segregation
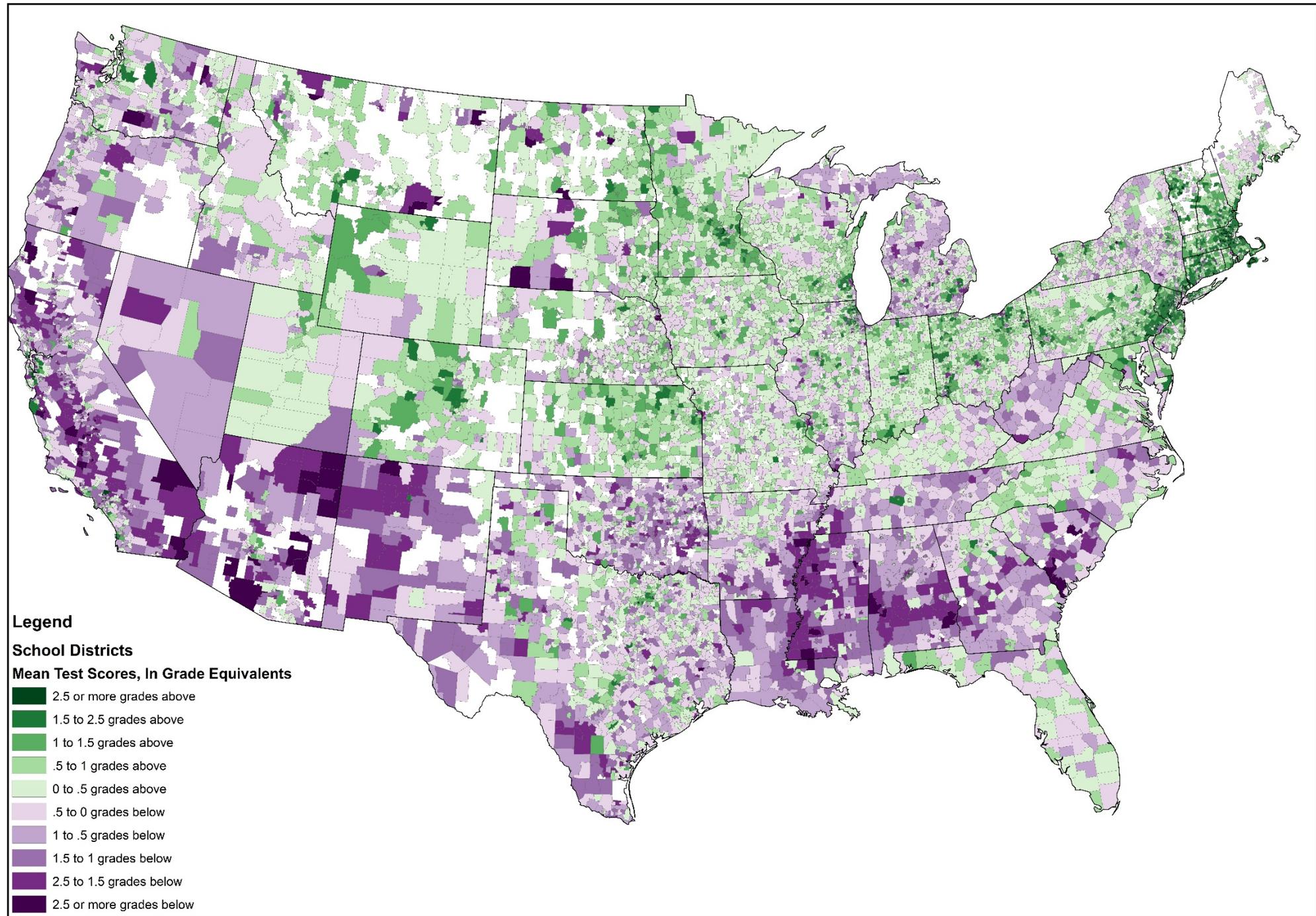# and educational opportunity
new evidence from population data

sean f. reardon

stanford university
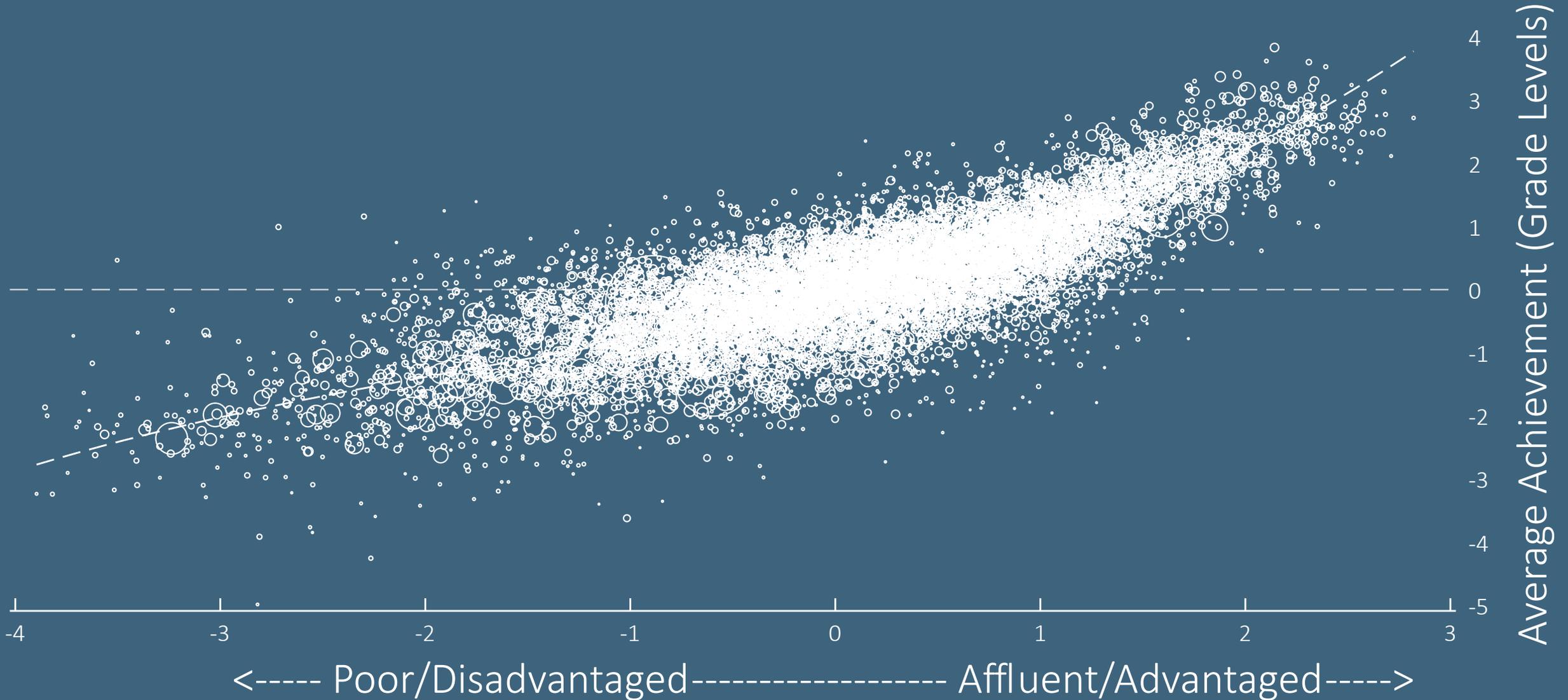
october, 2017

Data (http://seda.stanford.edu)

- Average district-level standardized test scores (on state accountability tests)
  - 11,280 <u>geographic</u> school districts (including local charter schools) and 384 metropolitan areas
  - Grades 3-8
  - Math & ELA (today I'm reporting average of Math and ELA)
  - 2009-2015 (10 cohorts of students entering K in 2000 – 2011)
  - By race/ethnicity and economic disadvantage
  - Based on ~300,000,000 test scores
  - Scores are placed on common scale across states, years, and grades
- Demographic data
  - Family characteristics (of families with children in public schools)
  - From American Community Survey (ACS)

Legend

School Districts

Mean Test Scores, In Grade Equivalents

- 2.5 or more grades above
- 1.5 to 2.5 grades above
- 1 to 1.5 grades above
- .5 to 1 grades above
- 0 to .5 grades above
- .5 to 0 grades below
- 1 to .5 grades below
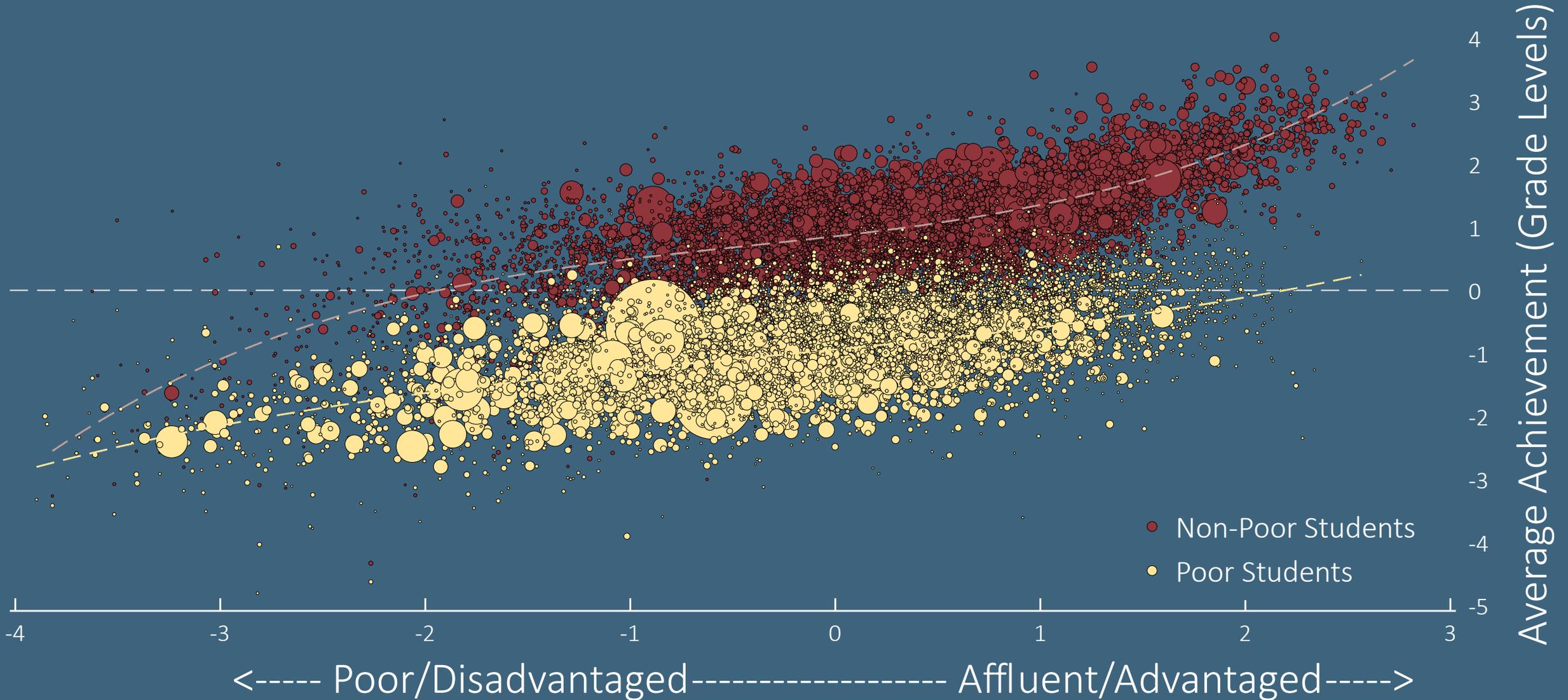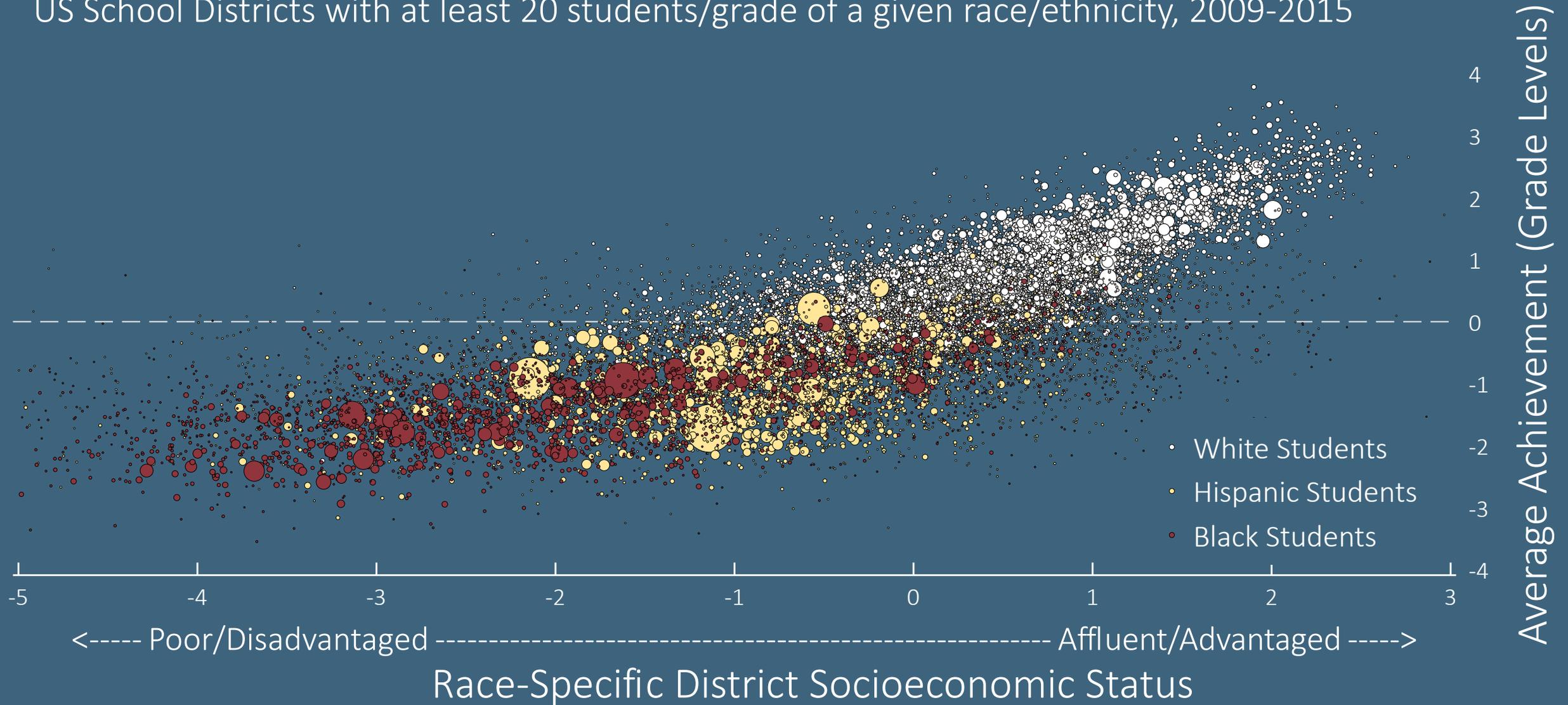- 1.5 to 1 grades below
- 2.5 to 1.5 grades below
- 2.5 or more grades below

Academic Achievement and Socioeconomic Status

US School Districts, 2009-2015

Academic Achievement and Socioeconomic Status, by Race/Ethnicity

US School Districts with at least 20 students/grade of a given race/ethnicity, 2009-2015

Average Achievement (Grade Levels)

○ White Students
○ Hispanic Students
○ Black Students

<----- Poor/Disadvantaged --- Affluent/Advantaged ----->

Race-Specific District Socioeconomic Status

Does segregation matter?

- This is another way of asking whether neighborhoods and schools affect children's opportunities
- If so, how?
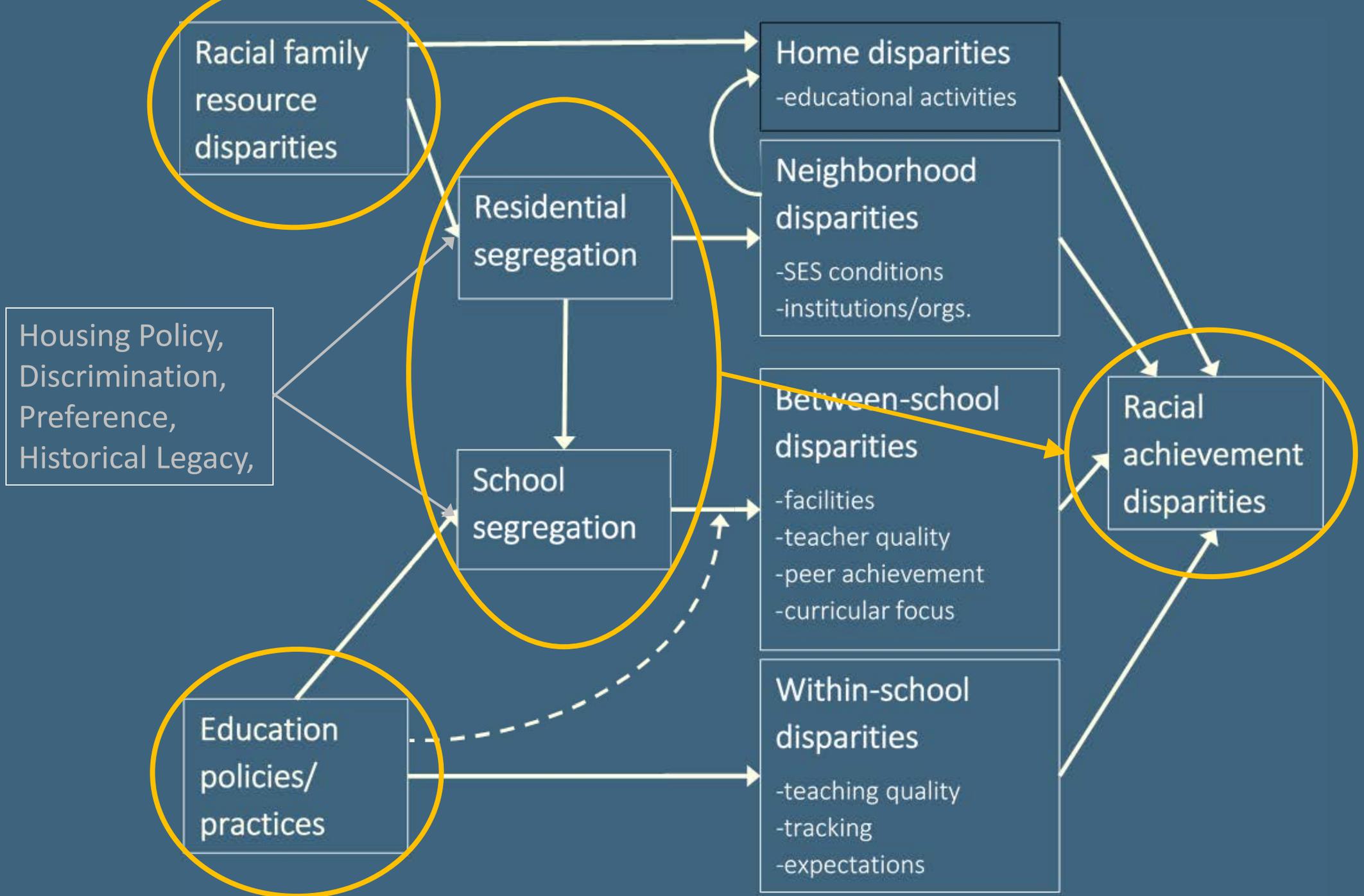
Which dimension(s) of segregation are related to achievement gaps?

- Residential vs School Segregation
  - Are schools or neighborhoods the more important context?
- Between-School/Neighborhood vs Between-District
  - Do processes operate at local or larger scale?
- Exposure vs Unevenness
  - Does the composition of minority students' contexts matter *per se*, or the difference in minority and white students' contexts?
- Racial vs Socioeconomic Contexts
  - Which is better proxy for the key processes of segregation?

Bivariate Correlations Between White-Black Achievement Gap and Various Dimensions of Segregation, 311 Metropolitan Areas, 2009-2012

	School Segregation		Residential Segregation	
	Between-School	Between-District	Between-School	Between-District
Black Students' Exposure to:				
Black Neighbors/Classmates	0.386 ***	0.344 ***	0.352 ***	0.325 ***
Poor Neighbors/Classmates	0.217 ***	0.155 **	0.191 ***	0.013
Difference Between Black and White Students' Exposure to:				
Black Neighbors/Classmates	0.429 ***	0.340 ***	0.401 ***	0.314 ***
Poor Neighbors/Classmates	0.628 ***	0.459 ***	0.461 ***	0.354 ***

*Note: each cell is the bivariate correlation between the pooled white-black achievement gap and a measure of segregation. * p<.05; ** p<.01; *** p<.001.*

Bivariate Correlations Between White-Black Achievement Gap and Various Dimensions of Segregation, 311 Metropolitan Areas, 2009-2012

	School Segregation		Residential Segregation	
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*Note: each cell is the bivariate correlation between the pooled white-black achievement gap and a measure of segregation. * p<.05; ** p<.01; *** p<.001.*

Bivariate Correlations Between White-Hispanic Achievement Gap and Various Dimensions of Segregation, 318 Metropolitan Areas, 2009-2012

	School Segregation		Residential Segregation	
	Between-School	Between-District	Between-School	Between-District
Hispanic Students' Exposure to:				
Hispanic Neighbors/Classmates	0.395 ***	0.342 ***	0.318 ***	0.308 ***
Poor Neighbors/Classmates	0.134 *	-0.041	0.023	-0.118 *
Difference Between Hispanic and White Students' Exposure to:				
Hispanic Neighbors/Classmates	0.600 ***	0.515 ***	0.519 ***	0.532 ***
Poor Neighbors/Classmates	0.678 ***	0.515 ***	0.450 ***	0.381 ***

Note: each cell is the bivariate correlation between the pooled white-Hispanic achievement gap and a measure of segregation.
* p<.05; ** p<.01; *** p<.001.

Bivariate Correlations Between White-Hispanic Achievement Gap and Various Dimensions of Segregation, 318 Metropolitan Areas, 2009-2012

	School Segregation		Residential Segregation	
	Between-School	Between-District	Between-School	Between-District
Hispanic Students' Exposure to:				
Hispanic Neighbors/Classmates	0.395 ***	0.342 ***	0.318 ***	0.308 ***
Poor Neighbors/Classmates	0.134 *	-0.041	0.023	-0.118 *
Difference Between Hispanic and White Students' Exposure to:				
Hispanic Neighbors/Classmates	0.600 ***	0.515 ***	0.519 ***	0.532 ***
Poor Neighbors/Classmates	0.678 ***	0.515 ***	0.450 ***	0.381 ***

Note: each cell is the bivariate correlation between the pooled white-Hispanic achievement gap and a measure of segregation.
* p<.05; ** p<.01; *** p<.001.

Average Proportion of Poor Students in Black and White Students' Schools

US Metropolitan Areas, 2009-12

Average Proportion of Poor Students in Black Students' Schools

Average Proportion of Poor Students in White Students' Schools
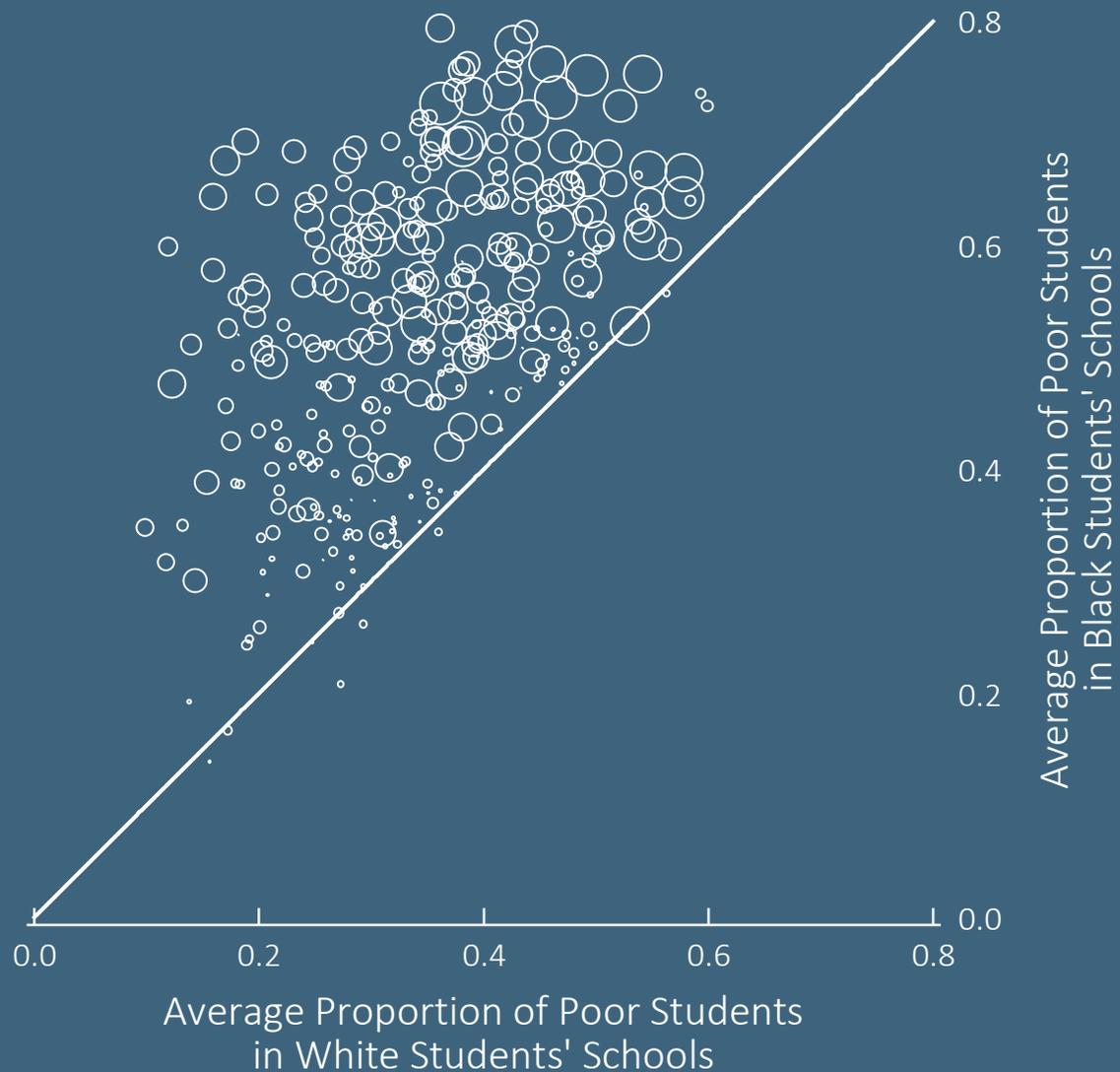
Average Proportion of Poor Students in Hispanic and White Students' Schools

US Metropolitan Areas, 2009-12

Average Proportion of Poor Students in Hispanic Students' Schools

Average Proportion of Poor Students in White Students' Schools
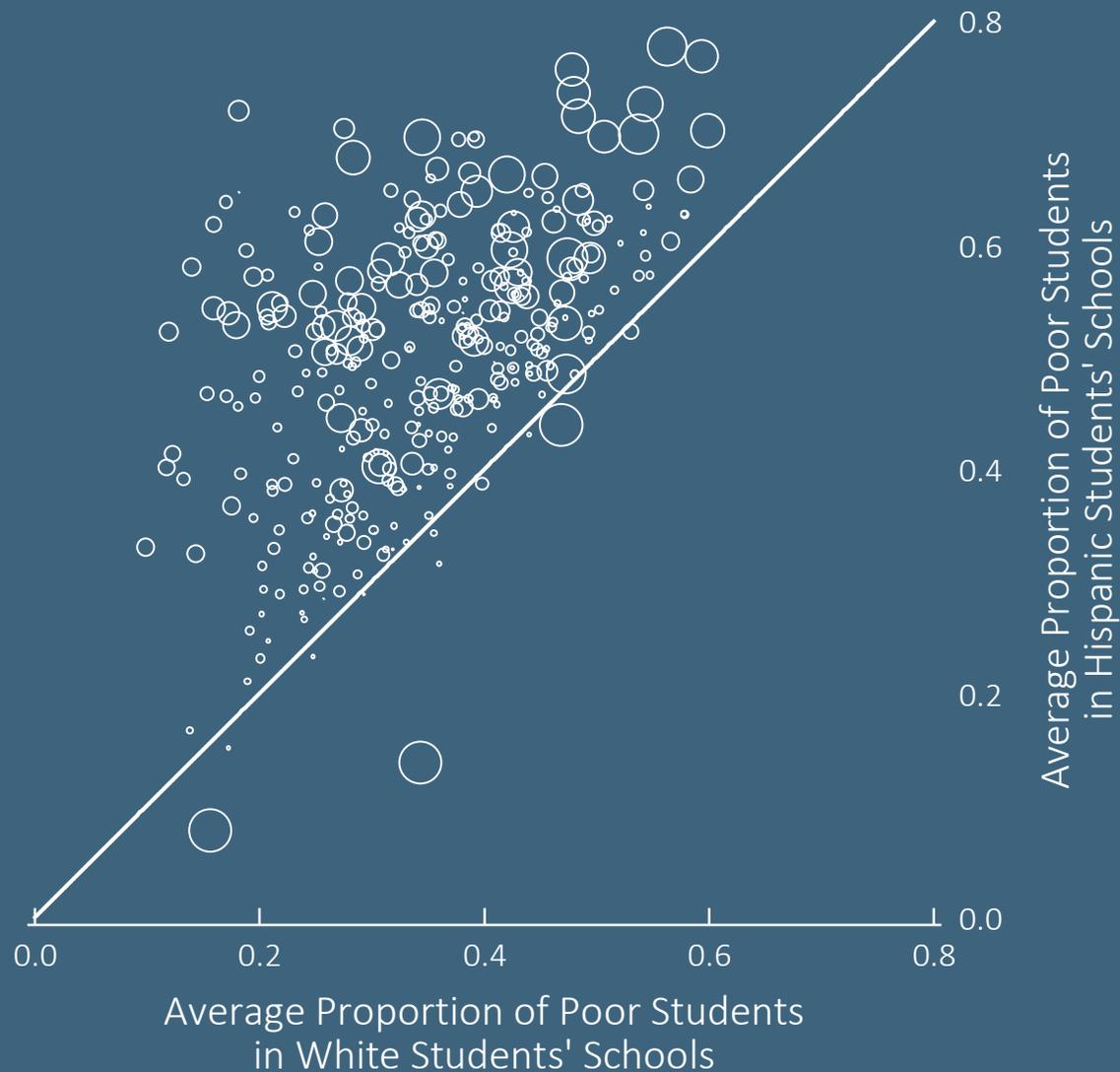
Exposure to School Poverty, by Race, 1991-2013

Averaged Across Metropolitan Areas

Legend:
- Black
- Hispanic
- White

X-axis: Year (1990, 1995, 2000, 2005, 2010, 2015)

Y-axis: Percent Poor in Average Student's School (0%, 10%, 20%, 30%, 40%, 50%, 60%)
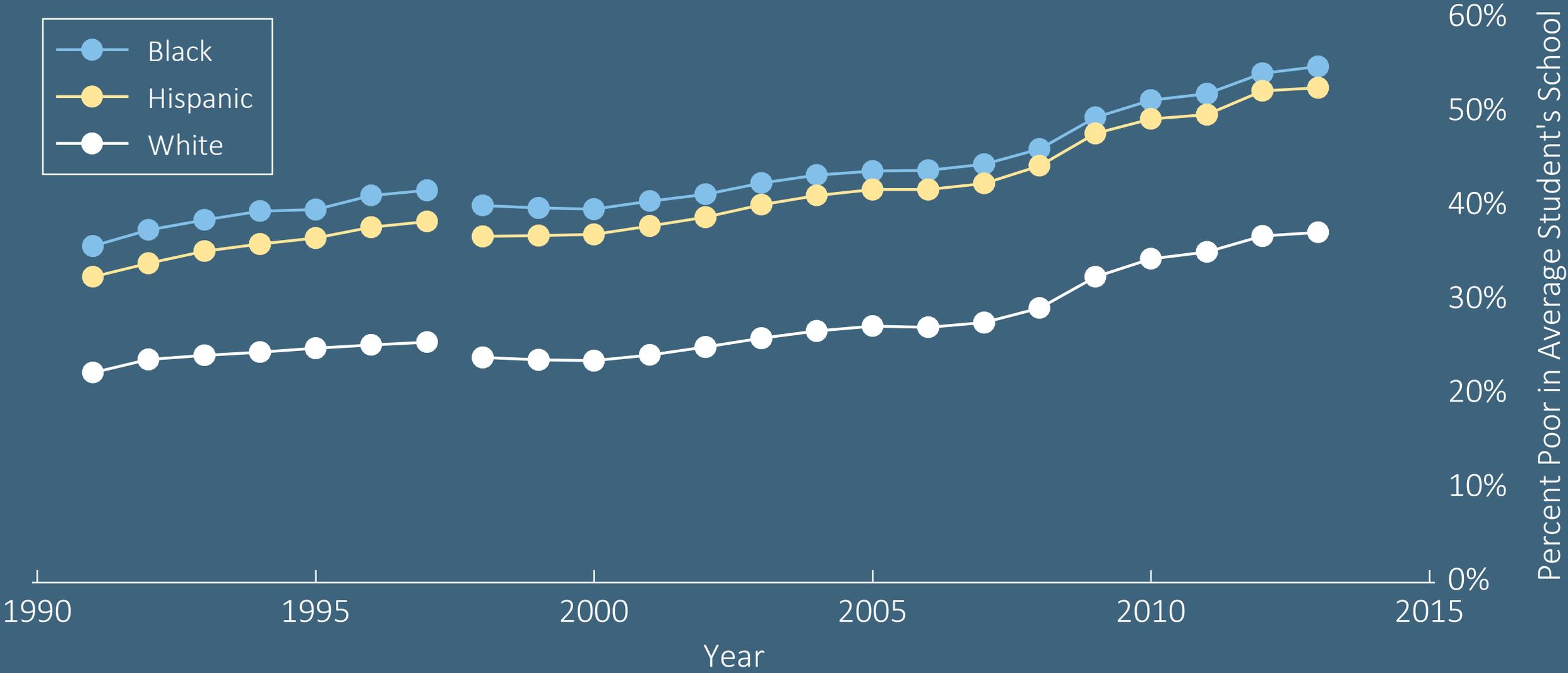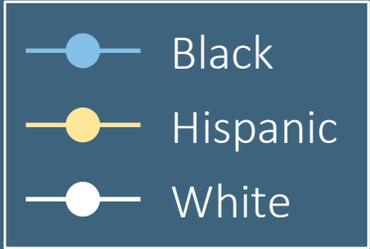
Racial Differences in Exposure to School Poverty, 1991-2013

Averaged Across Metropolitan Areas
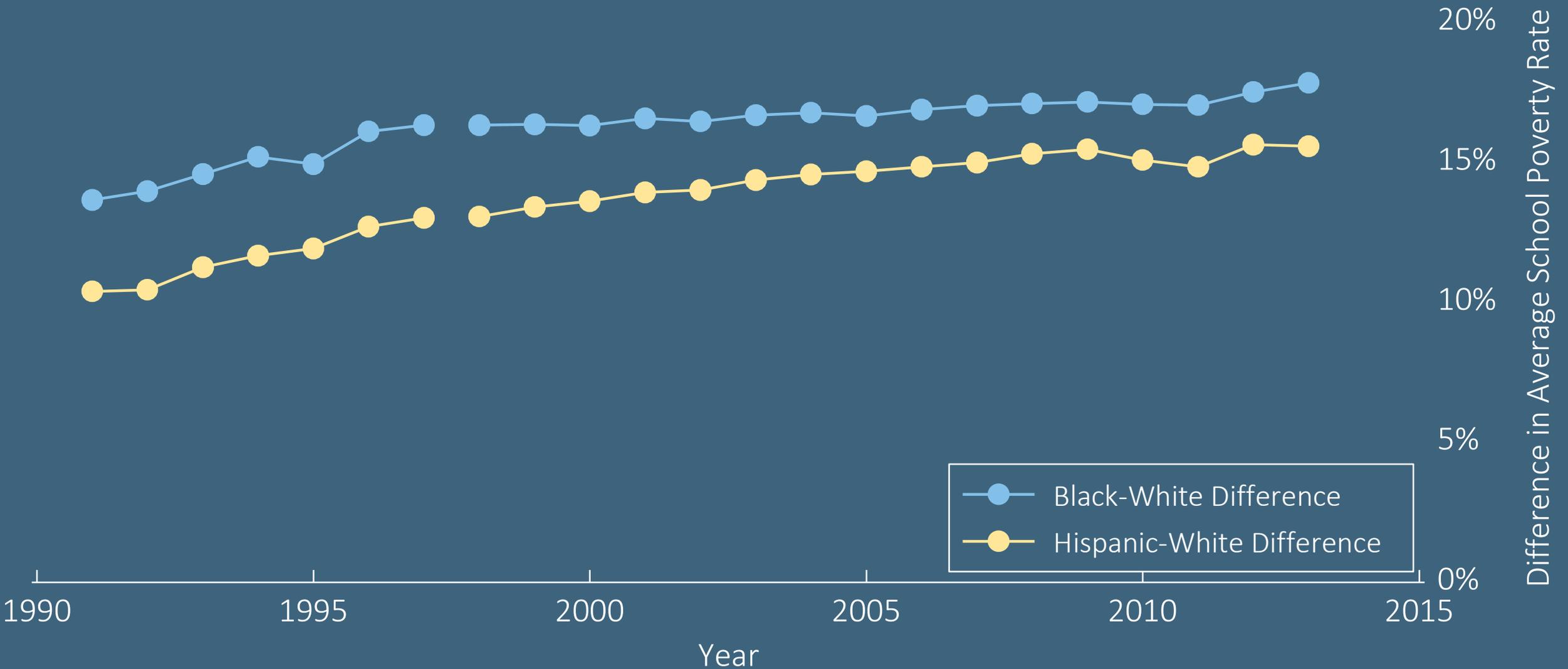
Difference in Average School Poverty Rate

- ● Black-White Difference
- ● Hispanic-White Difference

Year

Association Between White-Black Achievement Gap and Segregation
(Racial Difference in Exposure to School Poverty)

US Metropolitan Areas, 2009-12

Association Between White-Hispanic Achievement Gap and Segregation (Racial Difference in Exposure to School Poverty)

US Metropolitan Areas, 2009-12

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Black Achievement Gap and Segregation, 311 Metropolitan Areas, 2009-2012

	Model 1	Model 2	Model 3	Model 4	Model 5
Difference Between Black and White Students' Exposure to:					
District enrollment proportion black	-0.046				
	(0.295)				
District residents proportion black	-0.312				
	(0.314)				
District enrollment proportion poor	0.897 ***				
	(0.160)				
District residents proportion poor	0.203				
	(0.562)				
School enrollment proportion black					
Neighborhood residents proportion black					
School enrollment proportion poor					
Neighborhood residents proportion poor					
Adjusted R-squared	0.664				

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending. * p<.05; ** p<.01; *** p<.001.

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Black Achievement Gap and Segregation, 311 Metropolitan Areas, 2009-2012

	Model 1	Model 2	Model 3	Model 4	Model 5
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	(0.314)				
District enrollment proportion poor	0.897 ***				
	(0.160)				
District residents proportion poor	0.203				
	(0.562)				
School enrollment proportion black					
Neighborhood residents proportion black					
School enrollment proportion poor					
Neighborhood residents proportion poor					
Adjusted R-squared	0.664				

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending.   * p<.05; ** p<.01; *** p<.001.

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Black Achievement Gap and Segregation, 311 Metropolitan Areas, 2009-2012

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	(0.295)				
District residents proportion black	-0.312				
	(0.314)				
District enrollment proportion poor	0.897 ***				
	(0.160)				
District residents proportion poor	0.203				
	(0.562)				
School enrollment proportion black		-0.159			
		(0.161)			
Neighborhood residents proportion black		-0.025			
		(0.159)			
School enrollment proportion poor		0.793 ***			
		(0.132)			
Neighborhood residents proportion poor		0.365			
		(0.283)			
Adjusted R-squared	0.664	0.678			

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending. * p<.05; ** p<.01; *** p<.001.

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Black Achievement Gap and Segregation, 311 Metropolitan Areas, 2009-2012

	Model 1	Model 2	Model 3	Model 4	Model 5
Difference Between Black and White Students' Exposure to:					
District enrollment proportion black	-0.046		-0.025		
	(0.295)		(0.321)		
District residents proportion black	-0.312		-0.470		
	(0.314)		(0.319)		
District enrollment proportion poor	0.897 ***		0.501 *		
	(0.160)		(0.230)		
District residents proportion poor	0.203		-0.106		
	(0.562)		(0.580)		
School enrollment proportion black		-0.159	0.195		
		(0.161)	(0.224)		
Neighborhood residents proportion black		-0.025	-0.053		
		(0.159)	(0.167)		
School enrollment proportion poor		0.793 ***	0.358		
		(0.132)	(0.213)		
Neighborhood residents proportion poor		0.365	0.481		
		(0.283)	(0.300)		
Adjusted R-squared	0.664	0.678	0.686		

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending. * p<.05; ** p<.01; *** p<.001.

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Black Achievement Gap and Segregation, 311 Metropolitan Areas, 2009-2012

	Model 1	Model 2	Model 3	Model 4	Model 5
Difference Between Black and White Students' Exposure to:					
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District residents proportion black	-0.312		-0.470		
	(0.314)		(0.319)		
District enrollment proportion poor	0.897 ***		0.501 *	0.147	
	(0.160)		(0.230)	(0.148)	
District residents proportion poor	0.203		-0.106		
	(0.562)		(0.580)		
School enrollment proportion black		-0.159	0.195		
		(0.161)	(0.224)		
Neighborhood residents proportion black		-0.025	-0.053		
		(0.159)	(0.167)		
School enrollment proportion poor		0.793 ***	0.358	0.638 ***	
		(0.132)	(0.213)	(0.145)	
Neighborhood residents proportion poor		0.365	0.481		
		(0.283)	(0.300)		
Adjusted R-squared	0.664	0.678	0.686	0.676	

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending. * p<.05; ** p<.01; *** p<.001.

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Black Achievement Gap and Segregation, 311 Metropolitan Areas, 2009-2012

	Model 1	Model 2	Model 3	Model 4	Model 5
Difference Between Black and White Students' Exposure to:					
District enrollment proportion black	-0.046		-0.025		
	(0.295)		(0.321)		
District residents proportion black	-0.312		-0.470		
	(0.314)		(0.319)		
District enrollment proportion poor	0.897 ***		0.501 *	0.147	
	(0.160)		(0.230)	(0.148)	
District residents proportion poor	0.203		-0.106		
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School enrollment proportion black		-0.159	0.195		
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Neighborhood residents proportion black		-0.025	-0.053		
		(0.159)	(0.167)		
School enrollment proportion poor		0.793 ***	0.358	0.638 ***	0.759 ***
		(0.132)	(0.213)	(0.145)	(0.079)
Neighborhood residents proportion poor		0.365	0.481		
		(0.283)	(0.300)		
Adjusted R-squared	0.664	0.678	0.686	0.676	0.676

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending. * p<.05; ** p<.01; *** p<.001.

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Hispanic Achievement Gap and Segregation, 318 Metropolitan Areas, 2009-2012

	Model 1	Model 2	Model 3	Model 4	Model 5
Difference Between Hispanic and White Students' Exposure to:					
District enrollment proportion Hispanic	-0.098		-0.116		
	(0.236)		(0.307)		
District residents proportion Hispanic	-0.115		-0.051		
	(0.332)		(0.323)		
District enrollment proportion poor	0.409 *		-0.190	-0.185	
	(0.189)		(0.250)	(0.163)	
District residents proportion poor	0.553		0.591		
	(0.734)		(0.776)		
School enrollment proportion Hispanic		0.245	0.370		
		(0.227)	(0.288)		
Neighborhood residents proportion Hispanic		-0.486	-0.478		
		(0.284)	(0.285)		
School enrollment proportion poor		0.590 ***	0.657 **	0.720 ***	0.568 ***
		(0.151)	(0.219)	(0.162)	(0.091)
Neighborhood residents proportion poor		-0.014	-0.115		
		(0.332)	(0.366)		
Adjusted R-squared	0.738	0.756	0.754	0.755	0.755

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending. * p<.05; ** p<.01; *** p<.001.

Coefficient Estimates from Multivariate Regression Models of the Association Between White-Hispanic Achievement Gap and Segregation, 318 Metropolitan Areas, 2009-2012

	Model 1	Model 2	Model 3	Model 4	Model 5
Difference Between Hispanic and White Students' Exposure to:					
District enrollment proportion Hispanic	-0.098		-0.116		
	(0.236)		(0.307)		
District residents proportion Hispanic	-0.115		-0.051		
	(0.332)		(0.323)		
District enrollment proportion poor	0.409 *		-0.190	-0.185	
	(0.189)		(0.250)	(0.163)	
District residents proportion poor	0.553		0.591		
	(0.734)		(0.776)		
School enrollment proportion Hispanic		0.245	0.370		
		(0.227)	(0.288)		
Neighborhood residents proportion Hispanic		-0.486	-0.478		
		(0.284)	(0.285)		
School enrollment proportion poor		0.590 ***	0.657 **	0.720 ***	0.568 ***
		(0.151)	(0.219)	(0.162)	(0.091)
Neighborhood residents proportion poor		-0.014	-0.115		
		(0.332)	(0.366)		
Adjusted R-squared	0.738	0.756	0.754	0.755	0.755

All models include controls for racial disparities in family socioeconomic status, metropolitan area racial and socioeconomic composition, metropolitan area fragmentation, and average per pupil spending. * p<.05; ** p<.01; *** p<.001.

White-Black Achievement Gap, by White-Black SES Gap

All US School Districts with at least 100 Black & 100 White Students/Grade, 2009-2015
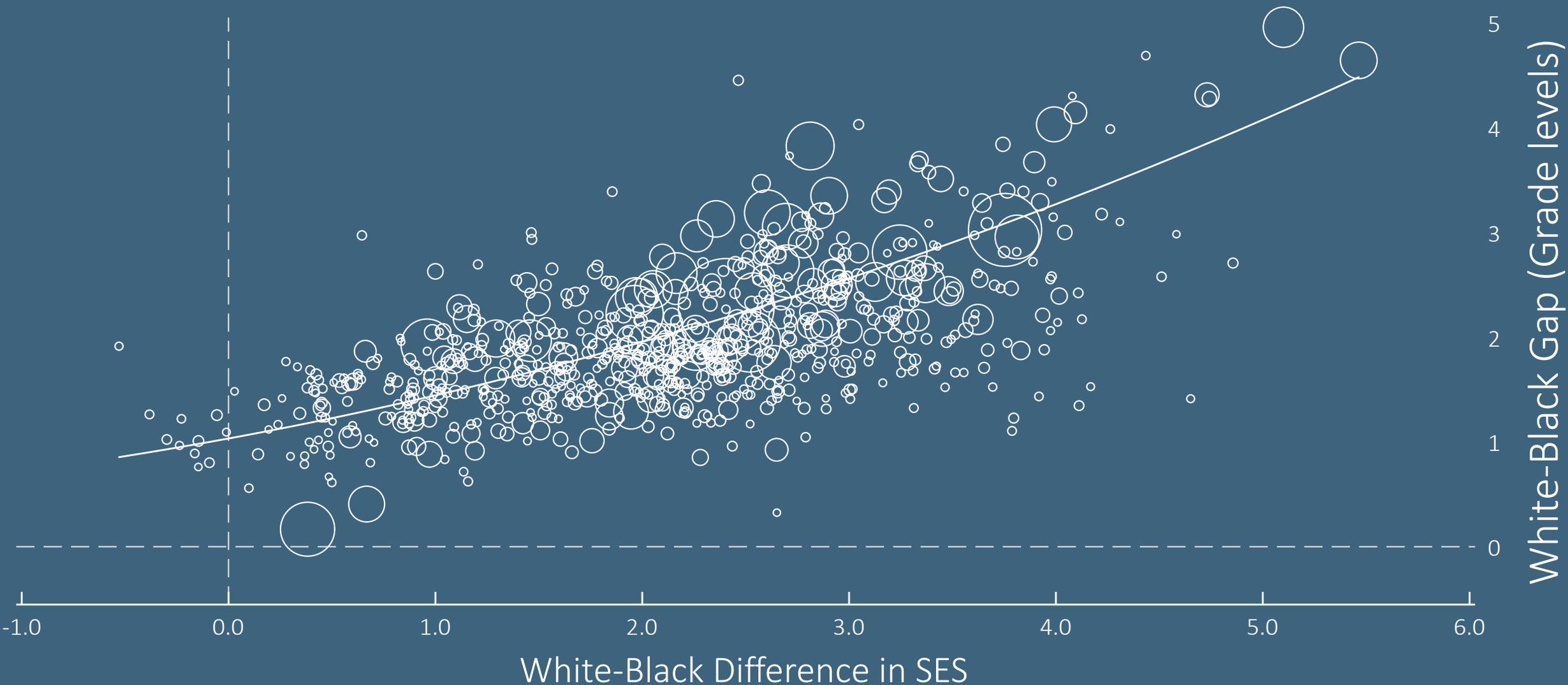
White-Black Gap (Grade levels)

White-Black Difference in SES

White-Black Achievement Gap, by White-Black Segregation

All US School Districts with at least 100 Black & 100 White Students/Grade, 2009-2015

White-Black Gap (Grade levels)

White-Black Difference in Exposure to Poverty

White-Black Achievement Growth Rate Gap, by White-Black Segregation

All US School Districts with at least 100 Black & 100 White Students/Grade, 2009-2015

White-Black Growth Gap (Grade levels/Year)

White-Black Difference in Exposure to Poverty

Poor-Nonpoor Achievement Gap, by FRPL Segregation

All US School Districts with at least 200 Students/Grade, 2009-2015
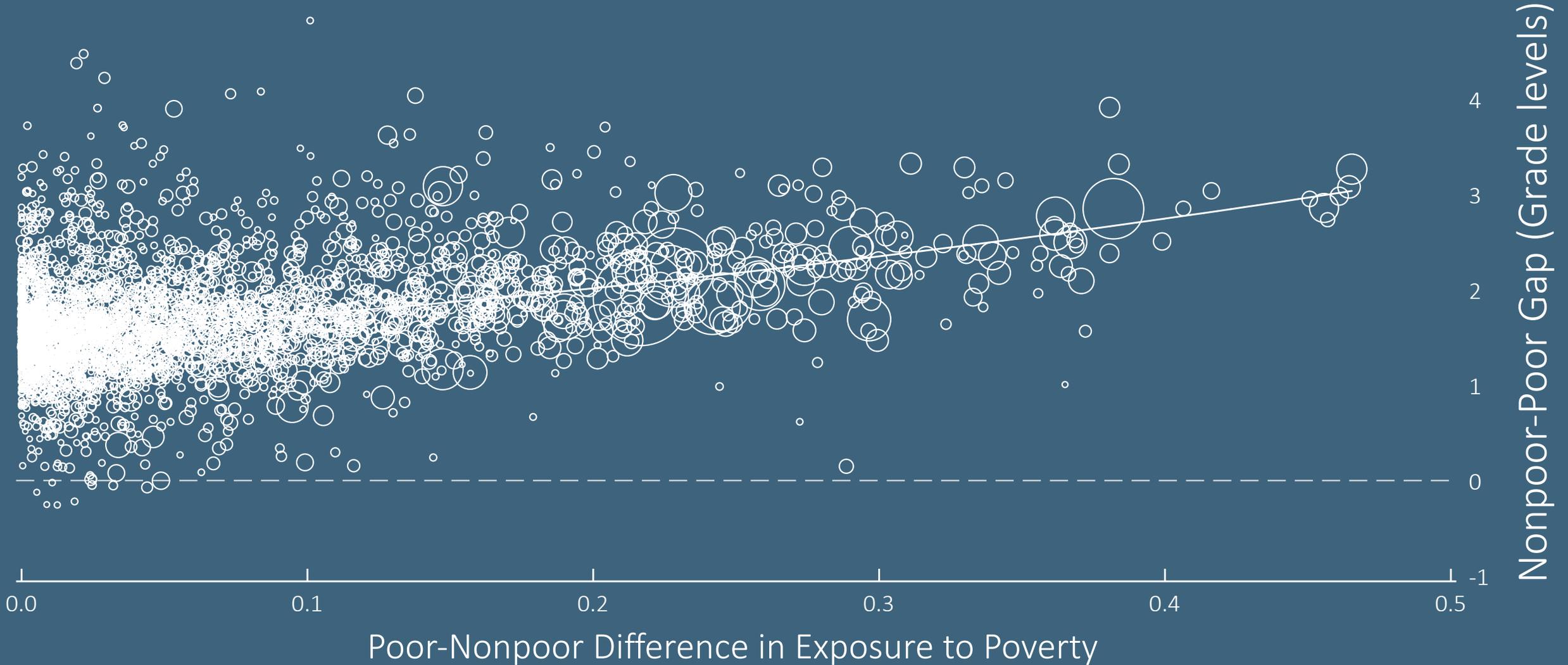
Poor-Nonpoor Achievement Growth Rate Gap, by FRPL Segregation

All US School Districts with at least 200 Students/Grade, 2009-2015
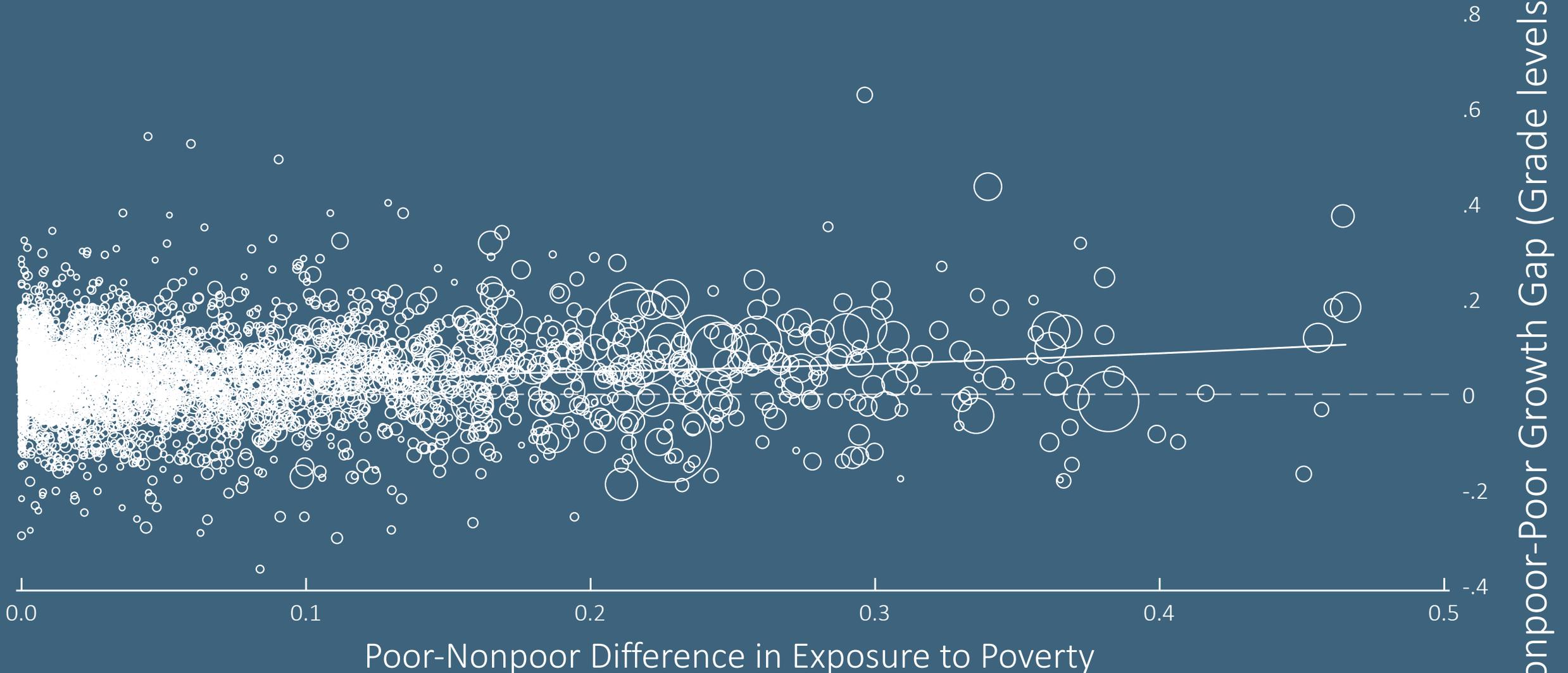
Partial Associations of Achievement Gaps, Gap Changes, and Local Characteristics

	White-Black Gaps		White-Hispanic Gaps	
	Levels	Slopes	Levels	Slopes
Bivariate Correlations				
Racial Socioeconomic Disparities				
White-Minority Income Gap	0.415 ***	0.073 ***	0.413 ***	-0.013
White-Minority Education Gap	0.558 ***	0.139 ***	0.423 ***	0.030
Segregation				
Minority-White School Poverty Difference	0.346 ***	0.133 ***	0.383 ***	0.056 **
Multivariate Regression Coefficients				
Racial Socioeconomic Disparities				
White-Minority Income Gap	0.018	-0.001	0.029 **	-0.003
White-Minority Education Gap	0.169 ***	0.004	0.175 ***	-0.001
Segregation				
Minority-White School Poverty Difference	0.904 ***	0.069 ***	0.708 ***	0.046 *
Sample Size	2476	2481	3241	3262

Note: ***p<=.001; **p<=.01; *p<=.05; models include measures of socioeconomic characteristics, racial composition, and school resources

School poverty and academic performance

- The racial/ethnic difference in exposure to school poverty is consistently the measure of segregation most strongly correlated with achievement gaps
  - This is true in bivariate models and multivariate models
  - And is true of changes in achievement gaps as well
- Coefficients are large:
  - they imply that segregation is independently associated with 15-20% of racial achievement gaps
- Imply that school poverty is associated with achievement: a 20% difference in the proportion of poor classmates is associated with a
  - 0.11-0.18 SD difference in achievement (in ~6th grade)
  - 0.009-0.014 SD difference in annual achievement growth (during 3-8th grades)

School poverty and academic performance

- BUT these analyses do not identify segregation mechanisms

- They indicate that school poverty is the best proxy for, or is most proximal to, the operative mechanisms of segregation

- Other forms of segregation (residential, racial, between-district) may operate through differential exposure to school poverty

- These results do not imply "peer effects" (though they might): High-poverty schools may be lower-quality for many reasons:
  - hard to attract most skilled teachers;
  - less parental social/political capital,
  - lower peer achievement may affect curriculum/instruction, etc.)

Stanford Education Data Archive (SEDA)

- Available at **http://seda.stanford.edu**

- These data exist thanks to the following people:

  Ross Santy, Michael Hawes, Marilyn Seastrom (US Dept. of Education)
  Andrew Ho (Harvard University)
  Demetra Kalogrides, Kenneth Shores, Ben Shear, Erin Fahle (Stanford University)
- Funding support from
  Institute of Education Sciences
  Spencer Foundation
  William T. Grant Foundation
  Bill and Melinda Gates Foundation
  Overdeck Family Foundation

Legend

School Districts

Mean Test Scores, In Grade Equivalents

- 2.5 or more grades above
- 1.5 to 2.5 grades above
- 1 to 1.5 grades above
- .5 to 1 grades above
- 0 to .5 grades above
- .5 to 0 grades below
- 1 to .5 grades below
- 1.5 to 1 grades below
- 2.5 to 1.5 grades below
- 2.5 or more grades below