressed communities such as Appalachia.

Orfield et al. (2016) provide an update to these results, highlighting changes over three time points (1993, 2003, and 2013) in "double segregation" by race and poverty. For students of all racial backgrounds, there was a large increase in the percentage of poor students in their schools (exposure to school poverty) in each decade. For black and Latino students, the average composition of their schools changed from 37 and 46% respectively, to 68% poor for both in the span of 20 years. A national level, minority students are also enrolled in higher poverty schools than their white peers. To the extent that school poverty is linked to low school quality, black and Hispanic students' schools are, on average, inferior to those of white students.

Reardon (2016) shows that racial segregation is associated with achievement gaps entirely through racial differences in exposure to school poverty. The author compares sixteen measures of school and residential segregation, finding that after controlling for racial differences in the percent of poor students in schools, associations between other segregation measures and achievement gaps disappear. While the analysis is descriptive, Reardon controls for a series of covariates (e.g., racial disparities in socioeconomic status and school system fragmentation) to demonstrate the robustness of this association.

Reardon et al. (2019b) build on this work, finding that the minority-white free lunch rate difference is strongly associated with racial achievement gaps in MSAs and school districts. In places with large racial disparities in exposure to school poverty, achievement gaps tend to be larger. In a new working paper, Reardon et al. (2019c), find that, not only is the racial difference in school poverty rates associated with the size of the achievement gaps, but it also predicts the rate at which the achievement gap grows while students are in school. Indeed, even within a given school district, achievement gaps grow faster in the grades where racial differences in school poverty are greatest. This suggests that segregation

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[1] For examples, see Harris (2019) and Yglesias (2019).

[2] For example, see Shapiro (2019).

of this form may be causally linked to large and growing achievement gaps.

While strong associations are found between racial differences in exposure to school poverty and racial achievement gaps, the above-mentioned research cannot definitively identify the mechanisms through which exposure to school poverty affects achievement. However, there are many such pathways. For example, high poverty schools have lower quality teachers by multiple measures including years of experience, level of education, and board certification (Clotfelter et al. 2007), as well as greater teacher turnover and shortages (Ingersoll 2001, 2004), which have been linked to lower average student achievement (Rice 2003; Darling-Hammond 2000; Ingersoll 2001; Sass et al. 2012).

High poverty schools may also have downward-leveling norms and less rigorous curriculum (Harris 2010; Willms 2010), as well as poorer facilities than low poverty schools. Goodman et al. (2018) find that poor and minority students are more often in schools without adequate heating, ventilation, and air conditioning systems, and that exposure to heat disrupts learning time and lowers student achievement. Moreover, schoolmates in high poverty schools will be, on average, less resourced and lower achieving than peers in low poverty schools (Reardon 2016).

Taken together, this literature suggests that black and Hispanic students are exposed to higher rates of school poverty than their white counterparts and that these racial differences in exposure to school poverty are consequential for educational inequality.

Why and When Might Racial Differences in Exposure to School Poverty Change?

In this paper, we focus on trends in racial differences in exposure to school poverty. Here, we develop some intuition about how changes over time in the racial difference in exposure to school poverty, which we denote Δ, might be related to changes in racial segregation, economic segregation, and the correlation between race and poverty status.

For simplicity, let us assume we have a two-group population, white and black. It is straightforward in this case to show the following. First, if there is complete racial segregation (the racial composition of the average black (white) student's school is all black (white)), then Δ equals the black-white difference in student poverty rates. Second, if there is no racial segregation (the racial composition of any school is identical to the racial composition of the overall unit—district, MSA, or state), then $\Delta = 0$. Third, if there is complete economic segregation (the student body of the average poor (nonpoor) student's school is all poor (nonpoor)), then Δ equals the black-white difference in student poverty rates. Finally, if there is no economic segregation (the economic composition of any school is identical to the economic composition of the overall unit—district, MSA, or state), then $\Delta = 0$ because every student, regardless of race, would be in a school with the same economic composition.

It follows from these results that if racial or economic segregation increases, all else equal, we might expect Δ to increase. Likewise, all else equal, if the racial differences in poverty rates increase, we might expect Δ to increase.[3] A discussion of what we know about recent trends in racial segregation, trends in economic segregation, and trends in the black-white difference in poverty rates will therefore be informative. It will provide evidence as to whether we expect to see changes over time in racial differences in exposure to poverty and whether there may be heterogeneity in those trends across places.

Trends in Segregation

Trends in racial school segregation since the 1990s vary depending on measure. There are two common types of segregation measures: exposure/isolation and evenness/unevenness. Exposure and isolation indices measure the degree to which students are exposed to another group or isolated among their own group. Evenness/unevenness measures the extent to which students of different racial groups are distributed across schools or other units of analysis.

Racial Segregation

Exposure measures indicate that racial segregation has increased since 1990 (e.g., Orfield and Lee 2007). Reardon and Owens (2014) find that black-white measures of exposure have declined substantially over the last 25 years—black students are in schools with fewer white students and more minority students, on average, than in prior years. Similarly, Logan et al. (2017) find that, nationally, black students' exposure to white students declined from 38.2 in 1990 to 24.2 in 2010 (equivalently, their exposure to minority students increased during this time). Isolation, the percentage of black students in the average black student's school, also declined. This suggests that much or all of the increase in black students' exposure to minorities is due to changing racial composition, in particular the increasing share of Hispanic public school students (Reardon and Owens 2014).

With regard to Hispanic students' exposure to white students, Reardon and Owens (2014) find that it has decreased steadily since the late 1960s. Looking at within-district segregation, Fuller et al. (2019) find that, on average, Latino children's exposure to white peers did not change within school districts between 1998 and 2010. However, like

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[3] These deductions assume monotonicity in the relationship between Δ and each factor (racial segregation, economic segregation, and FRPL rates).

Reardon and Owens, they observe declining exposure to white peers in districts with at least 10% Latino enrollment.

In contrast to the results for exposure, the racial distribution of students among schools (unevenness) has remained relatively stable since the 1990s (Reardon and Owens 2014). Stroub and Richards (2013) find modest increases in unevenness through the late 1990s or early 2000s, followed by declines in black-white and Hispanic-white segregation through 2009. Similarly, Logan et al. (2017) show that the black-white dissimilarity index has remained relatively stable since 1990 (growing slightly from 46.7 in 1990 to 49.0 in 2000, but dropping again to 46.7 in 2010). In contrast, Fuller et al. (2019) find that the Latino-white dissimilarity index within districts decreased from 65 to 56 among all districts between 1998 and 2010, suggesting more even racial distribution of students among schools within districts. However, the measure was stable in districts serving 10% or more Latino students.

Economic Segregation

From 1991 to 2012, Owens et al. (2016) find the between-school economic segregation (using free lunch eligibility) was relatively stable in small school districts (less than 10 schools) but increased by more than forty percent in the 100 largest districts and in districts with more than 20 schools. They further find that between-school economic segregation rose within MSAs between 1991 and 2000, but did not change appreciably between 2001 and 2012.

FRPL Eligibility Rates by Race

Data from the U.S. Census Bureau's Current Population Survey suggests that FRPL rates increased in the early 1990s for all student groups (white, black, Hispanic), but declined from the late 1990s through about 2008–2009. Post-recession, there are steady increases in FRPL rates for all groups. White-black gaps in FRPL rates appear to have declined somewhat over this entire period; they were 38 percentage points in 1990, 33 percentage points in 2000, and 33 percentage points in 2015. In contrast, white-Hispanic differences in FRPL rates have remained more stable: 40 percentage points in 1990, 43 percentage points in 2000, and 42 percentage points in 2015.[4]

Summary

Together, these data suggest that while there have not been large changes in racial and economic segregation, on average, these trends differ meaningfully among places—in particular, in large MSAs and districts, as well as districts serving large populations of minority students. Based on this, we would not expect large average changes in racial differences in exposure to poverty during the last few decades, but there may be substantial variation among places. That said, both the average trend and variation in trends in racial differences in exposure to poverty depend on each of these factors, their variances, and their covariances, and so are not directly predictable from existing research.

Data

We use school-by-year counts of students enrolled in U.S. public schools from the CCD[5] in the 1998–1999 through 2015–2016 school years, disaggregated by race (black, Hispanic, white) and by FRPL status.[6] We impute missing enrollment data by race and FRPL status using Stata's—mi impute chained—routine (StataCorp 2013).[7]

The imputed CCD enrollment data by race and the percent of students eligible for FRPL in each school are used to calculate the average student's exposure to school poverty by race (described below). Notably, FRPL eligibility is not a perfect measure of school poverty. Students identified as poor in one school may be less poor than students in another, and this measure will not capture that variation in the degree of poverty. However, FRPL eligibility is commonly used as an indicator of student poverty. Recent research by Domina et al. (2018) shows that while FRPL eligibility is a very coarse measure of actual income (as measured by IRS records), it is nonetheless robustly predictive of test scores.

Assigning Schools to Districts and MSAs

In the CCD, schools are assigned to local education agencies (LEAs) using unique NCES identifiers. For schools whose LEA is a traditional public school district (TPSD), we use the indicator provided in the CCD. Some charter schools, however, are not operated by a TPSD. We reassign these schools to a TPSD based on their geographic location. TPSDs are linked uniquely to MSAs, using the 2013 U.S. Census definitions.[8]

In all years, we identify charter schools operated by charter networks and geolocate them using their latitude

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[4] Authors calculations using data from the U.S. Census Bureau (https://www.census.gov/data.html).

[5] The CCD data is available for download here: https://www.census.gov/data.html).

[6] We begin our panel in the 1998–1999 school year because CCD began reporting reduced lunch in addition to free lunch in this year; in prior years, only data on free lunch was provided.

[7] The imputation model is described in detail in Fahle et al. (2019).

[8] The 2013 MSA definitons are available for download here: https://www.census.gov/programs-surveys/metro-micro/geographies/geographic-reference-files.2013.html

and longitude and the U.S. Census TigerLine shape files for U.S. public school districts.[9, 10] We remove a small number of schools for which we do not have sufficient information for geolocation. We also remove "virtual schools"—online schools that do not have physical location—using information from the Stanford Education Data Archive (SEDA) crosswalk (Reardon et al. 2019a; Fahle et al. 2019).

Sample Restrictions

We restrict our district, MSA, and state samples to include units that are observed in every year of our panel,[11] have at least two schools in every year, have at least 1 black, 1 Hispanic, and 1 white student in every year, and have an average of at least 20 black, 20 Hispanic, and 20 white students across the years in our sample.

Measures of differential exposure to school poverty rely on the accuracy of FRPL rates in each school. In some districts, the FRPL rate data appears erratic over the years in our sample, changing dramatically and non-monotonically from one year to another. Some of these erratic rates are likely data errors. Others likely reflect the introduction of the Community Eligibility Provision (CEP) in the last four years of our panel. CEP enables schools whose student body is more than 40% economically disadvantaged to provide free meals to all of its students. This provision was authorized by the U.S. Congress through the Healthy Hunger-Free Kids Act of 2010, piloted over the following three school years and implemented nationwide in the 2014–2015 school year.[12] While CEP has numerous benefits for students, families, and schools, one of the side effects for researchers is that the tracking and identification of students who meet the eligibility requirements for free lunch was affected (Koedel and Parsons 2019).

We identify units with erratic FRPL reporting by estimating unit-specific regressions of the percent FPRL regressed on a quadratic year trend. We remove individual units (districts, MSAs, and states) in which the RMSE is greater than 0.075. In total, 226 districts and 5 MSAs[13] were removed from their respective samples by this criterion. Additionally, the District of Columbia[14] was removed from the state sample (in addition to the district sample). For consistency between the state and national samples, we also remove the District of Columbia from the national data prior to estimation.[15]

Sample Coverage

The district sample includes 80% of all of the students in the national sample, on average across years. By subgroup, it includes 89% of all black students, 84% of all Hispanic students, 76% of all white students, and 80% of all poor students in the national sample. The MSA sample includes an average of 82% of students in the national sample across years, as well as 87% of black students, 89% of Hispanic students, 78% of white students, and 81% of poor students. The state sample includes all students in the national sample.

Methods

Segregation Measures

Our primary segregation measures are the exposure to school poverty by race (white, black, Hispanic) and the racial difference in exposure to school poverty (black-white and Hispanic-white). We calculate these measures separately in each year for school districts, MSAs, and states. Exposure to school poverty is calculated as the percentage of students eligible for FRPL in the average white, black or Hispanic student's school in each unit u (district, MSA, or state) and year y. The equation is shown below:

$$Exposure_{ugy} = \sum_{s \in u} \left(\frac{n_{sgy}}{\sum_{s \in u} n_{sgy}} \right) perfrpl_{sy},$$

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[9] In most years, the CCD reports the latitude and longitude for each school. In years when that data is unavailable, we use street addresses to find schools' latitude and longitude using—opencagegeo—in Stata (Zeigermann 2016).

[10] The TigerLine shapefiles are available for download here: https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.htmlIn states that have separate elementary and secondary districts, we use the secondary school boundaries for schools that start in 9th grade or later or start in 6th grade or later and end in 10th grade or later. All other schools are treated as if they are part of an elementary district.

[11] This restriction is only relevant for school districts. We use imputation to fill-in missing data; however, for school districts that opened or closed during our panel, we will not have complete data.

[12] For more information visit: https://www.fns.usda.gov/nslp/community-eligibility-provision-resource-center

[13] We removed the Washington–Arlington–Alexandria MSA, despite it not being flagged by the RMSE measure, because the District of Columbia's FRPL data are erratic.

[14] In the 2013–2014 school year, the FRPL rate in DC jumped to 1.0 from 0.57 in the 2012–2013 year. The rate stayed at 0.99 in the 2014–2015 school year, but then dropped again to 0.73 in the 2015–2016 school year. While these were the largest shifts, there were other years in which the FRPL rate changed by approximately 10–15 percentage points (1999–2000 to 2000–2001, 2000–2001 to 2000–2002, and 2010–2011 to 2011–2012).

[15] Note that all removals for erratic data are made at the unit-level. In practice, districts or MSAs that were removed in their samples still contribute data to the state and national samples.

Table 1 Summary statistics by unit

Variable	District		MSA		State		Nation
	Mean	SD	Mean	SD	Mean	SD	Mean
Number of schools	13	32	170	265	1835	1755	91,743
Total enrollment	7982	23,811	100,150	182,854	958,857	1,115,485	47,942,844
Proportion white	0.68	0.25	0.66	0.20	0.66	0.18	057
Proportion black	0.13	0.18	0.15	0.14	0.14	0.13	0.16
Proportion Hispanic	0.15	0.19	0.15	0.18	0.13	0.13	0.21
Proportion FRPL	0.40	0.21	0.44	0.12	0.42	0.10	0.45
Exposure to school poverty: white	0.38	0.20	0.37	0.11	0.35	0.09	0.34
Exposure to school poverty: black	0.42	0.21	0.54	0.12	0.55	0.11	0.62
Exposure to school poverty: Hispanic	0.42	0.22	0.52	0.11	0.53	0.10	0.62
Black-white difference in exposure to school poverty	0.03	0.05	0.17	0.11	0.20	0.11	0.28
Hispanic-white difference in exposure to school poverty	0.04	0.05	0.15	0.11	0.18	0.11	0.28
Black-white difference in exposure to minority schoolmates	0.04	0.07	0.22	0.17	0.31	0.18	0.47
Hispanic-white difference in exposure to minority schoolmates	0.04	0.06	0.18	0.13	0.25	0.14	0.48
Number of units	4828		394		50		1

Summary statistics include a single observation per unit that is the average across years. All units are observed 18 times in the data

where n_{sgy} is the number of students of subgroup g in school s in year y, *perfrpl* is the proportion of students eligible for FRPL in school s and year y.

To create the black-white and Hispanic-white differences in exposure to school poverty, we subtract the white exposure to school poverty measure from the black or Hispanic exposure to school poverty measure in each unit and year, respectively.

In addition to these measures we also calculate the exposure to minority schoolmates by race and the black-white and Hispanic-white differences in exposure to minority schoolmates. The calculation of these measures is identical to those above, substituting the percentage of minority (black plus Hispanic) students for the percentage of students eligible for FRPL. These measures are used to demonstrate the relationship between racial differences in exposure to poor students (the focus of this paper) and racial difference in exposure to minority students. Summary statistics for the sample are shown in Table 1.

Models

We fit the following model separately for each segregation measure (black, white and Hispanic exposure to school poverty, and black-white and Hispanic-white differences in exposure to school poverty) at each aggregation (district, MSA, and state):

$$seg_{uy} = \beta_{0u} + \beta_{1u}(year - 2007.5) + \sum_{i=1999}^{2016} \beta_{(i-1997)}I(year = i) + e_{uy}$$

$$\beta_{0u} = v_{0u}$$

$$\beta_{1u} = v_{1u}$$

$$e_{uy} \sim N[0, \sigma^2]; \begin{bmatrix} v_{0u} \\ v_{1u} \end{bmatrix} = \mathbf{v}_s \sim N[0, \boldsymbol{\tau}] \tag{1}$$

where seg_{uy} is the segregation measure in the unit-year, year is a continuous variable indicating the spring school year, and $I(year = i)$ is an indicator equal to one if the spring school year is equal to 1999 to 2016.

This model has a non-parametric year trend, which describes the average trend among units. It also includes a unit-specific random intercept (v_{0u}) and a unit-specific random coefficient on a linear year term (v_{1u}). These random terms allow each unit to have its own intercept (e.g., higher or lower segregation than the average unit), and linear deviation from the average trend (e.g., faster or slower annual change than the average trend). We use maximum likelihood to estimate both the model coefficients and the variances between-units in average segregation (τ_{00}) and in the annual change in segregation (τ_{11}).
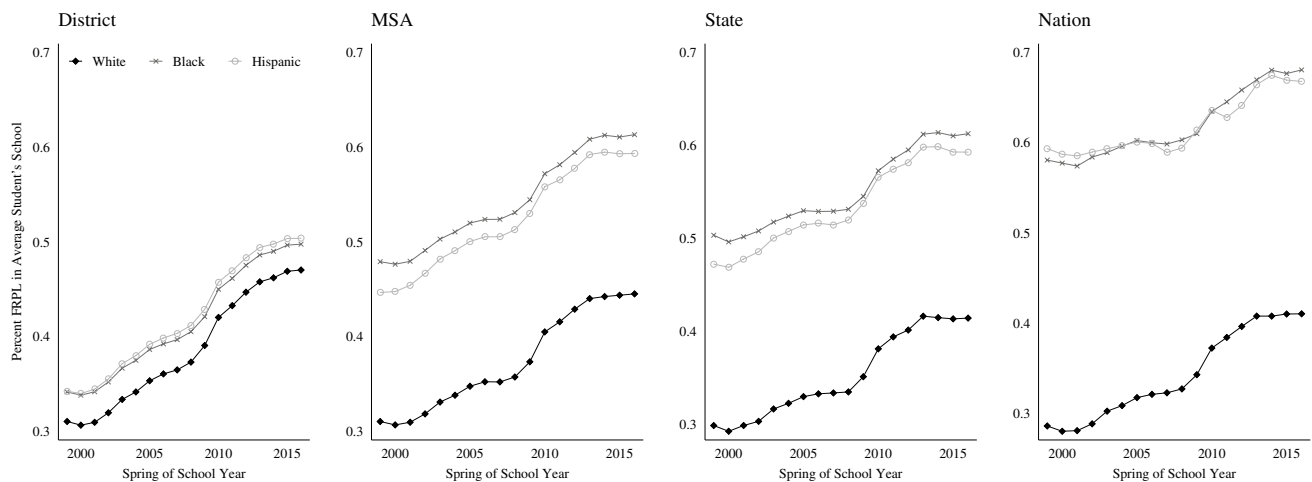
Fig. 1 Trends in exposure to school poverty by race and unit

Results

Takeaway 1: Increasing Exposure to School Poverty for All Students

Within the U.S., students' exposure to poor schoolmates has increased dramatically since the 1998–1999 school year (Fig. 1). Nationally, the proportion of students eligible for FRPL in the average white student's school increased from 0.29 to 0.41 (a 12 percentage point increase). This increase was slightly smaller in magnitude for the average black student (0.58 to 0.68, or 10 percentage points) and the average Hispanic student (0.59 to 0.67, or 8 percentage points). Within states, MSAs and school districts, we find the same general trend of increasing exposure to poor schoolmates for all groups, although increases are not consistently largest for white students.

These increases in exposure to poor schoolmates make sense in light of the changing demographics of U.S. public school students, in particular the large increases in the percentage of students eligible for FRPL (Snyder et al. 2019, Table 204.10). In particular, there is a noticeable jump in exposure to school poverty post-recession (2008–2009 to 2009–2010 SY). This coincides with the rapid rise in FRPL rates that occurred during the same time frame.

Takeaway 2: Large Racial Differences in Exposure to School Poverty

In all aggregations, average exposure to poor schoolmates is substantially higher for minority students than for white students (Table 1). Nationally, the average black-white and Hispanic-white differences in exposure to poor schoolmates across our panel were approximately 0.28 for both groups:

i.e., the poverty rate in the average black or Hispanic student's school is 28 percentage points higher than in the average white student's school. These gaps are somewhat smaller than the average differences in FRPL rates, described above. For comparison, the black-white FRPL rate difference hovered around 0.33 from 2000 through 2015 and the Hispanic-white difference around 0.42.

The average racial differences in exposure to poor schoolmates are smaller within states, MSAs, and districts. Most notably different are the average racial differences in exposure within school districts—they are relatively small at around 3–4 percentage points, on average. Figure 1 shows that minority students' exposure to poor schoolmates is lower and white students' exposure to poor schoolmates is higher within districts, compared with all other aggregations. This difference may be in part due to the greater homogeneity of student populations within school districts, relative to within MSAs, states or the nation overall. It is also due to the inclusion of small districts with low racial segregation, where there is little potential for racial differences in exposure to school poverty.

Takeaway 3: Stalled/Stable Racial Differences in Exposure to School Poverty

Figure 2 shows the trend in racial differences in exposure to school poverty since the 1998–1999 school year. In contrast to the large increases in the average exposure, differences in exposure to school poverty appear to have declined nationally. In 1999, the black-white difference was 0.29 and the Hispanic-white difference about 0.31. In 2016, the differences had dropped slightly to 0.27 and 0.26, respectively. This represents about an 8% decline in the gap in the black-white and a 16% decline in the Hispanic-white gaps in
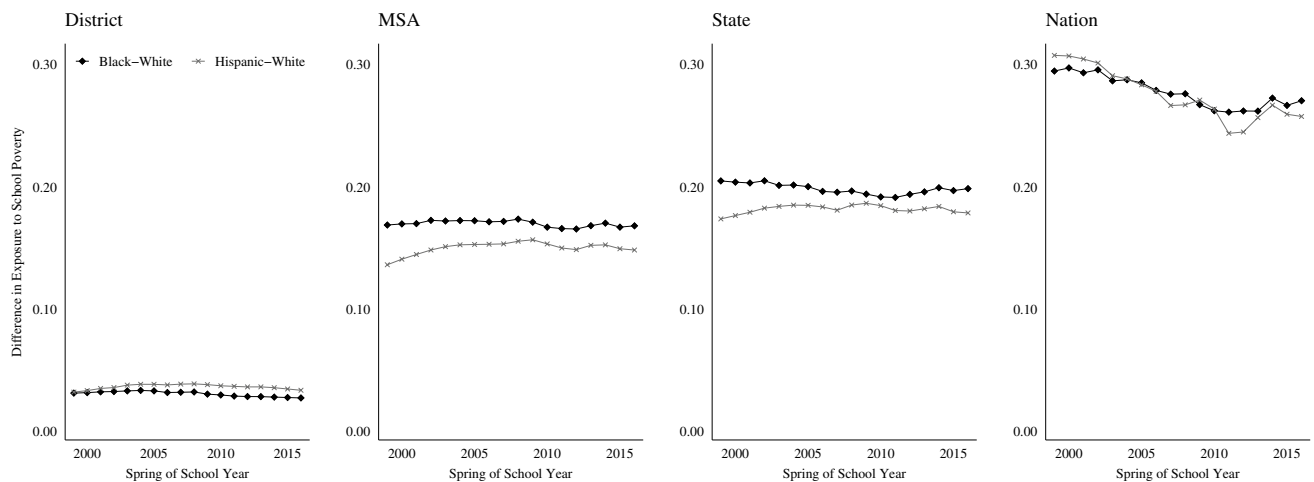
Fig. 2 Trends in racial differences in exposure to poverty by racial group and unit

exposure to school poverty over the 18 years of our panel—a rate of change of less than 1% per year. While this slow decline may be interpreted as an improvement, it should be noted that it is not due to the average student's school conditions improving. As shown above, students' exposure to poverty in schools is increasing for all groups. This decline in the differences, therefore, results from a slightly faster increase in exposure to school poverty for white students relative to minority students.

Moreover, the decline in racial differences in exposure to school poverty is not consistent across geographic scales. The unweighted average black-white gap in exposure to school poverty within districts declined by about 13% and in states by about 4%, but there was no appreciable change in the black-white gap within MSAs. The average Hispanic-white gap increased in districts by about 5% within districts, about 9% within metros, and about 3% within states. Thus, racial differences in exposure to poverty have been largely stable, on average, over the last two decades.

Takeaway 4: There is Substantial Variation in Racial Differences in Exposure to School Poverty

The relatively flat average trends shown above belie substantial variation in the racial difference in exposure to school poverty, and its trend over time, among states, MSAs and districts. Figure 3 graphs the average minority (black or Hispanic) exposure vs. white exposure to school poverty in all of the states, MSAs, and districts in our sample. Consistent with the average trend (shown in Fig. 2), in nearly every state, MSA, and district, the exposure to school poverty among black and Hispanic students is greater than that of white students (the scatter falls predominantly to the left of the y = x line).

That said, the scatter suggests that for any given level of white exposure to poverty, the level of black or Hispanic exposure can vary greatly. Figure 4 shows the distribution of the racial differences in exposure to school poverty within districts, MSAs, and states by racial group (black and Hispanic). Nearly all places have positive differences in exposure and some places have differences upwards of 0.40. Practically, this means that in some districts, MSAs and states, black, Hispanic and white students all attend schools with similar poverty rates, while in others black and Hispanic students attend schools with poverty rates that are over 40 percentage points higher than white students. In a handful of districts and MSAs, the difference is negative; white students' exposure to school poverty is greater in these places. In Fig. 3, these are the places to the right of the y = x line; most of them serve few minority students (evidenced by the size of marker). Table 2 provides estimates of the between-unit standard deviation in average segregation from Model 1.[16]

Figure 5 shows the racial differences in exposure to school poverty in 2016 plotted against the same measure in 1999. The scatter is clustered around the y = x line, suggesting that the differential exposure to school poverty changed little over time for most units—as we saw in the average trend. However, there are meaningful deviations. In some places, racial differences in exposure to school poverty have substantially increased (above the y = x line), and in others decreased (below the y = x line).
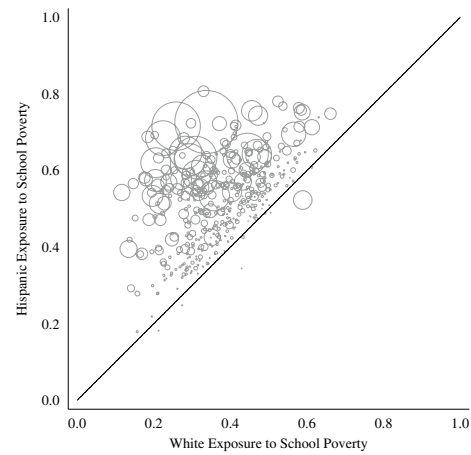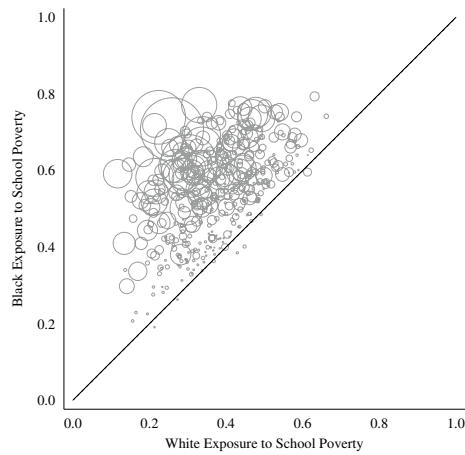
Table 2 reports the between-unit standard deviation in the annual change in segregation. For the district sample, it is about 0.003 for the black-white difference in exposure

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[16] The standard deviations are calculated as the square root of the τ_{00} and τ_{11} parameters.
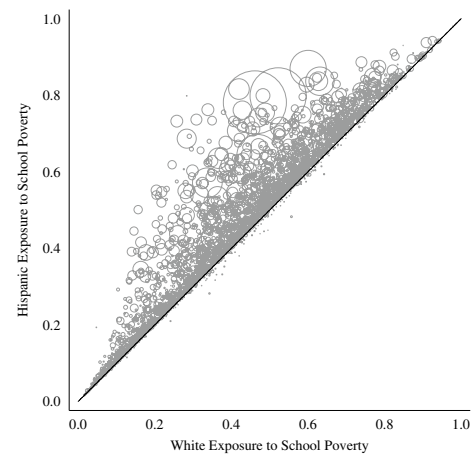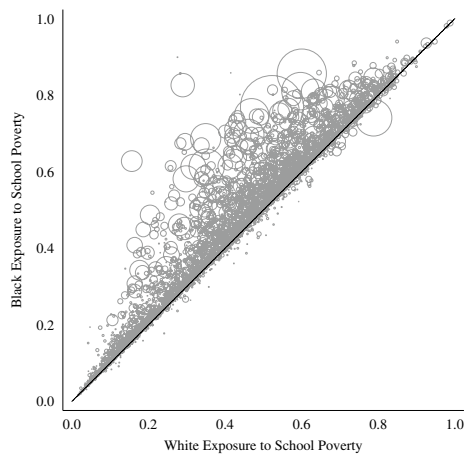
State
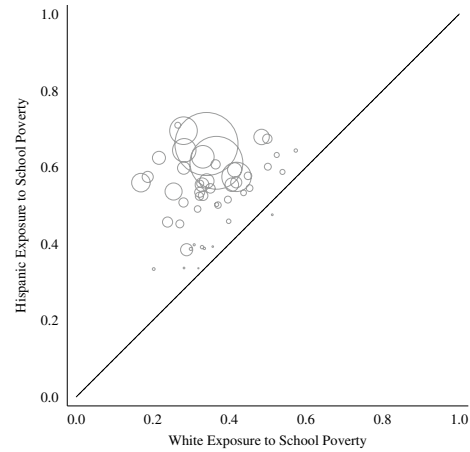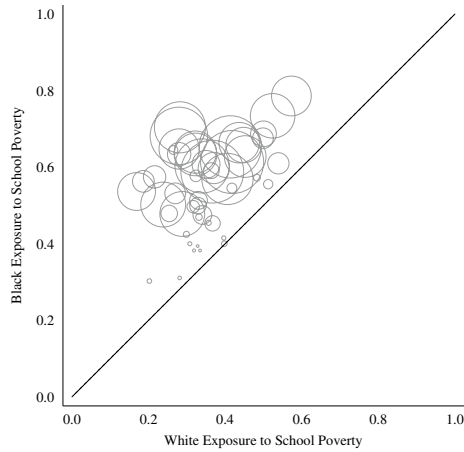
MSA

District

Fig. 3 Minority exposure to school poverty vs. white exposure to school poverty by unit

to school poverty. Over the 18 years in our panel, this suggests that the standard deviation of black-white differences in exposure to school poverty is about 0.05 (18×0.003).

Put differently, 95% of districts have changes in exposure to school poverty between -0.096 and 0.104 over the 18 years in our sample; there are districts where the black-white
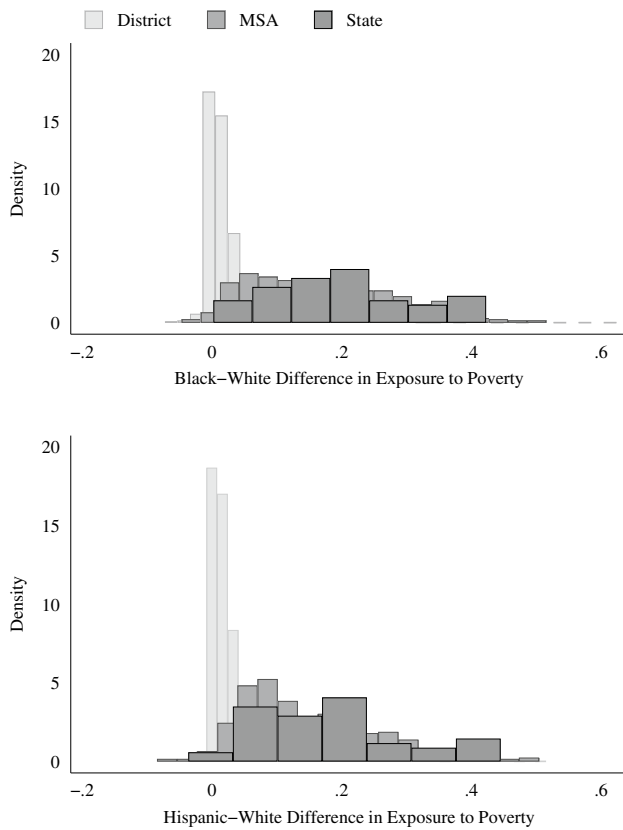
Fig. 4 Distribution of racial differences in exposure to school poverty by unit

difference in exposure to school poverty grew by approximately 10 percentage points, and places where it shrunk by about the same. The between-unit standard deviation in the annual change in the Hispanic-white difference in districts is also 0.003, suggesting a very similar range of growth rates.

Takeaway 5: Racial Differences in Exposure are Highest and Declining in Places with Large Minority Enrollments

Given that racial differences in exposure to poverty may have negative effects on minority students' educational opportunities, it is important to examine the trends specifically in districts or MSAs with large minority enrollments. We find that the average and trends in racial differences in exposure

to school poverty within MSAs and states are very similar to national patterns when the analysis is restricted to the units that serve the largest minority populations. Figure 6 replicates Fig. 2, including the 25% of districts, MSAs, and states in our sample with the largest minority enrollments. There is both a jump in average differences in exposure (vertical shift) and a negative trend in differential exposure (rather than a relatively stable trend). Again, it is worth noting that the declines are not a result of improving school conditions, but of faster increases in exposure to poverty for white students relative to minority students.

We also find that racial differences in exposure to school poverty differ by district or MSA size (Fig. 7). In large districts, the differences are larger on average and have increased over our panel. This finding aligns with the evidence of increasing economic segregation in large districts (Owens et al. 2016).

Takeaway 6: Racial Differences in Exposure to School Poverty are Highly Correlated with Racial Differences in Exposure to Minorities

While research suggests that racial segregation matters most when linked to poverty, racial differences in exposure to poor schoolmates and racial differences in exposure to minority schoolmates are highly correlated (Fig. 8). Within districts, MSAs, and states, minority students are often isolated along two dimensions—by race and by poverty.

This correlation indicates we would be remiss in assuming that segregation by race does not matter. We cannot reduce racial differences in exposure to poverty without addressing racial differences in exposure to minority schoolmates.

Discussion

This study sought to understand patterns and trends in racial differences in exposure to school poverty over the last two decades. We find that racial differences in exposure to school poverty are large and have remained relatively stable over the past 18 years, despite rapidly changing student demographics and growing exposure to school poverty for all students. Although differences in exposure to poverty have

Table 2 Estimates of between-unit standard deviations of racial differences in exposure to school poverty, by racial group and unit

	District		MSA		State	
	Black–white	Hispanic-white	Black–white	Hispanic-white	Black–white	Hispanic-white
Between-unit SD	0.052	0.054	0.112	0.108	0.110	0.113
Between-unit year slope SD	0.003	0.003	0.004	0.004	0.003	0.003

The samples include 4828 districts, 394 MSAs, and 50 states, respectively.
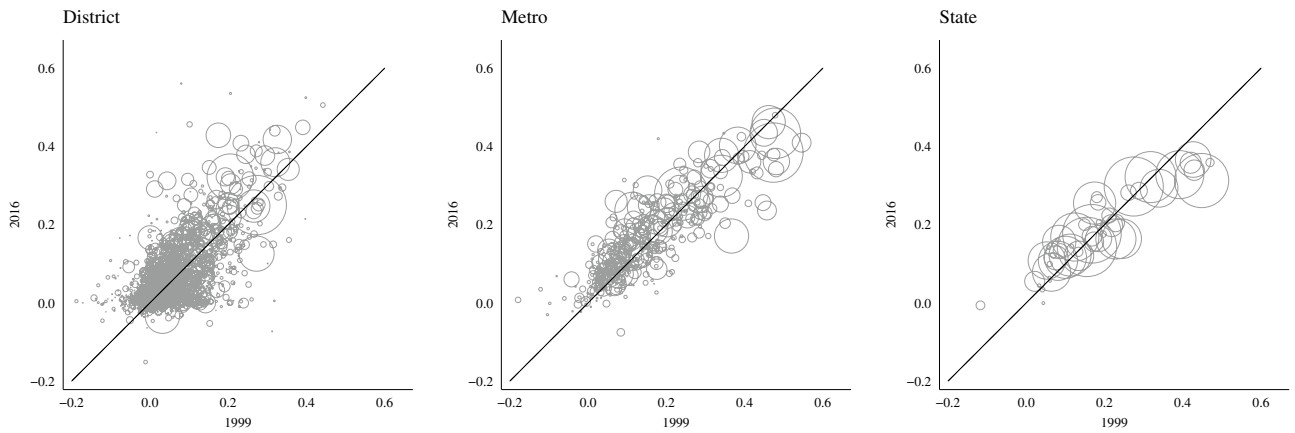
Black−White
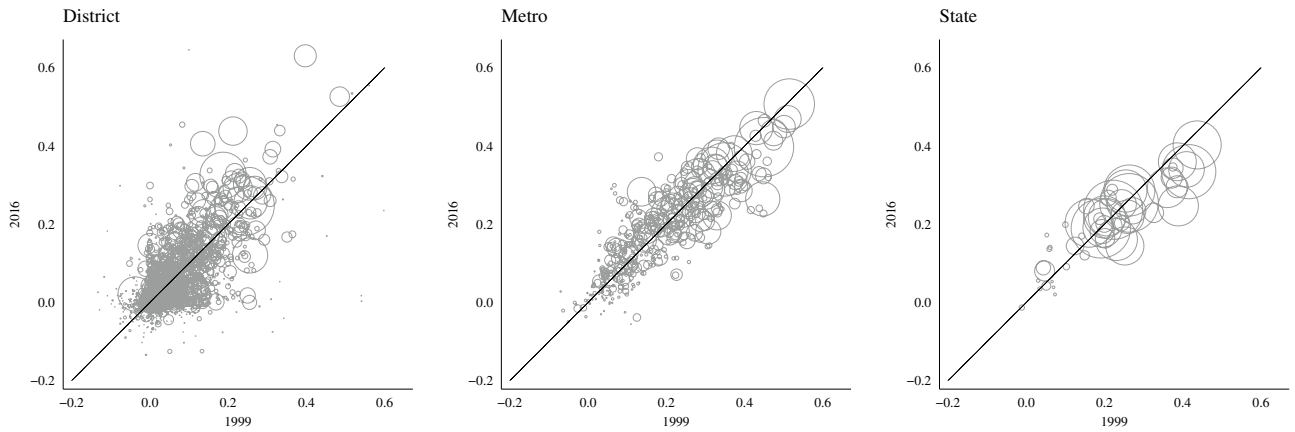
Hispanic−White

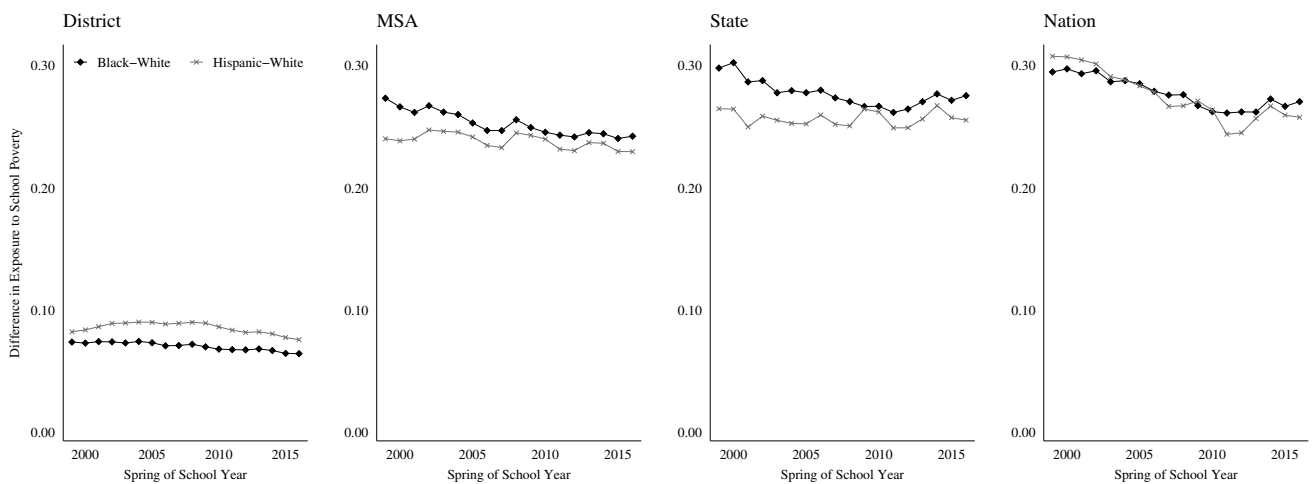**Fig. 5** Differences in exposure to school poverty in 2016 vs. 1999 by race and unit

Fig. 6 Trends in racial differences in exposure to school poverty, units with largest minority enrollment
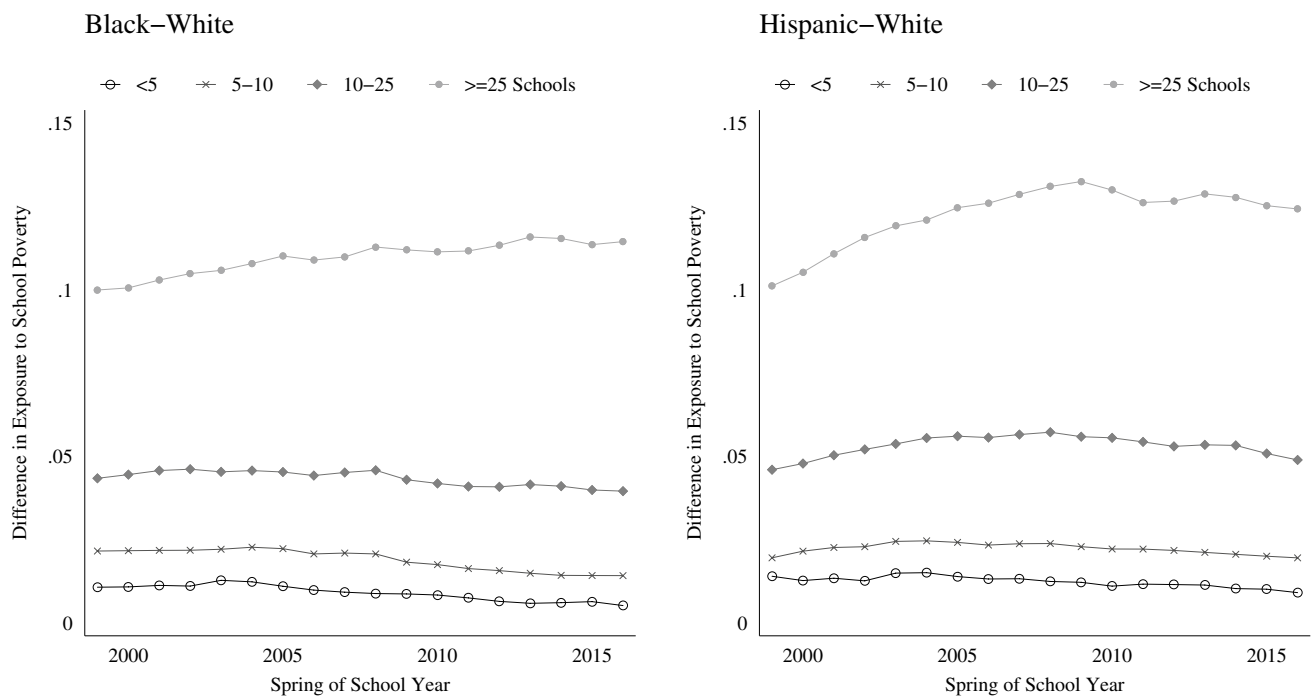
Black−White

Hispanic−White

Fig. 7 Trends in racial differences in exposure to school poverty within school districts by race and number of schools

declined modestly nationally, as well as in districts, MSAs, and states serving large numbers of minority students, this is largely the result of differentially increasing exposure to poverty. School poverty rates have increased for all students, but more so for white students than black and Hispanic students. Finally, there are no places where differences in exposure to poverty are high, but differences in exposure to minorities are low. For minority students, racial segregation almost always comes with a second form of segregation—their disproportionate concentration in high poverty schools. These findings echo those of Orfield and colleagues (2016), providing further evidence of "double segregation" by race and poverty.

Evidence suggests that racial differences in exposure to school poverty have consequences for racial achievement gaps in school districts and MSAs (Reardon 2016; Reardon et al. 2019b, c), and that increasing levels of racial differences in exposure to poverty are unrelated to racial differences in total expenditures despite school funding and spending policies being tied to poverty rates (Sosina and Weathers 2019). In light of this, the patterns we find have implications for educators, policymakers, and researchers. Using research to understand the mechanisms that lead to racial differences in exposure to school poverty and reducing racial disparities in exposure to school poverty through policy and practice are clear next steps.

Within the context of the school system, research has noted that school choice policies, and access to charter

schools, magnet schools, and private schools can exacerbate the racial and economic sorting of students (Bifulco et al. 2009; Kotok et al. 2017; Monarrez et al. 2019; Saporito 2003; Saporito and Sohoni 2006). However, given the small proportions of students served by charter schools and the lower average differences in exposure to poverty within school districts, it is unclear that refining choice policies alone will be sufficient. Large school districts, which we find have larger and faster growing average differences in exposure to poverty, may want to examine factors related to school segregation specific to their contexts. For example, in 2018 New York City public schools established a school diversity advisory group to review how district policies and programs can be altered to reduce segregation. They have highlighted a number of policy-based initiatives surrounding admissions processes, including gifted and talented programs with selective admissions (*Making the grade: The path to real integration and equity for NYC public school students* 2019).

To make radical change, however, we will need to think beyond schools and education policy as the sole solution to increasing school diversity and integration to the role of social policies more broadly. A first order issue is the alarming growth in child poverty following the recession (as proxied by FRPL rates). Economic strategies targeted to improve racial wage equality or raise minimum wage could help to improve the living conditions, and the out-of-school educational opportunities, of children in the U.S.
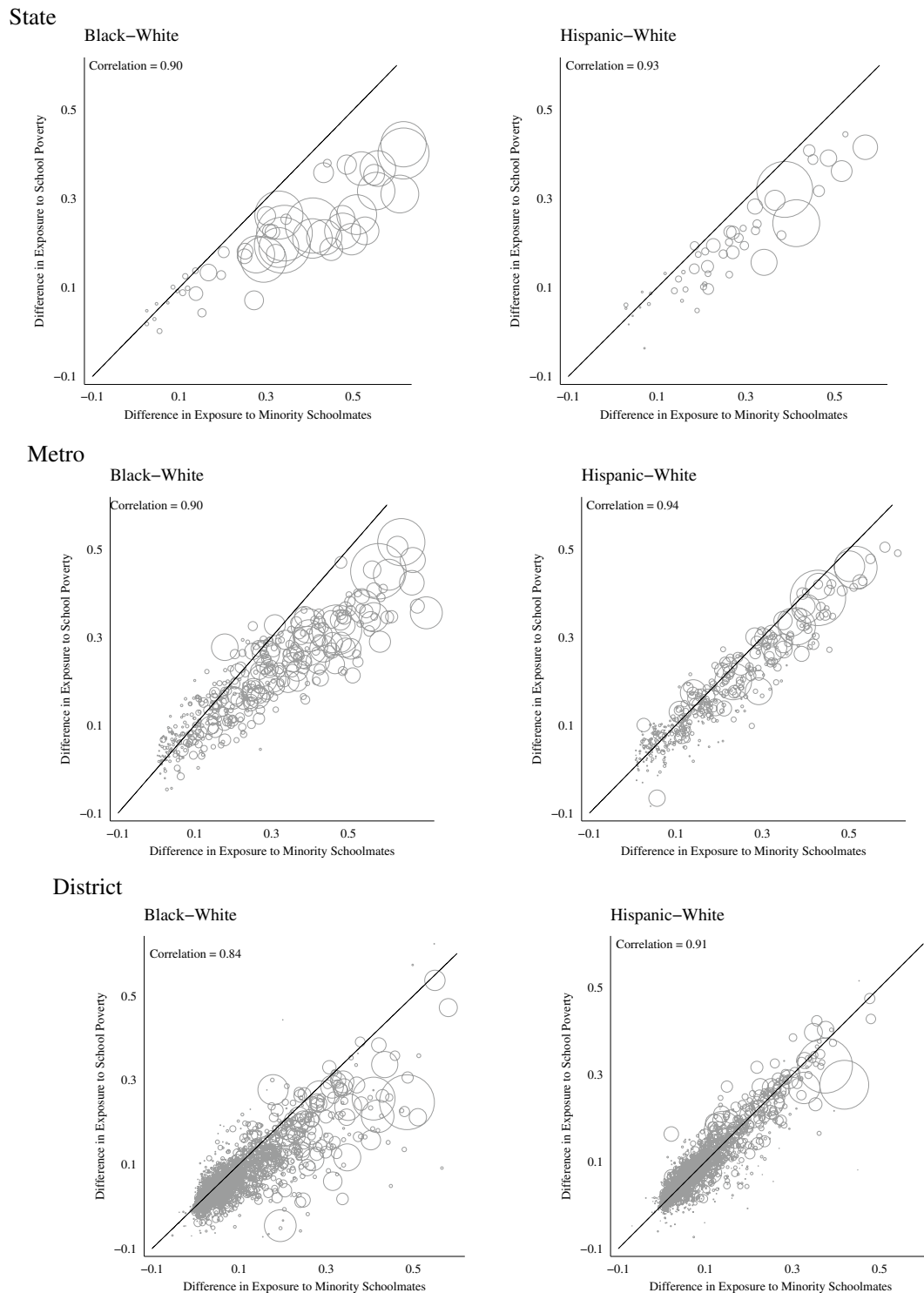
Fig. 8 Racial difference in exposure to poor schoolmates vs. racial difference in exposure to minority schoolmates by race and unit

While black and Hispanic students are more likely to attend schools with greater rates of poverty than white students, blacks and Hispanics also tend to live in racially isolated neighborhoods with lower average income than whites (Reardon et al. 2015; Pattillo 2013; Sharkey 2014). As such, another path forward may be housing policy.

Strategies such as providing affordable housing options in economically diverse neighborhoods and addressing housing discrimination that often blocks black families from living in white and more affluent communities (e.g., Massey 2005) may serve as opportunities to access neighborhood schools with lower rates of poverty.

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