ANNENBERG
BROWN UNIVERSITY

EdWorkingPaper No. 22-554

Biased Opportunities: The Role of Implicit and Explicit Bias in Advanced Placement and Dual Enrollment

Kaitlin P. Anderson
Lehigh University

Black and Latinx students are under-represented in Advanced Placement (AP) and Dual Enrollment (DE), and implicit bias of educators has been discussed as one potential contributing factor. In this study, I test whether implicit and explicit racial bias are related to AP and DE participation and racial/ethnic gaps in participation, controlling for various observable contextual factors. I find a small relationship between implicit racial bias and disparate AP participation for Black students relative to White students, and suggestive evidence of a relationship between explicit racial bias and disparate DE participation for Black students relative to White students. Further, more explicitly-biased communities tend to have lower AP participation rates overall. Implications for school leaders regarding implicit bias training and other ways to address systemic inequities in access are discussed.

VERSION: April 2022

Suggested citation: Anderson, Kaitlin P. . (2022). Biased Opportunities: The Role of Implicit and Explicit Bias in Advanced Placement and Dual Enrollment. (EdWorkingPaper: 22-554). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/g600-0d47

Biased Opportunities: The Role of Implicit and Explicit Bias in Advanced Placement and Dual Enrollment

Kaitlin P. Anderson, Ph.D.*
Assistant Professor of Educational Leadership
Lehigh University
kpa319@lehigh.edu
111 Research Dr.
Bethlehem, PA 18015

***Corresponding Author**

Abstract

Black and Latinx students are under-represented in Advanced Placement (AP) and Dual Enrollment (DE), and implicit bias of educators has been discussed as one potential contributing factor. In this study, I test whether implicit and explicit racial bias are related to AP and DE participation and racial/ethnic gaps in participation, controlling for various observable contextual factors. I find a small relationship between implicit racial bias and disparate AP participation for Black students relative to White students, and suggestive evidence of a relationship between explicit racial bias and disparate DE participation for Black students relative to White students. Further, more explicitly-biased communities tend to have lower AP participation rates overall. Implications for school leaders regarding implicit bias training and other ways to address systemic inequities in access are discussed.

Implicit and Explicit Bias in Advanced Placement and Dual Enrollment

In the United States, the Advanced Placement (AP) program, operated through the College Board, and dual enrollment (DE) are two ways that high school students can earn college credit. The AP program offers a wide range of subjects. Students enroll in AP coursework, typically taught by high school educators, and can take course-specific examinations to earn college credit. Although not all students enrolled in AP courses end up taking the AP exams, AP course-taking sends a signal to college admissions officers about the preparation and academic motivation of students (Geiser & Santelices, 2004; Santoli, 2002).

DE allows high school students to take college courses, typically with syllabi and requirements determined by the college (Xu et al., 2021). DE courses can be taught by faculty at either a college or a high school, and courses may be taken virtually through distance education, on a high school campus, or at a postsecondary institution (Thomas et al., 2013), so implementation and quality may vary widely. DE is a more direct way to earning college credit than AP, which requires passing scores on examinations to result in college credit. Thus, students are more likely to earn college credit through DE than AP (Speroni, 2011).

These programs have grown to be quite expansive, yet there is a lack of equitable access to participation. As of 2020, eight states[1] and the District of Columbia required all high schools to offer AP courses (Patrick et al., 2020). According to the 2017-18 Civil Rights Data Collection (CRDC), roughly 11% of students in grades 9-12 were enrolled in AP (National Center for Education Statistics (NCES), 2020). According to the High School Longitudinal Study of 2009, approximately a third of high school students took courses for postsecondary credit through dual or concurrent enrollment (NCES, 2019). However, African-American students and

[1] These eight states include Arkansas, Connecticut, Indiana, Iowa, Louisiana, Mississippi, South Carolina, and West Virginia.

Hispanic/Latinx[2] students in particular are underrepresented in AP and DE. In 2015-16, Black/African-American students represented approximately 15.4% of U.S. public school enrollment, but only 9.4% of those enrolled in at least one AP course, 7.5% of those enrolled in at least one AP science course, and 6.4% of those enrolled in at least one AP math course (U.S. Department of Education, Office for Civil Rights, n.d.). Similarly, only 4.7% of Black students and 5.7% of Hispanic/Latinx students participate in DE, compared to 8.1% of students overall (Fink, 2018). Such inequities put students from marginalized racial/ethnic groups at a disadvantage because advanced coursework is linked to college success (Morgan et al., 2018) and future earnings (Rose & Betts, 2004).

Recent studies have documented substantial racial disparities in AP and DE, and the school- or district- correlates of these gaps (e.g., Conger et al., 2009; Patrick et al., 2020; Xu et al. 2021), and many scholars have discussed implicit bias as a possible cause or implicit bias training as a potential solution (Naff et al., 2021; Patrick et al., 2020; Rivera et al., 2019; Xu et al., 2021). However, to my knowledge, there has been no direct investigation of the potential impact of implicit or explicit bias on these racial/ethnic gaps in advanced course taking. To fill this gap, the present study systematically examines whether implicit and explicit biases measured at the community level are related to racial/ethnic gaps in AP and DE participation, controlling for observable district characteristics that may also affect participation (e.g. achievement and

[2] "Hispanic" is the term used in the Civil Rights Data Collection (CRDC) data, the U.S. Census Bureau data, and in many of the studies using those datasets. There is a debate over the use of this term given its imposition by the government and connections to colonization (Rodriguez, 2019). Many prefer Latino/Latina/Latinx, the latter of which is a more modern term that was intended to be more inclusive of people with non-binary gender; Latinx is also controversial within the Latin American community (Rodriguez, 2019). Many people of Latin American descent identify more closely with their country of heritage than the broader categories such as Hispanic or Latinx, but publicly available government administrative datasets tend not to report country of origin. In this study, although I recognize the problems with generalizing across a large heterogenous group, and that many people within the category do not identify with the labels imposed by government datasets, the data lack country of origin data.

achievement gaps).[3]

I find a small relationship between implicit racial bias and disparate AP participation for Black students relative to White students, and suggestive evidence of a relationship between explicit racial bias and disparate DE participation for Black students relative to White students. Further, more explicitly-biased communities tend to have lower AP participation rates overall.

In the next section, I review the relevant literature to frame this study. Then, I discuss the data and analytic approach and the results and conclude with discussion of the results and their implications for educational policy and practice.

Theoretical Framework and Relevant Literature

Implicit and explicit bias in education

Students from marginalized racial/ethnic backgrounds face a variety of disadvantages in an education system run primarily by White educators. Black and Latinx students represent 39% of the nation's students, but Black and Latinx teachers represent only 15% of teachers (Boser, 2014). Implicit and explicit racial bias might influence students through their interactions with teachers or other adults in the school system, or through the way a community's bias places expectations on students' academic abilities and aspirations.

Implicit bias results in instantaneous, automatic, and unconscious reactions to different stimuli, with individuals unaware of the impact of these biases (Dovidio et al., 2002). Explicit biases, in contrast, are the attitudes, beliefs, and preferences that people generally are aware of and able to communicate (Daumeyer et al., 2019). Relative to explicit measures of bias, implicit measures are useful in research because they "provide an estimate of the construct of interest

[3] The Civil Rights Data Collection also includes measures of test taking and test passing in some years, but due to inconsistencies in reporting across years, these outcomes are not included in the present study.

without having to directly ask the participant," (Fazio & Olson, 2003, p. 300), and therefore are less vulnerable to social desirability bias (Brauer et al., 2000). Implicit bias measures are situational and fluid and should not be used as a trait-like factor for individual people (Steffens & Buchner, 2003). Yet, they are useful in research as aggregate measures (Payne et al., 2017).

Implicit bias has clear implications for education. In a lab-based study, in which participants were assigned roles of instructor (White participants only) or learner (White or Black), Jacoby-Senghor et al. (2016) found that White instructors' implicit bias leads to increased instructor anxiety, which reduces the effectiveness of their pedagogical techniques and learner performance, if the learner was Black but not if the learner was White. When non-Black learners watched videos of the same lessons, there was still a negative effect of implicit bias on learner performance, suggesting that the cause was a decrease in pedagogical skills of White instructors working with Black learners, rather than stereotype threat or other situational identity threat on the part of the Black learners.

Further, teachers' evaluations of students can be racially biased. For example, Copur-Gencturk et al. (2019) used an audit study in which gender- and race-specific names were randomly assigned to mathematics problem solutions. No teacher bias was detected in their assessment of the correctness of solutions, but when assessing the students' mathematical ability, educators held biases against students whose randomly assigned names indicated they were Black, Hispanic/Latinx, or female.

National studies have found a correlation between aggregate implicit bias and racial disparities in student discipline (Chin et al., 2020; Riddle & Sinclair, 2019) and achievement (Chin et al., 2020; Pearman, 2020). Importantly, however, the significant correlation is generally attenuated once controlling for other sorting mechanisms such as racial segregation, racial gaps

in gifted identification, and racial gaps in special education identification (Pearman, 2020).

While recent attention in the educational community has been primarily placed on implicit bias, some have expressed concern about ignoring explicit bias and attributing all of these impacts to implicit bias (Daumeyer et al., 2019). If discrimination is attributed to implicit attitudes or bias, it suggests that individuals are not morally responsible for their actions. Yet, describing the issue as one related to unconscious awareness may be an important starting point for a conversation with well-intended but biased White educators. Thus, I explore in this study the role of both implicit and explicit bias in explaining racial and ethnic gaps in AP and DE participation. To my knowledge, this is the first study to assess this relationship, despite numerous studies (Legette, 2020; Naff et al., 2021; Patrick et al., 2020; Rivera et al., 2019; Xu et al., 2021) suggesting that implicit bias, in particular may contribute to opportunity gaps in coursework.

Other factors associated with participation rates and disparities in AP and DE

While this study focuses on the role of implicit and explicit bias in explaining AP and DE participation, there are a variety of other factors that might contribute to these gaps, and thus, should be considered when attempting to isolate the direct relationship between implicit and explicit bias and measures of AP and DE participation.

A variety of studies have documented gaps in access to or enrollment in AP and DE. Poverty, rurality and urbanicity play a key role in whether these course offerings are available. Small rural schools and high poverty schools offer fewer AP courses (Klopfenstein, 2004; Planty et al., 2007), as schools are likely to only introduce new, advanced coursework when they have a critical mass of students academically prepared for it (Cisneros et al., 2014; Iatarola et al., 2011). Rural areas are more likely to offer DE, rather than AP (Thomas et al., 2013), yet rural districts

still face barriers to expansion of DE such as a lack of qualified teachers and other staff to teach and/or manage the DE programming, the financial cost placed on students and families, and isolation from postsecondary institutions (Piontek et al., 2016). Urban centers may include a greater number of high schools in a small geographic area, leading to more competition for students and prestige, perhaps through advanced course offerings (Rodriguez & McGuire, 2019).

Disparities in participation in AP and DE also likely reflects other opportunity gaps and tracking systems in schools. Specifically, students from marginalized racial/ethnic backgrounds may enter high schools less prepared for rigorous AP curricula in part because of the compounding effects of tracking or other categorical sorting mechanisms, which can affect students' exposure to high-achieving peers (Kubitschek & Hallinan, 1998, Zimmer, 2003), more experienced teachers (Kalogrides & Loeb, 2013), and teachers who hold higher educational expectations for their students (Kelly & Carbonaro, 2012). Indeed, prior achievement is a significant driver of advanced course-taking (Conger et al., 2009), and a recent nation-wide study using the CRDC finds that White-minority achievement gaps are the strongest predictor of the racial and ethnic gaps in participation in AP and DE (Xu et al. 2021). Notably, evidence from Florida suggests that background characteristics of students, including their eighth-grade test scores, are entirely driving the underrepresentation of Black and Hispanic/Latinx students in advanced coursework, because after controlling for these pre-high school characteristics, Black and Hispanic/Latinx students are actually likely to take advanced courses than observably similar White peers (Conger et al., 2009). As a result, an investigation of racial/ethnic gaps in AP and DE coursework should take into account other opportunity gaps (e.g. the racial/ethnic gaps in math and reading test scores). However, because achievement gaps are also correlated to racial bias (Chin et al., 2020; Pearman, 2020), observed achievement gaps may be a mediator through

which implicit and explicit bias affect access to advanced coursework.

There are also organizational, contextual, and resource-related factors related to racial/ethnic gaps in AP and DE participation. Xu et al., (2021), in their recent nation-wide study, find that the types of factors associated with higher overall participation (e.g. per-pupil instructional expenditures and the number of AP courses offered) are also correlated with wider racial/ethnic gaps in AP enrollment. Thus, providing additional resources to increase AP participation – without intentionally focusing on improving equity in participation rates - may serve to widen racial gaps. Similarly, Patrick et al. (2020) concluded that national inequities in AP enrollment of Black and Latinx students are due both to lower AP participation overall in schools serving more Black and Latinx students (a between-school issue) and to lower enrollment of Black and Latinx students, relative to their White peers in the same school (a within-school issue). Notably, Patrick et al. (2020) also find that the within-school inequities tend to be worse in more racially diverse schools.

In sum, a variety of factors may play a role in determining racial and ethnic gaps in advanced course-taking through either AP or DE. Whether or not implicit and explicit bias is related to these gaps, controlling for these other factors, can help us understand whether implicit bias or anti-racism training for educators maybe a useful tool to help address these opportunity gaps as some scholars (Naff et al., 2021; Patrick et al., 2020; Xu et al., 2021) have suggested. Specifically, this study addresses the following research questions:

1) Is community implicit or explicit bias (favoring Whites over Blacks) correlated with AP or DE participation rates, controlling for other district-level factors?
2) Is community implicit or explicit bias (favoring Whites over Blacks) correlated with racial/ethnic disparities in AP or DE participation, controlling for other district-level

factors?

Data and Methods

This study uses data from several publicly available nationwide sources. The key outcomes are racial/ethnic gaps in AP course-taking and DE from the Civil Rights Data Collection for 2011-12, 2013-14, 2015-16, and 2017-18, with DE outcomes only available in the last three collections. I use these data to calculate the proportion of students in each racial/ethnic group enrolled in at least one AP course and the proportion participating in DE. The CRDC data does not report AP or DE separately by grade level, however, I make the reasonable assumption that the vast majority of students enrolled in AP or DE would be in grade ten or higher, and use grades 10-12 enrollment as the denominator when calculating these proportions.

The main variables of interest are measures of implicit and explicit bias, from Project Implicit, with data representing over one million U.S. residents who completed the Race Implicit Association Test (IAT) between 2009 and 2015 (Xu et al., 2014). The implicit bias measure from the IAT is a task-based measure in which respondents are asked to complete two categorization tasks with four categories (e.g. Black vs. White people; words associated with Good v. Bad things). Students are asked to hit a key response (i.e. "E" or "I" on a keyboard) to sort these categories based on the instructions. The theory underlying the test is that if there is an implicit bias or preference for White (relative to Black) people, the responses will be faster and more accurate when the White and "Good" words are associated with the same keyboard key and Black and "Bad" words are associated with another key, than if the White and "Bad" words are associated with the same key, and Black and "Good" words are associated with another key. Systematic reviews have attested to the reliability and validity of the IAT (Lane et al., 2007; Greenwald et al., 2009). See Xu et al. (2014) for more description of the test and these measures.

I use IAT data from U.S. residents 18 years of age or older in the fifty states (plus D.C.) whose county of residence was identified. To reduce outliers and statistical noise in the measures, I drop observations if they did not have an IAT score combined over all IAT blocks on the assessment or if the test reported an error percent of 40% or greater, similar to the approach taken in prior work (Johnson & Chopik, 2019). Prior work finds negligible differences between the implicit bias of teachers and similar nonteachers (Starck et al., 2020), so the community aggregate implicit bias measures serve as a reasonable proxy for educator implicit bias as well.

For the majority of respondents, the IAT includes a measure of explicit bias based on two questions: 1) *Please rate how warm or cold you feel toward the following groups (0=coldest feelings, 5 = neutral, 10=warmest feelings): African Americans,* and 2) *Please rate how warm or cold you feel toward the following groups (0=coldest feelings, 5 = neutral, 10=warmest feelings): European Americans.* The explicit bias measure is the difference between warmth towards European Americans and towards African Americans, such that higher values indicate greater bias in favor of European Americans.

The IAT data are collected through a voluntary web-based sample, so the data are not nationally representative. To create a more geographically representative estimate of local implicit and explicit bias, I use post-stratification (Little, 1993). I group respondents into eight bins based on age group (18 to 24 or 25 and older) and educational attainment (less than high school, high school degree, some college or an associate's degree, and a bachelor's degree or higher), and I assign responses a greater weight based on their relative representation in their county. I pool the IAT data across years (2009 and 2015), and use county-level age and educational attainment from the American Community Survey 5-year rolling estimates for 2015-2017. The post-stratification process is done separately for the implicit and explicit bias

measures, as some respondents may have provided responses for part of the data collection but not others.[4] As a further effort to ensure the results are not driven by small numbers of individuals responding to the IAT, I exclude geographic district observations for which there were fewer than ten IAT responses for both the explicit and implicit measures.[5]

The implicit and explicit bias measures used in this study focus on preferences for White people over Black people, specifically. Although implicit bias for White people over Black people is moderately correlated with implicit preferences for Whites over Hispanic/Latinx people (Blair et al., 2013), I hypothesize that there will be a stronger relationship between the measures of bias used in this study and the Black-White gap measures, than the Hispanic/Latinx-White gap measures.

This study focuses on the geographic-district level for a variety of reasons. Firstly, a variety of control variables are available over-time, from SEDA, at the geographic district-level but not the school-level,[6] which combines the results for all public schools (including charter schools) in the geographic boundaries of that district. Further, the key outcome measures (racial/ethnic gaps in AP and DE participation) require non-trivial numbers of students (at least 20) in more than one racial group, so I prioritized district-level analyses due to the ability to include a greater number of complete districts, than I could by focusing on the school-level. I acknowledge that, theoretically, a student's access to AP or DE is going to be more directly affected by whether it is offered at their particular school. However, district resource allocation

[4] Earlier years of the ACS data were not practical for my purposes here, due to a lack of the detail needed to create all the post stratification cells (e.g. earlier years did not break out educational attainment for individuals aged 18-24).
[5] I also test the sensitivity of the results to using a higher threshold (20 responses on both the implicit and explicit bias measures). The results are nearly substantively similar and are available from the author by request.
[6] I focus the analyses at the district-level due to the lack of some covariates at the school-level. Specifically, the SEDA data include an SES composite measure – and racial/ethnic gaps therein – at the district- but not the school-level.

(e.g. distribution of high quality teachers) likely plays a role in access to AP and DE across schools, and by focusing on within-school gaps only, we may miss important differences in AP and DE participation due to the types of schools that students from marginalized racial/ethnic groups are assigned to or able to attend.

To create geographic district-level outcome measures, I begin with school-level data from the U.S. Department of Education's Civil Rights Data Collection (CRDC), and exclude schools with zero students in grades 10-12, juvenile justice system/Department of Justice system schools, alternative education schools, virtual schools, and special education schools, resulting in 26,406 schools in 13,269 districts. These schools were excluded due to their lower likelihood of offering AP and DE than a typical high school. The school data are summarized at the geographic district level, including traditional public schools, magnet schools, and charter schools within the geographic boundaries of the district, as defined by the Stanford Education Data Archive (SEDA) data (Reardon et al., 2021). To reduce the influence of outliers such as schools with very little racial/ethnic diversity, and to be consistent with the available data from SEDA, the analyses that compare Black-White or Hispanic/Latinx-White gaps in AP or DE outcomes are limited to districts that had at least 20 students of both racial/ethnic groups enrolled in grades 10-12. This 20-student requirement also reflects the number of students required in each group for the SEDA-calculated achievement gaps, used as covariates in the analysis (Fahle et al., 2021). This limits the samples further, reflecting that U.S. school districts are still substantially racially segregated.[7]

I use a robust set of geographic district-level covariates from the American Community

[7] There are almost 8,000 districts with fewer than 20 Black students in grades 10-12, more than 900 districts with fewer than 20 White students in grades 10-12, and about 7,000 districts with fewer than 20 Hispanic/Latinx students in grades 10-12.

Survey's (ACS) Education Demographic and Geographic Estimates (EDGE) web portal,[8] and the National Center for Education Statistics' (NCES) Common Core of Data (CCD),[9] provided by SEDA.[10] The SEDA also includes district location type (urban, suburban, town, or rural) and district demographics such as the percent of students who are free- and reduced-price lunch (FRL) eligible, the percent who are receiving special education services, eighth grade math achievement, and racial/ethnic academic eighth grade math achievement gaps.[11]

The SEDA includes a socio-economic status (SES) composite index, calculated from ACS data including median family income, the proportion of adults with at least a bachelor's degree, the unemployment rate, the household poverty rate, the proportion of households receiving Supplemental Nutrition Assistance Program (SNAP) benefits, and the proportion of households with children headed by a single mother. SEDA provides SES composites for Black, White, and Hispanic/Latinx families separately, as well as two gap measures: the White-Black SES gap and the White- Hispanic/Latinx SES gap, indicating levels of economic disparity within the community.

These data are further supplemented with CCD enrollment data by grade, used to create the denominators of the AP and DE participation rates (based on the number of 10^{th}-12^{th} graders in each district. CCD data are also used to calculate the racial/ethnic representation of the district (percent White, percent Black, percent Hispanic/Latinx, and percent from other races).[12]

---

[8] The ACS EDGE data are available for download at https://nces.ed.gov/programs/edge/Demographic/ACS.
[9] The CCD data are available for download at https://nces.ed.gov/ccd/ccddata.asp.
[10] The SEDA data are available for download at https://cepa.stanford.edu/seda/data-archive.
[11] I use the grade-cohort standardized scale such that a 1-unit change is equivalent to a one-grade level difference in average performance, comparable across districts.
[12] Given the analytic approach, which focuses on comparing outcomes in districts with at least 20 students in each of two different racial/ethnic backgrounds, I unfortunately would have very little ability to analyze access gaps for various Asian, Pacific Islander, indigenous, or other racial/ethnic groups. I recognize that excluding these groups from the analysis further marginalizes groups that are already often "othered," excluded, and marginalized and encourage future research that centers and is better able to address advanced coursework access for these groups of students.

To answer the research questions, I use a series of multivariate regression models predicting AP- and DE-related outcomes as a function of observable district and community characteristics, using the following equation:

$$Y_{dt} = \alpha_0 + \boldsymbol{\alpha_1} implicit\_bias_d + \boldsymbol{\alpha_2} explicit\_bias_d + \boldsymbol{X_{dt}\alpha_3} + \boldsymbol{\delta_s} + \boldsymbol{\theta_t} + \varepsilon_{dt} \quad (1)$$

Y_{dt} is one of several AP- or DE-related outcome measures: 1) the proportion of 10th-12th graders in geographic district *d* in year *t* enrolled in at least one AP or DE,[13] 2) absolute risk differences (ARD) indicating White-Black and White-Hispanic/Latinx differences in AP course-taking and DE, and 3) relative risk ratios (RRR) indicating White-Black and White-Hispanic/Latinx differences in AP course-taking and DE.

As an example, the White/Black ARD of exposure to at least one AP course equals the percent of White students (in this case, in grades 10-12 in geographic district *d* and year *t)* enrolled in at least one AP course, minus the percent of Black students (in grades 10-12 in geographic district *d* and year *t)* enrolled in at least one AP course. The RRR is calculated by dividing – rather than subtracting – these rates. For the ARD, zero indicates equal rates of exposure, and for the RRR, a value of one indicates equal rates of exposure. In both cases, greater values indicate that White students are overrepresented at greater rates, relative to Black students. It is recommended to report the results using both the relative and the absolute risks, (Noordzij et al., 2017; Shores et al., 2020).

The coefficients $\alpha_1$and α_2 represent the main relationships of interest. The measures $implicit\_bias_d$ and $explicit\_bias_d$ are based on county-level measures, pooled over time, post-

[13] More precisely, one cannot determine from the CRDC data the precise grade level of those enrolled in AP courses, so the proportion represents the number of students in AP overall divided by the number of students in grades 10-12. I use enrollment in grades 10-12 as the denominator in the calculations of these proportions, to approximate a share among the grades in which students are more likely to be enrolled in AP. Very few AP students are in ninth grade or below.

stratified and linked to the geographic district-level data.[14] Due to a moderate correlation between these measures (r = 0.55 in the analytic sample) and concerns about multicollinearity, I test the results using one measure at a time as well.

$\boldsymbol{X_{dt}}$ is a vector of geographic district-by-year level observable characteristics, including the log of student enrollment in grades 10-12, indicators for locale type (urban, suburban, or town, relative to rural), the percent of students that are in special education, the percent Black, percent Hispanic/Latinx, and percent of other non-White race[15], eighth grade math achievement and racial/ethnic gaps in eighth grade math achievement, SES index, and racial/ethnic SES gaps. In some models, I exclude the district level achievement, achievement gaps, SES composite index, and SES gaps provided by SEDA, because the gap measures are only available for districts with at least 20 students in each of the groups being compared, which limits the sample size.

I control for time-invariant differences across states using state fixed effects, $\boldsymbol{\delta_s}$ and for nation-wide differences across time using year fixed effects, $\boldsymbol{\theta_t}$. Finally, ε_{dt} is the idiosyncratic error term, clustered at the state level. For ease of interpretation, all continuous variables (e.g. everything except for the state fixed effects, year fixed effects, and urbanicity indicators) are in standard deviation units (i.e., standardized to have a mean of zero and standard deviation of one).

[14] The Project Implicit data are pooled across years. In some cases, particularly in rural areas, some geographic school districts serve multiple counties or parts thereof. In these instances, IAT data for all counties served were averaged to create the community level IAT measure for the district. When combining county level implicit and explicit bias measures to the geographic district level, it would be intuitive to do so by weighting based on the relative proportion of students in the district that come from each county. Unfortunately, the NCES geographic relationship files used to link geographic district and counties do not provide data to do so. Rather, I simply combine the post-stratified county-level measures to a geographic district level, weighting each county's contribution based on the number of respondents on the IAT from that county.

[15] Given the analytic approach, which focuses on comparing outcomes in districts with at least 20 students in each of two different racial/ethnic backgrounds, I unfortunately would have very little ability to analyze access gaps for various Asian, Pacific Islander, indigenous, or other racial/ethnic groups. I recognize that excluding these groups from the analysis further marginalizes groups that are already often "othered," excluded, and marginalized and encourage future research that centers and is better able to address advanced coursework access for these groups of students.

Descriptive statistics (prior to standardization) for the outcomes of interest are in Table 1. The mean district has about 15% of 10^{th}-12^{th} grade students participating in AP and about 14% participating in DE. White-Black gaps in AP and DE participation are larger than the White-Hispanic/Latinx gaps. Further, the AP gaps are often larger than the DE gaps, except for the White-Hispanic/Latinx DE RRR, which is greater than the related AP RRR. White students are about 2.4 times as likely to enroll in at least one AP, relative to Black students, and about 1.8 times as likely, relative to Hispanic/Latinx students. White students are about 2.2 times as likely to enroll in DE, relative to Black students, and about 1.9 times as likely, relative to Hispanic-Latinx students.

District-level AP and DE participation rates are mapped in Figures 1 and 2, respectively. Further, Figure 3 shows the district-level RRRs for participation in AP and DE. Notable in Figure 3 is the amount of districts with missing data (due to having limited racial/ethnic diversity in the district). There is regional variation in these gaps, with larger White-Hispanic/Latinx gaps in the Western U.S., and larger White-Black gaps in the Southeastern U.S.

Results

RQ1: Is community implicit or explicit bias (favoring Whites over Blacks) correlated with AP or DE participation rates, controlling for other district-level factors?

The main results from Equation (1), utilizing the outcomes related to overall participation in AP and DE, are in Table 2. The results provide marginally significant evidence that explicit racial bias is negatively correlated with AP participation rates – but not DE participation rates. For each standard deviation increase in explicit racial bias, AP participation rates are approximately 2.5% of a standard deviation lower. Implicit bias is not shown to be correlated with overall participation rates in AP and DE. The samples for the preferred models in Table 2

required at least 10 IAT responses to be included, but I test the sensitivity of the results to requiring at least 20 as well, and the results are nearly identical.[16]

Table 2 also indicates notable differences in terms of other correlates of overall AP and DE participation rates. District achievement is positively correlated with both AP and DE participation. AP participation is higher in larger districts, non-rural districts, and districts with a greater share of non-white students, while the opposite is true for DE. AP participation is higher in more socioeconomically advantaged areas, while the opposite is true for DE. Also notable, districts with greater achievement gaps and greater SES gaps tended to have higher AP participation rates overall, but this relationship was not significantly related to DE participation.

RQ2: Is community implicit or explicit bias (favoring Whites over Blacks) correlated with racial/ethnic disparities in AP or DE participation, controlling for other district-level factors?

Next, I present the results for racial/ethnic gaps in AP and DE participation. The high-overall results for Black-White gaps in AP and DE participation are in Tables 3 and 4. Implicit bias (preference for White people over Black people) is associated with greater Black-White gaps in AP participation, but not in DE participation. A one standard deviation increase in implicit racial bias is associated with approximately 4.4 to 4.5% of a standard deviation increase in the Black-White AP disparity. Table 4 provides marginally significant evidence that districts with higher explicit racial bias have greater Black-White gaps in DE participation, but this is only the case without controls for achievement, SES, and the related gaps. As hypothesized, because the bias measures are focused on bias against Black people, when looking at the results for Hispanic/Latinx-White gaps (Tables 5 and 6), the relationship is weaker and not statistically significant.

[16] Results available from author, by request.

The samples for the preferred models in Tables 3-6 required at least 10 IAT responses to be included, but I test the sensitivity of the results to requiring at least 20 as well, and the results are nearly identical, except that I find a positive and statistically significant relationship (at the 95%) confidence level, between explicit bias and DE, even though this relationship was only marginally significant (at the 90%) confidence level, in column 5 of table 4.[17]

Several of the control variables, as expected, are significantly related to the Black-White AP and DE enrollment gaps. More diverse districts (i.e. those with a smaller share of White students), tended to have larger Black-White AP gaps, but this finding generally did not hold for DE gaps. Rural districts had smaller Black-White AP gaps compared to other district types, while rural districts had larger Black-White DE gaps relative to urban settings in particular. This latter finding was only the case for the absolute risk differences, which are more influenced by base participation rates than relative risk ratios.

Higher achieving districts had larger Black-White gaps in both AP and DE. Higher SES districts had larger Black-White AP gaps, but smaller Black-White DE gaps. For both AP and DE, the Black-White gaps in participation tended to be larger where achievement gaps and SES gaps were larger, but this was not always significant for the DE outcomes.

The relationship between the control variables and Hispanic/Latinx-White gaps is generally similar to the relationship between the control variables and Black-White gaps just described. An additional notable finding is that districts with a greater share of Hispanic/Latinx students tend to have greater Hispanic/Latinx-White gaps in DE Participation.

Discussion and Conclusions

This study assessed whether community-level implicit and explicit biases are related to

[17] Results available from author, by request.

AP and DE participation, as well as racial/ethnic gaps in participation. Explicit bias was negatively correlated with overall AP participation, even controlling for a variety of other characteristics such as racial demographics, urbanicity/rurality, achievement levels and gaps, and SES status and gaps in the area. This might suggest that AP – but not DE – is more prevalent in districts where the community is biased in preference of White students in ways that encourage more tracking and categorical sorting mechanisms to provide White students elite and prestigious opportunities. This would be consistent with an opportunity hoarding hypothesis (Lewis & Diamond, 2015; Tilly, 1999). This concept has been used to describe behaviors by which some parents (e.g., White or higher SES parents) seek to protect and maintain the best possible educational opportunities for their children while excluding others from those same opportunities. Lewis and Diamond (2015) and Kelly and Price (2011) have attributed racialized tracking and advanced coursework disparities to opportunity hoarding, and Rodriguez and McGuire (2019) have applied this concept specifically to AP coursework. The findings, here, related to AP – but generally not DE – continue to support this theory. Further, given the elitist origins of AP (Naff et al., 2021), it is intuitive that this is occurring primarily for AP but not DE.

Also related to this opportunity hoarding hypothesis, more disparate districts (ie., those with greater achievement gaps and SES gaps), have higher AP participation overall but that this does not hold true for DE. Thus, when comparing the results for AP and DE participation rates overall, it appears that an opportunity hoarding hypothesis better explains overall participation in AP, than DE.

Beyond overall participation rates, the main interest was in racial and ethnic gaps in AP and DE participation, and whether bias may be driving these gaps. Given that the measures of bias focused on preference for Whites over Blacks specifically, it is not surprising to find more

statistically significant associations between bias and participation gaps for Black and White students, than for Hispanic/Latinx and White students. Greater implicit bias is associated with larger White-Black gaps in AP, but not DE, and implicit bias for Whites over Blacks is not associated with White-Hispanic/Latinx gaps. Implicit bias predicted Black-White AP gaps even controlling for Black-White achievement gaps and socioeconomic disparities between Black and White students. There was marginally significant evidence that explicit bias was associated with greater White-Black DE participation gaps. The difference in findings for Black-White and Hispanic/Latinx-White gaps was expected due to the bias measures focusing on preference for White over Black specifically but raises further questions about how bias against Hispanic/Latinx students would relate to these outcomes. That I find more statistically significant relationships with implicit bias than explicit bias is also not surprising given the concerns about social desirability bias (Brauer et al., 2000) for the explicit measure.

This provides some, limited support, for the calls for more implicit bias training (Naff et al., 2021; Patrick et al., 2020; Rivera et al., 2019; Xu et al., 2021), however, there is still little known about the effectiveness of implicit bias and anti-racism training for educators. A review of various approaches to alleviating the impact of implicit bias in education, with a focus on student discipline (Romero et al., 2020) identified three main strategies as "promising": empathetic mindset training (Okonofua et al. 2016), motivated self-regulation (Burns et al. 2017), and prejudice habit breaking intervention (Forscher et al. 2017; Devine et al. 2012). However, the effectiveness of such interventions has primarily been tested in lab settings, and more work is needed to understand whether the results can be sustained over time, scaled up, and applied in a real-world school-based intervention as well (Lai et al., 2016).

Further, it would be naïve to focus solely on implicit bias or anti-racism training without

addressing the systemic ways in which biases get entrenched well before high school (e.g. gifted identification and academic tracking). Many scholars have discussed the role of teachers and counselors as gatekeepers to a variety of educational opportunities such as gifted coursework, Algebra I, and other advanced courses, which tends to disproportionately deny to students from historically marginalized racial and ethnic groups (Crabtree et al., 2019; Davis et al., 2013; Naff et al., 2021; Xu et al., 2021). School and district leaders can play an important role in setting the expectations and culture around equity and access in the school community (Mayer & Tucker, 2010; Oakes & Lipton, 1992; Theoharis, 2010), and should provide opportunities for educators in their schools to learn about ways to dismantle the barriers to access, such as universal screening (Card & Giuliano, 2016), diverse assessments of ability that do not rely on solely Eurocentric views of ability (Ford, 2016), and professional development to increase awareness of what giftedness looks like in students with a diverse set of linguistic and racial/ethnic backgrounds (Allen, 2017; Ford, 2016; Milner & Ford, 2007).

This study has a few important limitations, leading to suggestions for continued research. First, the Project Implicit data are useful as a starting point for investigating the role of implicit and explicit bias, but are not available for all counties and districts and are not of a representative sample of residents in those areas. Further, I did not limit the IAT data to educators, so for a variety of reasons, these results are not able to speak to the direct impact of teacher bias. A nation-wide dataset of measures specific to preference for Whites over Hispanic/Latinx people was not available. Therefore, future research should explore IAT data from a representative sample of teachers and with respect to different racial/ethnic groups.

Further, this study was not able to investigate another potential mechanism – the lack of teacher diversity – because there is not systematically reported data on teacher diversity for all

districts in the country. If the Office for Civil Rights began systematically collecting this information from schools and districts, it would enable a more robust set of analyses in the future.

Finally, this study is not able to assess whether the relationship between implicit and explicit bias is causal, nor the underlying mechanisms driving that relationship. Qualitative and mixed-methods work to further investigate the ways in which biases relate to academic outcomes would be useful for designing more effective practices such as implicit bias or anti-racism training that attends to the specific causal mechanisms.

References

Allen, J. K. (2017). Exploring the role teacher perceptions play in the underrepresentation of culturally and linguistically diverse students in gifted programming. *Gifted Child Today*, *40*(2), 77-86.

Blair, I. V., Havranek, E. P., Price, D. W., Hanratty, R., Fairclough, D. L., Farley, T., Hirsh, H. K., & Steiner, J. F. (2013). Assessment of biases against Latinos and African Americans among primary care providers and community members. *American Journal of Public Health, 103*(1), 92-98.

Boser, U. (2014). *Teacher diversity revisited: A new state-by-state analysis.* Center for American Progress. Retrieved from: https://files.eric.ed.gov/fulltext/ED564608.pdf

Brauer, M., Wasel, W., & Niedenthal, P. (2000). Implicit and explicit components of prejudice. *Review of General Psychology*, *4*(1), 79-101.

Burns, M. D., Monteith, M. J., & Parker, L. R. (2017). Training away bias: The differential effects of counterstereotype training and self-regulation on stereotype activation and application. *Journal of Experimental Social Psychology*, *73*, 97-110.

Card, D., & Giuliano, L. (2016). Universal screening increases the representation of low-income and minority students in gifted education. *Proceedings of the National Academy of Sciences*, *113*(48), 13678-13683.

Chin, M. J., Quinn, D. M., Dhaliwal, T. K., & Lovison, V. S. (2020). Bias in the air: A nationwide exploration of teachers' implicit racial attitudes, aggregate bias, and student outcomes. *Educational Researcher*, *49*(8), 566-578.

Cisneros, J., Holloway-Libell, J., Gomez, L. M., Corley, K. M., & Powers, J. M. (2014). The Advanced Placement opportunity gap in Arizona: Access, participation, and

success. *AASA Journal of Scholarship and Practice*, *11*(2), 20-33.

Conger, D., Long, M. C., & Iatarola, P. (2009). Explaining race, poverty, and gender disparities in advanced course-taking. *Journal of Policy Analysis and Management, 28*(4), 555–576.

Copur-Gencturk, Y., Cimpian, J. R., Lubienski, S. T., & Thacker, I. (2019). Teachers' bias against the mathematical ability of female, Black, and Hispanic students. *Educational Researcher*, *49*(1), 30-43.

Crabtree, L. M., Richardson, S. C., & Lewis, C. W. (2019). The gifted gap, STEM education, and economic immobility. *Journal of Advanced Academics*, *30*(2), 203-231.

Daumeyer, N. M., Onyeador, I. N., Brown, X., & Richeson, J. A. (2019). Consequences of attributing discrimination to implicit vs. explicit bias. *Journal of Experimental Social Psychology*, *84*. https://doi.org/10.1016/j.jesp.2019.04.010

Davis, P., Davis, M. P., & Mobley, J. A. (2013). The school counselor's role in addressing the advanced placement equity and excellence gap for African American students. *Professional School Counseling*, *17*(1), 32-29.

Devine, P. G., Forscher, P. S., Austin, A. J., & Cox, W. T. (2012). Long-term reduction in implicit race bias: a prejudice habit-breaking intervention. *Journal of Experimental Social Psychology, 48*(6), 1267–1278. https://doi.org/10.1016/j.jesp.2012.06.003

Dovidio, J. F., Kawakami, K., & Gaertner, S. L. (2002). Implicit and explicit prejudice and interracial interaction. *Journal of Personality and Social Psychology*, *82*(1), 62.

Fahle, E. M., Chaves, B., Kalogrides, D., Shear, B. R., Reardon, S.F., & Ho, A. D. (2021). *Stanford Education Data Archive: Technical Documentation (Version 4.1).* Retrieved from: https://stacks.stanford.edu/file/druid:db586ns4974/seda_documentation_4.1.pdf

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their

meaning and use. *Annual Review of Psychology, 54,* 297-327.

Fink, J. (2018). How does access to dual enrollment and Advanced Placement vary by race and gender across states? *The Mixed Methods Blog.* Teachers College Columbia University. https://ccrc.tc.columbia.edu/easyblog/access-dual-enrollment-advanced-placement-race-gender.html

Ford, D. Y. (2016). Desegregating gifted education for culturally different students: Recommendations for equitable recruitment and retention. In J.T. DeCuir-Gunby & P. A. Schutz (Eds.), *Race and ethnicity in the study of motivation in education* (pp. 193-208). Routledge.

Forscher, P. S., Mitamura, C., Dix, E. L., Cox, W. T., & Devine, P. G. (2017). Breaking the prejudice habit: mechanisms, timecourse, and longevity. *Journal of Experimental Social Psychology, 72*, 133– 146. https://doi.org/10.1016/j.jesp.2017.04.009.

Geiser, S., & Santelices, V. (2004). *The role of advanced placement and honors courses in college admissions.* Research & Occasional Paper Series CSHE 4.04, University of California at Berkeley, Center for Studies in Higher Education.

Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, *97*(1), 17.

Iatarola, P., Conger, D., & Long, M. C. (2011). Determinants of high schools' advanced course offerings. *Educational Evaluation and Policy Analysis*, *33*(3), 340-359.

Jacoby-Senghor, D. S., Sinclair, S., & Shelton, J. N. (2016). A lesson in bias: The relationship between implicit racial bias and performance in pedagogical contexts. *Journal of Experimental Social Psychology*, *63*, 50-55.

Johnson, D. J., & Chopik, W. J. (2019). Geographic variation in the Black-violence stereotype. *Social Psychological and Personality Science*, *10*(3), 287-294.

Kalogrides, D., & Loeb, S. (2013). Different teachers, different peers: The magnitude of student sorting within schools. *Educational Researcher*, *42*(6), 304-316.

Kelly, S., & Carbonaro, W. (2012). Curriculum tracking and teacher expectations: Evidence from discrepant course taking models. *Social Psychology of Education*, *15*(3), 271-294.

Kelly, S., & Price, H. (2011). The correlates of tracking policy: Opportunity hoarding, status competition, or a technical-functional explanation? *American Educational Research Journal*, *48*(3), 560-585.

Klopfenstein, K. (2004). Advanced Placement: Do minorities have equal opportunity? *Economics of Education Review*, *23*(2), 115-131.

Kubitschek, W. N., & Hallinan, M. T. (1998). Tracking and students' friendships. *Social Psychology Quarterly*, 1-15.

Lai, C. K., Skinner, A. L., Cooley, E., Murrar, S., Brauer, M., Devos, T., ... & Nosek, B. A. (2016). Reducing implicit racial preferences: II. Intervention effectiveness across time. *Journal of Experimental Psychology: General*, *145*(8), 1001.

Lane, K. A., Banaji, M. R., Nosek, B. A., & Greenwald, A. G. (2007). Understanding and using the Implicit Association Test: IV: What we know (so far) about the method. In B. Wittenbrink & N. Schwartz (Eds.), *Implicit Measures of Attitudes* (pp. 59-102). The Guilford Press.

Legette, K. (2020). A social-cognitive perspective of the consequences of curricular tracking on youth outcomes. *Educational Psychology Review*, *32*(3).

Lewis, A. E., & Diamond, J. B. (2015). *Despite the best intentions: How racial inequality thrives*

in good schools. New York, NY: Oxford University Press.

Little, R. J. (1993). Post-stratification: a modeler's perspective. *Journal of the American Statistical Association*, *88*(423), 1001-1012.

Mayer, A. P., & Tucker, S. K. (2010). Cultivating students of color: Strategies for ensuring high academic achievement in middle and secondary schools. *Journal of School Leadership*, *20*(4), 470-490.

Milner, H. R., & Ford, D. Y. (2007). Cultural considerations in the underrepresentation of culturally diverse elementary students in gifted education. *Roeper Review*, *29*(3), 166-173.

Morgan, T. L., Zakhem, D., & Cooper, W. L. (2018). From high school access to postsecondary success: An exploratory study of the impact of high-rigor coursework. *Education Sciences*, *8*(4), 191.

Naff, D., Parry, M., Ferguson, T., Palencia, V., Lenhardt, J., Tedona, E., ... & Baber, E. (2021). *Analyzing Advanced Placement (AP): Making the Nation's Most Prominent College Preparatory Program More Equitable*. Metropolitan Educational Research Consortium (MERC), Virginia Commonwealth University School of Education. https://scholarscompass.vcu.edu/merc_pubs/121/

National Center for Education Statistics (NCES). (2019). *Dual Enrollment: Participation and Characteristics.* NCES 2019-176. https://nces.ed.gov/pubs2019/2019176.pdf

National Center for Education Statistics (NCES). (2020). Table 203.10: Enrollment in public elementary and secondary schools, by level and grade: Selected years, fall 1980 through fall 2029. *Digest of Education Statistics.*

Noordzij, M., van Diepen, M., Caskey, F. C., & Jager, K. J. (2017). Relative risk versus absolute

risk: one cannot be interpreted without the other. *Nephrology Dialysis Transplantation*, *32*(suppl_2), ii13-ii18.

Oakes, J., & Lipton, M. (1992). Detracking schools: Early lessons from the field. *The Phi Delta Kappan*, *73*(6), 448-454.

Okonofua, J. A., Paunesku, D., & Walton, G. M. (2016). Brief intervention to encourage empathic discipline cuts suspension rates in half among adolescents. *Proceedings of the National Academy of Sciences*, *113*(19), 5221-5226.

Patrick, K., Socol, A. R., & Morgan, I. (2020). *Inequities in Advanced Coursework: What's Driving them and What Leaders Can Do.* The Education Trust. https://edtrust.org/resource/inequities-in-advanced-coursework/

Payne, B. K., Vuletich, H. A., & Lundberg, K. B. (2017). The bias of crowds: How implicit bias bridges personal and systemic prejudice. *Psychological Inquiry*, *28*, 233–248.

Pearman, F. A. (2020). *Collective Racial Bias and the Black-White Test Score Gap.* CEPA Working Paper No. 20-01. Stanford Center for Education Policy Analysis.

Piontek, M. E., Kannapel, P. J., Flory, M., & Stewart, M. S. (2016). The implementation of dual credit programs in six nonurban Kentucky school districts.

Planty, M., Provasnik, S., & Daniel, B.. *High School Coursetaking: Findings from The Condition of Education 2007*. NCES 2007-065. National Center for Education Statistics. Retrieved from https://files.eric.ed.gov/fulltext/ED497123.pdf

Reardon, S. F., Ho, A. D., Shear, B. R., Fahle, E. M., Kalogrides, D., Jang, H., & Chavez, B. (2021). *Stanford Education Data Archive (Version 4.0).* Retrieved from http://purl.stanford.edu/db586ns4974.

Riddle, T., & Sinclair, S. (2019). Racial disparities in school-based disciplinary actions are

associated with county-level rates of racial bias. *Proceedings of the National Academy of Sciences*, *116*(17), 8255-8260.

Rivera, L. E., Kotok, S., & Ashby, N. (2019). Access to dual enrollment in the United States: Implications for equity and stratification. *Texas Education Review, 7*(2), 14-29.

Rodriguez, A. (June 29, 2019). 'Latinx' explained: A history of the controversial word and how to pronounce it. *USA Today.* https://www.usatoday.com/story/news/nation/2019/06/29/latina-latino-latinx-hispanic-what-do-they-mean/1596501001/

Rodriguez, A., & McGuire, K. M. (2019). More classes, more access? Understanding the effects of course offerings on Black-White gaps in Advanced Placement course-taking. *The Review of Higher Education*, *42*(2), 641-679.

Romero, L. S., Scahill, V., & Charles, S. R. (2020). Restorative approaches to discipline and implicit bias: looking for ways forward. *Contemporary School Psychology*, *24*(3), 309-317.

Rose H., & Betts J.R. (2004). The effect of high school courses on earnings. *The Review of Economics and Statistics, 86*(2), 497–513.

Santoli, S. P. (2002). Is there an Advanced Placement advantage? *American Secondary Education*, 23-35.

Shores, K., Kim, H. E., & Still, M. (2020). Categorical inequality in Black and White: Linking disproportionality across multiple educational outcomes. *American Educational Research Journal, 57*(5), 2089–2131.

Speroni, C. (2011). *Determinants of Students' Success: The Role of Advanced Placement and Dual Enrollment Programs.* Working Paper. National Center for Postsecondary

Research.

Starck, J. G., Riddle, T., Sinclair, S., & Warikoo, N. (2020). Teachers are people too: Examining the racial bias of teachers compared to other American adults. *Educational Researcher*, *49*(4), 273-284. https://doi.org/10.3102/0013189X20912758

Steffens, M. C., & Buchner, A. (2003). Implicit Association Test: separating transsituationally stable and variable components of attitudes toward gay men. *Experimental Psychology*, *50*(1), 33.

Theoharis, G. (2010). Disrupting injustice: Principals narrate the strategies they use to improve their schools and advance social justice. *Teachers College Record*, *112*(1), 331-373.

Thomas, N., Marken, S., Gray, L., & Lewis, L. (2013). *Dual Credit and Exam-Based Courses in US Public High Schools: 2010-11. First Look.* NCES 2013-001. National Center for Education Statistics.

Tilly, C. (1999). *Durable inequality*. Berkeley: University of California Press.

U.S. Department of Education, Office for Civil Rights. (n.d.*) 2015-16 State and National Estimations.* Available at https://ocrdata.ed.gov/estimations/2015-2016

Xu, D., Solanki, S., & Fink, J. (2021). College acceleration for all? Mapping racial gaps in Advanced Placement and dual enrollment participation. *American Educational Research Journal*, *58*(5), 954-992. https://doi.org/10.3102/0002831221991138

Xu, K., Nosek, B., & Greenwald, A.G. (2014). Data from the Race Implicit Association Test on the Project Implicit Demo Website. *Journal of Open Psychology, 2*(1). DOI: http://dx.doi.org/10.5334/jopd.ac

Zimmer, R. (2003). A new twist in the educational tracking debate. *Economics of Education Review*, *22*(3), 307-315.

Table 1. Descriptive statistics: Advanced Placement and Dual Enrollment participation

	n	M	SD	Min	Max
AP Participation Rates	43,252	0.15	0.16	0.00	1.00
DE Participation Rate	25,385	0.14	0.18	0.00	1.00
White-Black AP ARD	12,582	0.13	0.12	-1.00	0.92
White-Black DE ARD	6,431	0.06	0.09	-0.84	0.83
White-Black AP RRR	11,930	2.38	2.00	0.00	100.15
White-Black DE RRR	5,117	2.23	2.74	0.00	141.08
White-Hispanic/Latinx AP ARD	16,042	0.09	0.11	-0.89	0.97
White-Hispanic/Latinx DE ARD	8,506	0.05	0.09	-0.62	0.80
White-Hispanic/Latinx AP RRR	15,227	1.79	1.33	0.00	40.72
White-Hispanic/Latinx DE RRR	6,859	1.88	4.94	0.00	384.62

Note. AP = Advanced Placement, DE = Dual Enrollment, ARD = Absolute Risk Difference, and RRR = Relative Risk Ratio.

Table 2. Overall AP and dual enrollment participation

	Std. Geographic District Share of 10th-12th Grade Enrolled in At Least One AP Course			Std. Geographic District Share of 10th-12th Grade Participating in Dual Enrollment		
	(1)	(2)	(3)	(4)	(5)	(6)
Std. Implicit Racial Bias	0.006	-0.005		0.013	0.009	
	(0.011)	(0.012)		(0.016)	(0.016)	
Std. Explicit Racial Bias	-0.025*		-0.023*	-0.009		-0.005
	(0.013)		(0.013)	(0.012)		(0.012)
Std. Student Enrollment (Gr. 10-12)	0.023*	0.023*	0.023*	-0.011*	-0.011*	-0.011*
	(0.013)	(0.013)	(0.013)	(0.006)	(0.006)	(0.006)
Std. % Special Education	-0.034*	-0.035*	-0.034*	-0.058***	-0.058***	-0.057***
	(0.019)	(0.019)	(0.019)	(0.017)	(0.017)	(0.017)
Std. % Black	0.082***	0.087***	0.081***	-0.034**	-0.032**	-0.037**
	(0.018)	(0.017)	(0.017)	(0.013)	(0.013)	(0.014)
Std. % Hispanic/Latinx	0.083***	0.083***	0.083***	-0.072***	-0.072***	-0.072***
	(0.028)	(0.027)	(0.028)	(0.024)	(0.024)	(0.024)
Std. % Other Race	0.108***	0.110***	0.108***	-0.040**	-0.039**	-0.039**
	(0.030)	(0.030)	(0.030)	(0.016)	(0.016)	(0.016)
Urban	0.541***	0.540***	0.542***	-0.112**	-0.112**	-0.110**
	(0.047)	(0.047)	(0.046)	(0.044)	(0.044)	(0.045)
Suburban	0.381***	0.382***	0.381***	-0.096**	-0.095**	-0.095**
	(0.041)	(0.041)	(0.041)	(0.036)	(0.036)	(0.036)
Town	0.202***	0.203***	0.203***	-0.058**	-0.058**	-0.057**
	(0.036)	(0.036)	(0.036)	(0.026)	(0.026)	(0.026)
Std. Eighth Grade Math Test Scores	0.186***	0.187***	0.186***	0.057***	0.057***	0.057***
	(0.020)	(0.020)	(0.020)	(0.016)	(0.016)	(0.016)
Std. Gr. 8 Math Test Score Gap (Wh-Bl)	0.054***	0.054***	0.054***	0.002	0.002	0.002
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
Std. Gr. 8 Math Test Score Gap (Wh-Hi)	0.002	0.002	0.002	0.004	0.004	0.004
	(0.011)	(0.011)	(0.011)	(0.015)	(0.015)	(0.015)
Std. SES Composite Index	0.338***	0.339***	0.338***	-0.080***	-0.079***	-0.081***
	(0.024)	(0.024)	(0.024)	(0.014)	(0.014)	(0.014)
Std. SES Gap (Wh-Bl)	0.050***	0.050***	0.050***	-0.011	-0.011	-0.011
	(0.015)	(0.015)	(0.015)	(0.009)	(0.009)	(0.009)
Std. SES Gap (Wh-Hi)	0.021**	0.021**	0.022**	0.021	0.021	0.021
	(0.008)	(0.008)	(0.008)	(0.012)	(0.012)	(0.012)
Constant	0.012	0.012	0.011	-0.683***	-0.683***	-0.684***
	(0.049)	(0.048)	(0.049)	(0.069)	(0.069)	(0.069)
Observations	18,580	18,580	18,580	11,198	11,198	11,198
Adj. R-squared	0.366	0.366	0.366	0.261	0.261	0.261

Note. All models include state and academic year fixed effects. All variables except for urban, suburban, and town indicators are in standard deviation units. Heteroskedastic-robust standard errors, clustered at the state level, are in parentheses. "Wh-Bl" indicates White-Black and "Wh-Hi" indicates "White-Hispanic/Latinx. *** p<0.01, ** p<0.05, * p<0.1

Table 3. White-Black gaps in AP participation

	Std. Geographic District-Level Absolute Risk Difference: Black-White AP Participation				Std. Geographic District-Level Relative Risk Ratio: Black-White AP Participation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Std. Implicit Racial Bias	0.010	0.047**	0.044**		-0.006	0.015	0.009	
	(0.023)	(0.021)	(0.019)		(0.024)	(0.029)	(0.026)	
Std. Explicit Racial Bias	0.004	-0.005		0.014	0.019	-0.011		-0.005
	(0.017)	(0.016)		(0.015)	(0.027)	(0.026)		(0.024)
Std. Student Enrollment (Gr. 10-12)	0.033**	0.005	0.005	0.005	-0.018**	-0.024***	-0.024***	-0.024***
	(0.016)	(0.010)	(0.010)	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)
Std. % Special Education	-0.139***	0.002	0.002	0.003	0.009	0.046***	0.046***	0.047***
	(0.027)	(0.024)	(0.024)	(0.024)	(0.013)	(0.015)	(0.015)	(0.015)
Std. % Black	0.062***	0.218***	0.218***	0.208***	0.079***	0.088***	0.090***	0.085***
	(0.021)	(0.024)	(0.024)	(0.024)	(0.016)	(0.025)	(0.025)	(0.026)
Std. % Hispanic/Latinx	0.001	0.188***	0.188***	0.188***	-0.024	0.005	0.005	0.005
	(0.034)	(0.025)	(0.025)	(0.025)	(0.016)	(0.020)	(0.020)	(0.020)
Std. % Other Race	0.121***	0.007	0.008	0.007	0.030*	-0.002	-0.001	-0.002
	(0.041)	(0.030)	(0.030)	(0.030)	(0.018)	(0.014)	(0.014)	(0.014)
Urban	0.734***	0.494***	0.494***	0.503***	0.264***	0.155***	0.154***	0.158***
	(0.078)	(0.062)	(0.062)	(0.064)	(0.042)	(0.039)	(0.039)	(0.038)
Suburban	0.504***	0.290***	0.290***	0.294***	0.106**	0.108***	0.108***	0.110***
	(0.064)	(0.038)	(0.038)	(0.039)	(0.049)	(0.038)	(0.038)	(0.037)
Town	0.287***	0.270***	0.270***	0.274***	0.290***	0.222***	0.222***	0.223***
	(0.046)	(0.040)	(0.040)	(0.040)	(0.053)	(0.042)	(0.042)	(0.041)
Std. Eighth Grade Math Test Scores		0.121***	0.121***	0.122***		0.044*	0.044*	0.044*
		(0.028)	(0.028)	(0.028)		(0.025)	(0.025)	(0.025)
Std. Gr. 8 Math Test Score Gap (Wh-Bl)		0.258***	0.258***	0.258***		0.158***	0.158***	0.158***
		(0.024)	(0.024)	(0.024)		(0.023)	(0.024)	(0.023)
Std. SES Composite Index		0.304***	0.304***	0.300***		0.038	0.038	0.037
		(0.022)	(0.022)	(0.021)		(0.031)	(0.031)	(0.031)
Std. SES Gap (Wh-Bl)		0.153***	0.153***	0.151***		0.121***	0.121***	0.121***
		(0.016)	(0.016)	(0.016)		(0.013)	(0.013)	(0.013)
Constant	-0.519***	-0.509***	-0.509***	-0.514***	-0.127***	-0.146***	-0.145***	-0.147***
	(0.039)	(0.029)	(0.028)	(0.029)	(0.027)	(0.033)	(0.034)	(0.032)
Observations	11,502	9,534	9,534	9,534	10,914	9,057	9,057	9,057
Adj. R-squared	0.135	0.280	0.280	0.279	0.056	0.094	0.094	0.094

Note. All models include state and academic year fixed effects. All control variables except for urban, suburban, and town indicators are in standard deviation units. Heteroskedastic-robust standard errors, clustered at the state level, are in parentheses. "Wh-Bl" indicates White-Black. *** p<0.01, ** p<0.05, * p<0.1

Table 4. White-Black gaps in DE participation

	Std. Geographic District-Level Absolute Risk Difference: Black-White DE Participation				Std. Geographic District-Level Relative Risk Ratio: Black-White DE Participation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Std. Implicit Racial Bias	0.018	0.003	0.004		0.021	0.022	0.028	
	(0.016)	(0.016)	(0.014)		(0.014)	(0.020)	(0.022)	
Std. Explicit Racial Bias	0.004	0.002		0.003	0.029*	0.012		0.021
	(0.012)	(0.016)		(0.013)	(0.017)	(0.012)		(0.016)
Std. Student Enrollment (Gr. 10-12)	-0.029***	-0.024***	-0.024***	-0.024***	-0.021***	-0.021**	-0.021**	-0.021**
	(0.010)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)
Std. % Special Education	-0.033*	-0.031	-0.031	-0.031	-0.031	-0.024	-0.024	-0.024
	(0.018)	(0.021)	(0.021)	(0.021)	(0.033)	(0.031)	(0.030)	(0.030)
Std. % Black	0.039**	0.025	0.025	0.024	0.096**	0.138	0.137	0.133
	(0.019)	(0.024)	(0.025)	(0.025)	(0.044)	(0.091)	(0.090)	(0.087)
Std. % Hispanic/Latinx	-0.035*	-0.033	-0.033	-0.033	-0.004	0.000	0.000	0.000
	(0.021)	(0.039)	(0.039)	(0.039)	(0.017)	(0.015)	(0.015)	(0.015)
Std. % Other Race	-0.052**	-0.057**	-0.057***	-0.057**	-0.009	-0.031	-0.031	-0.031
	(0.020)	(0.021)	(0.021)	(0.021)	(0.030)	(0.053)	(0.053)	(0.053)
Urban	-0.143**	-0.158*	-0.158*	-0.157*	0.000	-0.024	-0.024	-0.019
	(0.064)	(0.086)	(0.086)	(0.087)	(0.049)	(0.058)	(0.058)	(0.060)
Suburban	-0.123**	-0.054	-0.054	-0.053	-0.018	-0.038	-0.038	-0.034
	(0.056)	(0.069)	(0.070)	(0.070)	(0.039)	(0.071)	(0.071)	(0.069)
Town	0.146**	0.071	0.071	0.072	0.133**	0.088*	0.087	0.0900*
	(0.062)	(0.070)	(0.071)	(0.070)	(0.051)	(0.051)	(0.052)	(0.051)
Std. Eighth Grade Math Test Scores		0.125***	0.125***	0.125***		0.036	0.035	0.036
		(0.030)	(0.030)	(0.030)		(0.022)	(0.022)	(0.022)
Std. Gr. 8 Math Test Score Gap (Wh-Bl)		0.029	0.030	0.030		0.082***	0.082***	0.083***
		(0.027)	(0.027)	(0.027)		(0.023)	(0.023)	(0.023)
Std. SES Composite Index		-0.108***	-0.108***	-0.108***		-0.008	-0.007	-0.010
		(0.027)	(0.027)	(0.027)		(0.034)	(0.033)	(0.032)
Std. SES Gap (Wh-Bl)		0.064***	0.064***	0.064***		-0.016	-0.016	-0.016
		(0.013)	(0.013)	(0.013)		(0.044)	(0.044)	(0.045)
Constant	-0.551***	-0.641***	-0.641***	-0.641***	-0.126**	-0.172***	-0.172***	-0.176***
	(0.071)	(0.073)	(0.073)	(0.073)	(0.050)	(0.051)	(0.052)	(0.054)
Observations	5,843	4,792	4,792	4,792	4,640	3,762	3,762	3,762
Adj. R-squared	0.158	0.159	0.159	0.159	0.032	0.032	0.033	0.032

Note. All models include state and academic year fixed effects. All variables except for urban, suburban, and town indicators are in standard deviation units. Heteroskedastic-robust standard errors, clustered at the state level, are in parentheses. "Wh-Bl" indicates White-Black. *** p<0.01, ** p<0.05, * p<0.1

Table 5. White-Hispanic/Latinx gaps in AP participation

	Std. Geographic District-Level Absolute Risk Difference: Hispanic/Latinx-White AP Participation				Std. Geographic District-Level Relative Risk Ratio: Hispanic/Latinx-White AP Participation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Std. Implicit Racial Bias	-0.006	0.004	0.008		0.021	0.025	0.025	
	(0.018)	(0.025)	(0.023)		(0.019)	(0.025)	(0.020)	
Std. Explicit Racial Bias	0.009	0.011		0.012	0.000	0.001		0.011
	(0.012)	(0.014)		(0.012)	(0.019)	(0.020)		(0.013)
Std. Student Enrollment (Gr. 10-12)	0.033**	-0.003	-0.003	-0.003	-0.014**	-0.025***	-0.025***	-0.025***
	(0.015)	(0.010)	(0.010)	(0.010)	(0.006)	(0.008)	(0.008)	(0.008)
Std. % Special Education	-0.066***	0.010	0.010	0.010	0.025	0.037***	0.037***	0.038***
	(0.021)	(0.014)	(0.015)	(0.014)	(0.015)	(0.013)	(0.013)	(0.013)
Std. % Black	0.061***	0.180***	0.178***	0.179***	0.066***	0.058*	0.058*	0.053*
	(0.022)	(0.028)	(0.028)	(0.028)	(0.019)	(0.030)	(0.030)	(0.031)
Std. % Hispanic/Latinx	0.089**	0.139***	0.139***	0.140***	0.105***	0.075**	0.075**	0.075**
	(0.043)	(0.038)	(0.038)	(0.038)	(0.031)	(0.037)	(0.037)	(0.037)
Std. % Other Race	0.068***	0.005	0.004	0.005	0.022	0.001	0.001	0.001
	(0.021)	(0.026)	(0.026)	(0.026)	(0.016)	(0.016)	(0.016)	(0.016)
Urban	0.516***	0.368***	0.368***	0.369***	0.074	0.045	0.045	0.047
	(0.078)	(0.060)	(0.060)	(0.061)	(0.077)	(0.053)	(0.053)	(0.053)
Suburban	0.298***	0.201***	0.201***	0.201***	-0.039	-0.004	-0.004	-0.004
	(0.067)	(0.046)	(0.046)	(0.046)	(0.056)	(0.049)	(0.049)	(0.050)
Town	0.187***	0.213***	0.214***	0.213***	0.102**	0.106**	0.106**	0.106**
	(0.044)	(0.035)	(0.035)	(0.035)	(0.042)	(0.041)	(0.041)	(0.041)
Std. Eighth Grade Math Test Scores		0.0440*	0.0442*	0.0439*		-0.012	-0.012	-0.012
		(0.025)	(0.025)	(0.025)		(0.026)	(0.027)	(0.026)
Std. Gr. 8 Math Test Score Gap (Wh-Hi)		0.265***	0.265***	0.265***		0.184***	0.184***	0.184***
		(0.028)	(0.028)	(0.028)		(0.024)	(0.024)	(0.024)
Std. SES Composite Index		0.233***	0.232***	0.233***		0.025	0.025	0.023
		(0.026)	(0.026)	(0.025)		(0.028)	(0.028)	(0.028)
Std. SES Gap (Wh-Hi)		0.113***	0.113***	0.113***		0.075***	0.075***	0.074***
		(0.011)	(0.011)	(0.011)		(0.011)	(0.011)	(0.010)
Constant	-0.330***	-0.388***	-0.388***	-0.388***	-0.006	-0.038	-0.038	-0.038
	(0.058)	(0.042)	(0.042)	(0.042)	(0.047)	(0.031)	(0.031)	(0.031)
Observations	14,358	11,607	11,607	11,607	13,646	11,000	11,000	11,000
Adj. R-squared	0.114	0.212	0.212	0.212	0.049	0.082	0.082	0.082

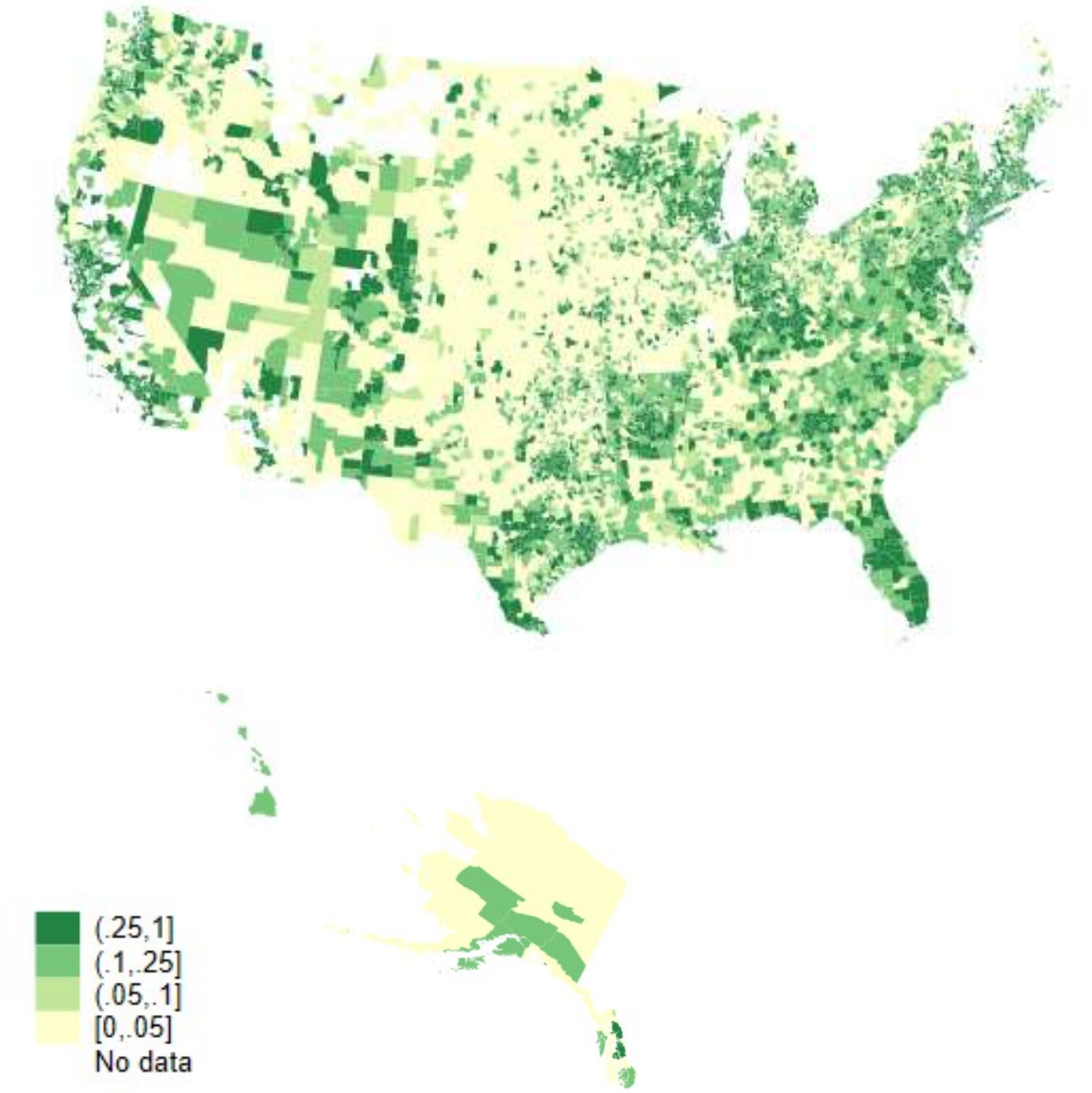
Note. All models include state and academic year fixed effects. All variables except for urban, suburban, and town indicators are in standard deviation units. Heteroskedastic-robust standard errors, clustered at the state level, are in parentheses. "Wh-Hi" indicates "White-Hispanic/Latinx. *** p<0.01, ** p<0.05, * p<0.1

Table 6. White-Hispanic/Latinx gaps in DE participation

	Std. Geographic District-Level Absolute Risk Difference: Hispanic/Latinx-White DE Participation				Std. Geographic District-Level Relative Risk Ratio: Hispanic/Latinx-White DE Participation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Std. Implicit Racial Bias	0.028	0.010	0.004		0.037	0.008	0.016	
	(0.026)	(0.015)	(0.017)		(0.037)	(0.025)	(0.021)	
Std. Explicit Racial Bias	-0.011	-0.014		-0.011	0.010	0.019		0.022
	(0.019)	(0.024)		(0.024)	(0.027)	(0.035)		(0.031)
Std. Student Enrollment (Gr. 10-12)	-0.022**	-0.021***	-0.021***	-0.021***	-0.011	-0.017	-0.018	-0.018
	(0.009)	(0.005)	(0.005)	(0.005)	(0.011)	(0.012)	(0.012)	(0.012)
Std. % Special Education	-0.021	-0.015	-0.016	-0.014	0.009	-0.001	0.000	-0.001
	(0.023)	(0.025)	(0.025)	(0.025)	(0.024)	(0.026)	(0.026)	(0.026)
Std. % Black	-0.011	-0.001	0.002	-0.003	0.007	-0.015	-0.019	-0.017
	(0.012)	(0.017)	(0.018)	(0.017)	(0.021)	(0.031)	(0.032)	(0.028)
Std. % Hispanic/Latinx	0.069***	0.074**	0.074**	0.074**	0.104***	0.117***	0.117***	0.118***
	(0.020)	(0.034)	(0.034)	(0.033)	(0.035)	(0.038)	(0.038)	(0.038)
Std. % Other Race	-0.006	-0.036*	-0.0356*	-0.0361*	0.019	0.001	0.000	0.001
	(0.024)	(0.018)	(0.018)	(0.018)	(0.016)	(0.019)	(0.019)	(0.019)
Urban	-0.180**	-0.166**	-0.166**	-0.165**	-0.037	-0.012	-0.011	-0.011
	(0.083)	(0.073)	(0.072)	(0.073)	(0.080)	(0.061)	(0.061)	(0.062)
Suburban	-0.193***	-0.151**	-0.151**	-0.151**	-0.085	-0.032	-0.032	-0.031
	(0.070)	(0.066)	(0.066)	(0.066)	(0.068)	(0.059)	(0.059)	(0.059)
Town	0.050	0.053	0.053	0.054	0.0794*	0.076	0.077	0.076
	(0.058)	(0.072)	(0.072)	(0.072)	(0.044)	(0.049)	(0.048)	(0.049)
Std. Eighth Grade Math Test Scores		0.072***	0.072***	0.072***		0.010	0.011	0.011
		(0.022)	(0.022)	(0.022)		(0.028)	(0.029)	(0.028)
Std. Gr. 8 Math Test Score Gap (Wh-Hi)		0.113***	0.112***	0.113***		0.155***	0.156***	0.155***
		(0.031)	(0.031)	(0.031)		(0.028)	(0.029)	(0.028)
Std. SES Composite Index		-0.043**	-0.042**	-0.043**		-0.015	-0.015	-0.015
		(0.020)	(0.020)	(0.020)		(0.031)	(0.031)	(0.031)
Std. SES Gap (Wh-Hi)		0.023*	0.023*	0.023*		0.044***	0.044***	0.044***
		(0.012)	(0.012)	(0.012)		(0.015)	(0.015)	(0.015)
Constant	-0.400***	-0.463***	-0.462***	-0.464***	-0.0795	-0.164***	-0.165***	-0.165***
	(0.059)	(0.067)	(0.067)	(0.067)	(0.072)	(0.051)	(0.051)	(0.051)
Observations	7,607	5,991	5,991	5,991	6,094	4,683	4,683	4,683
Adj. R-squared	0.096	0.099	0.099	0.099	0.050	0.070	0.070	0.070

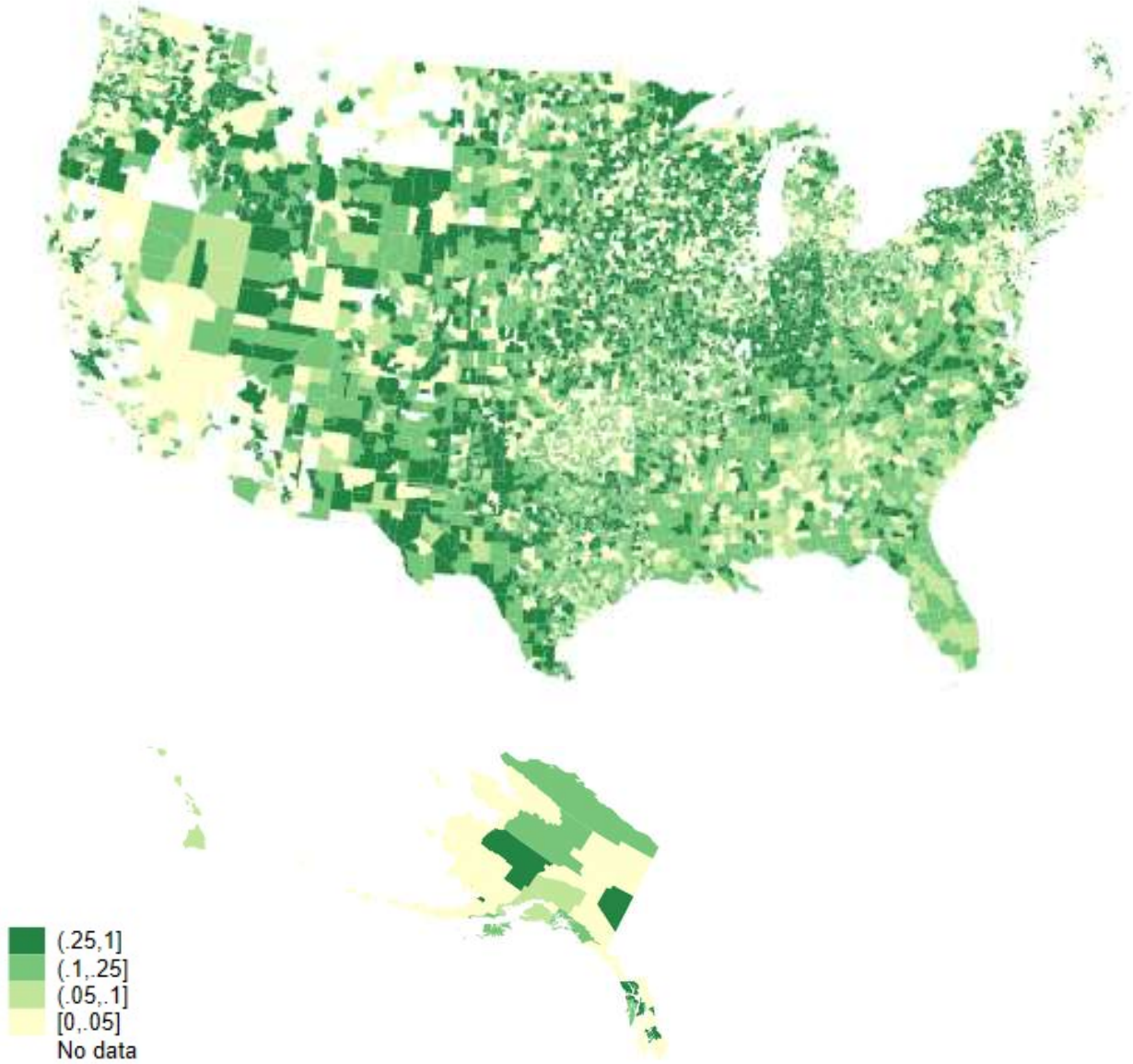
Note. All models include state and academic year fixed effects. All variables except for urban, suburban, and town indicators are in standard deviation units. Heteroskedastic-robust standard errors, clustered at the state level, are in parentheses. "Wh-Hi" indicates "White-Hispanic/Latinx.
*** p<0.01, ** p<0.05, * p<0.1

Figure 1. Advanced Placement Participation Rates, 2017-18



Note. Advanced placmenent (AP) partcpation calculated as the number of students enrolled in at least one AP course, divided by the number of 10^{th}-12^{th} graders in the district, using the 2017-18 Civil Rights Data Collection.

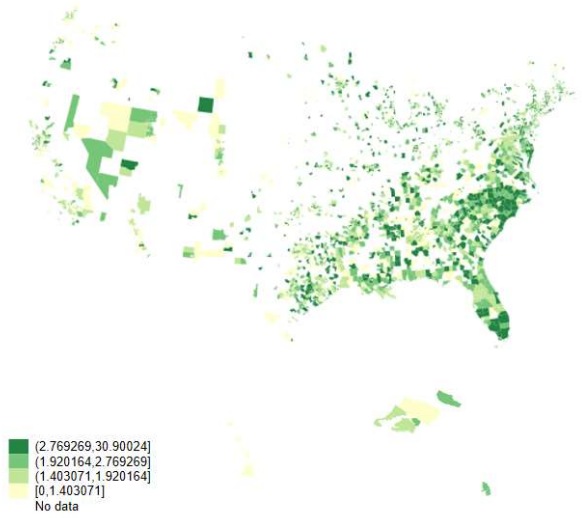
Figure 2. Dual Enrollment Rates, 2017-18



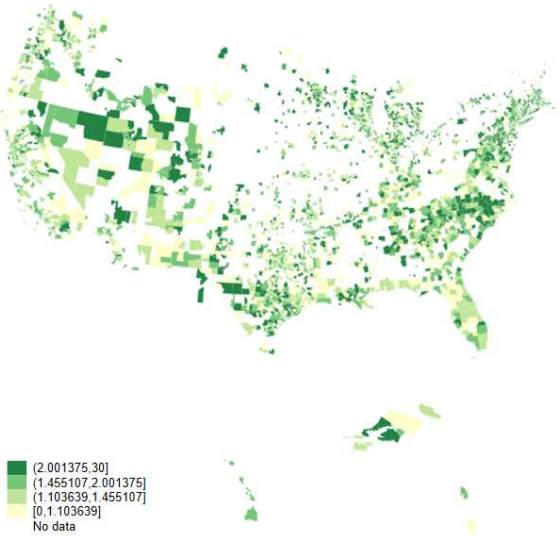
Note. Dual enrollment participation calculated as the number of participating, divided by the number of 10th-12th graders in the district, using the 2017-18 Civil Rights Data Collection.

Figure 3. White-Black and White-Hispanic/Latinx Advanced Placement and Dual Enrollment Participation Gaps, Relative Risk Ratios, 2017-18

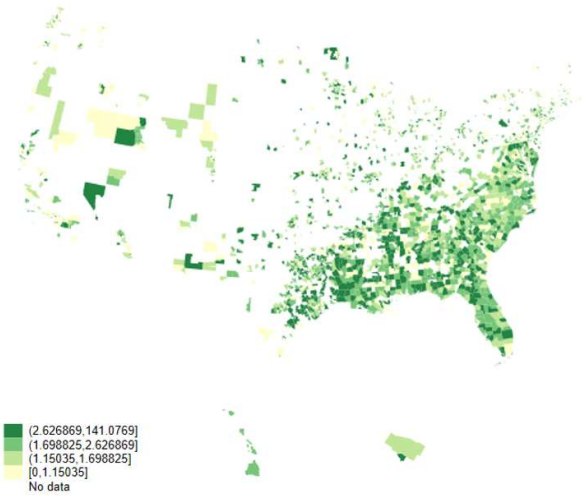
White-Black RRR for AP



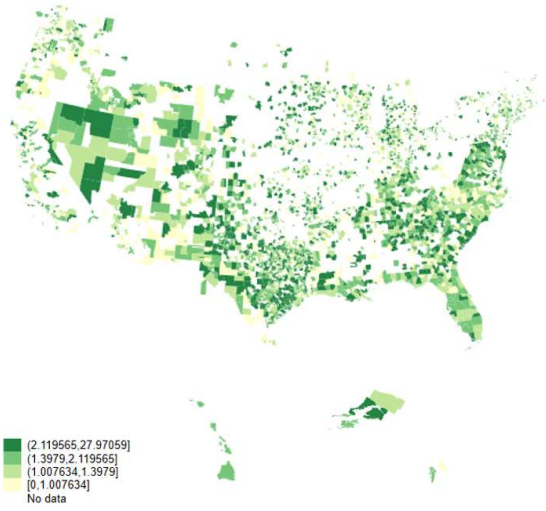
White-Hispanic/Latinx RRR for AP



White-Black RRR for DE



White-Hispanic/Latinx RRR for DE



Note. Data from the 2017-18 Civil Rights Data Collection. Relative risk ratio equals the proportion of White students enrolled divided by the proportion of Black or Hispanic/Latinx students enrolled, respectively, at the district level. Only includes districts with at least 10 students in each racial/ethnic group being compared, which is different than the criterion for inclusion in the preferred models (at least 20 of each).