HHS Public Access

Author manuscript

Psychol Sch. Author manuscript; available in PMC 2022 May 01.

Published in final edited form as:

Psychol Sch. 2021 May ; 58(5): 893–912. doi:10.1002/pits.22477.

A Multilevel Model of the Association Between School Climate and Racial Differences in Academic Outcomes

Tiffany M. Jones[1], **Charles Fleming**[2], **Research and Evaluation Team**[3]

[1]School of Social Work, Colorado State University

[2]Center for the Study of Health and Risk Behaviors, Department of Psychiatry and Behavioral Sciences, University of Washington

[3]Seattle Public Schools, John Stanford Center for Educational Excellence, Seattle, WA.

Abstract

This study examined the relationships between school-level school climate and race differences in student grades, accounting for school sociodemographic composition. We found that schools with more positive school climates had smaller race differences in student self-reported grades. The moderating effect of school climate remained after accounting for the sociodemographic composition of the school and students' own perceptions of climate at their school. This moderating effect was confounded by school grade band (i.e., elementary, middle, or high) since perception of positive school climate was lower in middle and high schools than in elementary schools. Despite the difficulty of disentangling school climate from grade band, the findings suggest school improvement strategies focused on school climate may promote racial equity in academic outcomes. School practitioners' efforts to improve the school climate may also contribute to racial equity in academics.

Keywords

School climate; racial equity; achievement gap; sociodemographic composition

Students of color, and in particular Black students, have been receiving an unequal education since schools were integrated following *Brown v. Board of Education* in 1954 (Lee, 2002; Love, 2004). The structural and institutional inequalities experienced by students of color are embodied in the existence of significant racial differences in academic outcomes (Carter et al., 2016; Ladson-Billings, 2006; Lee, 2002). Ladson-Billings (2006) suggests that the achievement gap is a problematic understanding of racial differences in achievement, but that the "education debt" is a more apt concept to capture the sociopolitical, historical, economic drivers of student difference accumulated over time, which have led to a debt owed to students of color. Most student groups of color, with the exception of some students of Asian descent, have consistently had less academic success compared to White students,

All correspondence should be addressed to Tiffany M. Jones, School of Social Work, Colorado State University, Fort Collins, CO 80521. tiffany.jones@colostate.edu.

We have no conflicts of interest to disclose.

and these differences, particularly for Black compared to White students, appear to grow larger as students grow older (Reardon et al., 2015). Given the existence of the education debt, it is critical that researchers identify malleable aspects of schools that can be altered to contribute to racial equity in academic outcomes and that existing school efforts be examined for their potential contribution to racial (in)equity. Focusing on structural and systemic factors rather than student characteristics avoids the deficit narratives too often used to label students of color.

School climate, the collective social environment of schools, is an actionable intervention target known to be associated with students' academic achievement (Berkowitz et al., 2016; Kwong & Davis, 2015; Voight, & Hanson, 2017; Wang & Degol, 2016). In schools where students feel safe and supported by their teachers and peers, they are more apt to stay on task and be motivated to learn. However, little is known about the extent to which school climate promotes racial equity in academic outcomes. Since schools vary in the magnitude of race differences in academic outcomes, school climate is a potential characteristic of schools that can explain between-school variation in the size of race differences in academic success. This exploratory study aimed to further understand the variation by race in the relationship between school climate and self-reported grades, a measure of academic outcomes and how these relationships manifest across school levels (i.e., elementary, middle, high school) in a large school district in the pacific northwest (PNWS). Our investigation also acknowledges the importance of the context of schools, in particular the structural factors of the level of school poverty and racial composition of the schools. These structural factors are known to be associated with school climate and academic outcomes (Berkowitz et al., 2016). Through these analyses, we hope to learn whether school climate is a potential mechanism to promote racial equity in academic success, accounting for school poverty, racial composition and school level (elementary, middle or high school).

Race and Academic Success in Schools

We frame race differences in academic outcomes as evidence of the education debt (Ladson-Billings, 2006), which recognizes the race differences as the result of longstanding structural and institutional inequality in the education of students of color. In the United States academic success is generally racially patterned, with the except of students of east Asian descent, students of color receive lower scores across measures of achievement: from standardized test scores to high school graduation rates and grade point averages (GPA; Kao & Thompson, 2003). Evidence for race differences in achievement emerges as young as three years old, and some of these differences have been found to grow larger at higher grade levels (Burchinal et al., 2011 Reardon et al., 2015). It is critical to point out that the reasons for these differences are not due to student deficit, rather, are due to systemic racism and structural barriers. Students of color are subject to higher rates of exclusionary discipline, attend lower resourced schools on average, are systematically tracked into special education and away from advance learning opportunities (Carter, et al., 2016). We refer to students of color collectively to recognize the different school experiences of all racial groups compared to White students that result from racism's adverse effects in schools. However, we recognize that students of color are by no means a monolith and there is more variation within racial groups than between (Betancourt & Lopez, 1993).

Students are differentially racialized, and therefore have very different experiences based on their race, and as such, we observe racial differences in academic outcomes. Based on data from the National Education Longitudinal Study (NELS) Asian students had an average GPA of 3.24, White students 2.96, Hispanic students 2.74, and Black students 2.73 (Kao & Thompson, 2003). Data from the ECLS-K show race differences in standardized achievement scores present when student start kindergarten and larger differences by the time students reach 5th grade. By 8th grade the differences between racial groups of students stabilize, with Black students generally receiving scores at about one standard deviation below White students (Reardon et al., 2015). Less is known about racial differences in academic success for Latinx students as they progress through school. Evidence available from the ECLS-K data at the elementary school level suggests that the gap between Latinx and White students is narrow through elementary school, but evidence is inconclusive about the size of the racial differences in secondary school. Within the Latinx population of students, academic performance is known to vary based on factors such as ethnicity, language, context of immigration, and acculturation, and because of this heterogeneity, studies are inconsistent as to the size and trajectory of differences in academic success (Reardon et al., 2015). Similar to Latinx students, Asian students are another highly heterogeneous group whose achievement is also intertwined with issues of ethnicity and language. When grouped together, Asian and Pacific Islander students tend to do better than White students on most markers of achievement and do increasingly better as students progress through school (Kao & Thompson, 2003; Reardon et al., 2015). Asian and Pacific Islander students' achievement is often reported together, though studies where 13 different Asian ethnicities were disaggregated found significant differences in achievement among different ethnic groups (Pang et al., 2011). The research on Native American students is sparse, but data available from the sample of 300 students who identify as Native American in ECLS-K shows that Native American students perform lower than all other racial groups on average, but that the difference in achievement lessens as students progress through school (Demmert, et al., 2006).

School Climate

School climate refers to the social environment at school and how students experience school (Wang & Degol, 2016). School climate is defined as the collective experiences of students at school related to students' relationships with teachers and their peers, their sense of physical and emotional safety, their sense of belonging or connectedness to the school, and their perceived quality of teacher instruction (Cohen et al., 2009; Thapa, et al., 2013; Wang & Degol, 2016). Positive school climate serves as an important foundation for learning, since students who are in fear or under stress do not learn as well, and students with positive relationships who look forward to attending school are more successful (Cohen et al., 2009; Garibaldi et al., 2015; Wang & Degol, 2016).

Many studies have demonstrated that students' individual perceptions of school climate are related to academic outcomes, and that measures of school climate aggregated to the school level are also related to individual students' academic success. Wang and Degol (2016) reviewed evidence for how different domains of school climate are related to academic success of students. These authors organized school climate literature into academic climate,

community, safety, and institutional environment factors. They found that schools with positive academic environments characterized by high standards, effective leaders, and a commitment to student mastery also have more academically successful students. Similar to the community domain, positive relationships between students and teachers, parental community, and a high regard for diversity are also known to increase student academic success (Thapa et al., 2013; Wang & Degol, 2016).

There is empirical support for the relationship between academic success and school climate. For example, Voight and Hanson (2017) found that middle schools where students perceived more positive climate also had higher English and Math performance in 7th grade. Kwong and Davis (2015) found that positive school climate was associated with academic success, as students performed better on reading tests in schools with a more positive school climate. These authors also examined student-level perception of school climate and found that it was associated with improved academic performance on standardized test scores (Kwong and Davis, 2015). Voight and colleagues (2015) examined within-school racial disparities in perceptions of school climate and how these gaps were associated with race differences in achievement. They found that schools with higher proportions of students in poverty had smaller Black-White gaps in students' perception of safety and connectedness. They also found that racial gaps in students' perceptions of climate within schools were linked with racial differences in student academic performance for Black and Hispanic students compared to White students (Voight et al., 2015).

In their study of 53,946 fifth and eighth grade Israeli students, Berkowitz and colleagues (2015) found that school climate was associated with performance on standardized test scores. Further, school climate moderated the relationship between student socioeconomic status and academic achievement such that the gap between students with low and high socioeconomic status was smaller in positive climate schools. As such, school climate is thought to buffer the negative effects that living in poverty has on students' academic success. In a review of 78 studies, Berkowitz and colleagues (2016) found that school climate can diminish the negative effect that students' low socioeconomic status has on academic outcomes. All but one study found school climate to be positively associated with academic outcomes, and 84% of studies included in the review found that a positive school climate reduced the gap between low and high-income students on academic outcomes (Berkowitz et al., 2016). These findings indicating the importance of climate are promising for the present investigation of whether climate might have a compensatory effect on race differences in academic outcomes as well, since structural forces (i.e. systemic racism, segregation, etc.) have created a social gradient whereby race and socioeconomic status are highly correlated.

Dynamics of School Climate as Students Progress Through School

It is important to examine school climate in the context of development and whether students' perceptions of school climate change as they move from elementary to high school (Wang & Degol, 2016). Most research is cross-sectional and focused on a single developmental time point. Cross-sectional studies in elementary school demonstrate the relationship between academic success and school climate in younger students. For example,

Brookover and colleagues (1978) studied 4th and 5th graders from 68 elementary schools and found that school climate was associated with mean school achievement after controlling for school socioeconomic status and racial composition. Similarly, in a sample of 1,535 5th grade students from 50 schools, Wang and colleagues (2014) found that a one unit increase in average school climate score was associated with almost a whole grade point increase in GPA.

The transition from elementary to middle school corresponds with significant changes in students' physical and social development and increasing rigor in academic expectations (Wang & Eccles, 2011). During this transition, students learn to be more autonomous, and social acceptance is increasingly important (Voight & Hanson, 2017). The transition from elementary to middle school corresponds to a decrease in grades (Schwerdt & West, 2012; Seidman et al., 1994), as well as to a decrease in students' perceptions of climate in middle school (Kim et al., 2014). Researchers have suggested that discrepancies between school environments and students' developmental needs are related to the decline in school engagement and, relatedly, perceptions of school climate (Wang & Eccles, 2011; Wang & Degol, 2016).

Many studies have focused on middle school specifically, or trajectories of school climate throughout secondary school, as students' perceptions of school climate are known to decrease over this developmental time period (Seidman et al., 1994; Wang & Dishion, 2012; Wang et al., 2010, Wang & Degol, 2016). Wang and colleagues (2010) found that over the course of middle school, the proportion of students who perceived their school to have a positive climate decreased. In addition, students who perceived better school climate also had a lower probability of having behavior problems. In another model of school climate trajectories, Way and colleagues (2007) found that student perceptions of school climate decreased throughout middle school, and these declines were associated with increases in behavioral and psychological problems. Further, these authors tested the direction of effect and found that school climate largely influenced behavioral adjustment rather than the reverse.

School engagement, school connectedness, and school bonding are closely related concepts, and are subcomponents of most measures of school climate, including the school climate measure used in this study. Definitions of each of the related concepts varies by study, though they share common elements related to the sense of feeling supported and included by school staff and peers in the school social environment (Chapman et al., 2013). Wang and Eccles (2011) studied trajectories of grades in middle and high school alongside trajectories of school engagement. They found that students' grade point average (GPA) decreased over grades 7 to 11, as did each of the components of school engagement. The authors define school engagement as school participation, self-regulated learning (a measure of cognitive engagement), and school belonging. Trajectories of school participation and self-regulated learning were related to trajectories of GPA and educational aspirations, but school belonging was related to educational aspirations but not GPA. Bond and colleagues (2007) conducted a longitudinal study of school connectedness in secondary Canadian Catholic school students from 8th to 10th grade. These authors found that school connectedness was associated with high school completion and higher education test scores, and that poor social

connectedness and experiencing bullying reduced the odds of completing high school (Bond et al., 2007). By high school, many students have become disconnected from school, putting them at risk for school dropout and behavioral health problems. A sense of belonging in high school is related to higher grades and is protective against a number of issues including school dropout and behavioral health problems (Bond et al., 2007; Monahan et al., 2010). Another characteristic of schools known to impact students' academic achievement is the socioeconomic composition of schools.

School Socioeconomic and Sociodemographic Composition

Sociodemographic composition of schools refers to the socioeconomic status of the families of students within a school and the racial composition of school student populations. There is significant variation in the racial and socioeconomic makeup of the student bodies of schools both nationally and in the setting of this study. A number of studies have found that school sociodemographic composition significantly impacts academic outcomes (Crosnoe, 2009; Palardy, 2013; Perry & McConney, 2010; Reid & Ready, 2013). Racial and socioeconomic composition are highly intertwined, as White students are more likely to attend higher resourced, higher achieving schools while Black and Brown students are concentrated in higher poverty, largely minority schools, lower achieving schools (Brown-Jeffy, 2006; Fiel, 2013).

Research has generally confirmed that schools that have larger proportions of students of lower income families perform worse in terms of average levels of academic achievement, and these findings have been replicated across the spectrum of development. For example, in a sample of 12,000 students in Australia, Perry and McConney (2010) found that students' academic achievement increased when the average socioeconomic status of the school increased, and this relationship was found for all students independent of their individual socioeconomic status. Brown-Jeffy (2006) found that racial composition of schools contributes to race differences in reading scores above the effect of socioeconomic composition. Palardy (2013) used the Education Longitudinal Study, which surveyed students in 10^{th} grade in 2002 and 12^{th} grade in 2004, and found that a one standard deviation increase in socioeconomic composition of a school increased the odds of a student graduating high school by 40%, enrolling in a 2-year college by 16%, and enrolling in a 4-year college by 55%. The effects of socioeconomic composition on student academic outcomes can be seen as early as preschool. Reid and Ready (2013) also found that socioeconomic composition of preschool classrooms was associated with language and mathematics skill development, regardless of students' own socioeconomic status. Given these findings that demonstrate the importance of the sociodemographic composition of school on academic outcomes, this school characteristic is another important structural characteristic of schools that is important to examine alongside school climate.

The Present Study

This study explored whether school climate is associated with racial equity in student grades. In line with the education debt framing, we examine school-level variation in school climate and school sociodemographic composition, taking the focus off of individual

students and their perceptions. For the present study, analyses are conducted within a single school district, allowing for schools that have smaller differences in academics across race to be identified. The survey included questions on students' perceptions of school climate as well as students' grades. Specifically, we examine the extent to which school climate explains race differences in grades, testing the hypothesis that better school climate is associated with smaller racial differences in grades. In addressing this research question, we also consider sociodemographic composition of schools and grade level to account for student development.

Method

Sample

Data are from the student school climate survey from an urban school district in the Pacific Northwest administered in the spring of 2016. Seventy-one percent of the 41,430 students enrolled in 3rd-12th grade completed the survey in 2016, leading to a sample size of 29,415. The resulting sample self-reported their race: 43% White, 16% Asian, 12% Black, 17% Multiracial, 7% Latino, 2% Pacific Islander, and 1.5% Native American. Students also self-identified their gender, with 41% male, 47% female, and 7% decline to state (an option on the survey as opposed to missing). Students in the district originate from 149 different countries and speak 146 different languages. Thirty-four percent of students in the district meet criteria for free and reduced-price lunch. All 97 schools were included in the sample: 60 elementary schools, 10 middle schools, 10 K-8 schools, 15 high schools, and 2 alternative schools. Schools ranged in the percentage of students who met criteria for free and reduced-price lunch from 4% to 96%, with a district wide average of 34%.

Survey Development and Procedures

The survey was largely developed by the school district, drawing from a number of existing valid surveys to tailor to the needs and language used by the school district. The district conducted their own unpublished, internal analyses of the survey quality. With the support of a research practice partnership with a local university, the survey was revised and underwent extensive validation in 2016 (Herrenkohl et al., 2017). The survey was administered by school district staff, and data was received from all 97 schools. Schools chose between a paper or computer-based survey, and teachers and school staff administer the survey during the school day. The survey takes most students about ten minutes to complete. The survey is anonymous, so student data cannot be linked to any other school data. The survey contains 51 items and includes 45 survey items and 6 items on demographics and self-reports of grades.

Measures

Self-reported grades were the academic outcome of focus. Students selected whether they had achieved "Mostly D's or F's," "Mostly C's," "Mostly B's," or "Mostly A's," with response options ranging from 1 to 4. Standardized effect sizes for race disparities in self-reported grades found in the current study were slightly smaller than the size of race disparities in the percentage of students meeting grade level on English and Math Smarter Balanced standardized tests in 7th grade according to school records in the district for the

same year (Jones, 2018). We analyzed student self-reported grades, grades are an important academic outcome as they are correlated with achievement test scores, but also incorporate student efforts (Kao & Thompson, 2003). Grades are also more related to success in higher education than other markers of achievement (Farrington et al., 2012; Kao & Thompson, 2003). Prior research has also shown self-report of grades to be correlated with school records of grades (r range .61 and .90) (Kuncel et al., 2005).

Race was self-reported by students. The racial groups available were determined by the list provided by the federal government necessary for reporting school district demographics (U.S. Department of Education, 2008): Asian, Black or African American, Latinx or Hispanic, Multiracial, Native American, or Pacific Islander. For models predicting self-reported grades, dummy variables for each racial group were created, with White coded as the referent category. Gender and grade level were included as control variables in all models. Gender was dummy coded with male students and those who declined to state gender contrasted with female students. Grade level was self-reported by students and included grades 3 through 12.

Student perceptions of school climate was measured by 33 items constituting six different subscales: 1) healthy community, 2) belonging, 3) student relations, 4) school safety, 5) pedagogical effectiveness, and 6) motivation and inclusion. Response options were on a Likert scale including “strongly disagree,” “disagree,” “neither agree nor disagree,” “agree,” and “strongly agree.” Scales were determined through an adequate fitting confirmatory factor analysis (RMSEA= 0.042; CFI= 0.926; TLI=0.919), are invariant to by race, gender, and home language, and were found to be internally consistent, with Cronbach’s alpha ranging from .72 to .87. Details of the scale construction and psychometric properties of these scales are reported elsewhere (Author, 2018). Mean scores for each student on each subscale were calculated and standardized to create a more parsimonious model. A final individual school climate score was calculated for each student by taking the average of students’ reports on each of the six subscales. In models predicting grades, student perceptions of school climate were treated as both an individual- and a school-level variable. Individual-level scores were standardized across all students and group mean centered, with a student’s perception of climate scored relative to the mean score in that student’s school. School-level school climate was calculated by taking the average across all students’ individual perceptions of school climate at each school. School climate scale scores were standardized across schools.

Sociodemographic composition of schools was determined by the percentage of students who met criteria for free and reduced priced lunch at each school. Students from families who make less than 130% of poverty receive free lunch, and students between 130% and 185% of poverty receive a reduced-price lunch (NSLP, 2017). There are also categorically eligible students who qualify if they are homeless, migrant, runaway, or in foster care (NSLP, 2017). Family income information is collected by the Nutrition Services department and is only available at the school level. We also investigated the relationship between the percentage of students who were White and the percentage of students qualifying for free and reduced-price lunch to see how this measure of school poverty was related to other sociodemographic characteristics of schools. The percentage of White students of each

school was correlated with the percentage of students qualifying for free and reduced lunch at r=−.97. As such, it is impossible to disentangle racial composition and socioeconomic composition in our data. We use the term school poverty as a shortened term for the variable that also indicates the direction of effect (higher numbers indicate more students in poverty). The school poverty variable was standardized across schools.

Analysis Plan

A series of multilevel models predicting grades were conducted in Mplus version 7.4 (Muthén, & Muthén, 2010). Schools were entered as the clustering variable, and two-level models were estimated with self-reported grades specified as ordered categorical. First, we tested for between-school variation in race effects on grades by comparing fit of models in which effects of race were treated as fixed versus a model in which they were treated as random at the school level. The BIC was used to assess change in fit, as well as the significance of the variances in each of the random effects. To assess whether school-level variables accounted for between-school differences in race effects, school climate and school poverty were added to the model, both as main effects on grades and as moderators of race effects. First, school climate and poverty were entered separately (Models 2 & 3) and then entered into the same model (Model 4). In models including school climate, individual perceptions of climate were included as an individual-level variable with a main effect on grades in order to illustrate how school climate may relate to grades at both the individual and school level. All models used maximum likelihood estimation with robust standard errors. Models were specified as two-level random and estimated with Monte Carlo integration.

Results

Students reported that, on average, their grades were in the “Mostly A’s” range, with a mean of 3.35 on the variable coded in terms of the 1–4 response range, with a standard deviation of .76. Schools had an average of 38% of students meeting criteria for free and reduced-price lunch, with schools ranging from 4% to 96%. The racial composition of the sample reflects that of the school district. Schools contained an average of 47% White students, ranging from 2% White to 80% White. Descriptive statistics and correlations are reported in Table 1.

A model in which effects of race on grades were treated as random (Model 1 in Table 2) was a better fit than a model in which these effects were treated as fixed as evidenced by a lower BIC. The main effects of race on grades indicate the significant difference in grades compared to White students for all other racial groups. As expected, all groups except Asian students received on average significantly lower grades compared to White students. Also reflecting the better fit of the random race effects model, we found significant between-school variance in the effect of each race dummy, with the exception of the effect of Native American, for which the variance approached significance (p>.073). We elected to retain the random slope for the Native American effect in the model for consistency. Plots of school variation in the magnitude of the race differences in grades derived from Model 1 are found in Figure 1, with the size of the effects standardized (e.g., the mean difference in grades

between Black and White students was −.69 standard deviation units). The standard deviation reported in the Figure 1 captures the variation across schools, also represented visually in the distribution of the histograms.

Model 2 in Table 2 shows the effect of school climate on grades at the individual and school level, as well as tests of whether school climate moderated race effects. At the individual level, a one standard deviation unit increase in perception of school climate was associated with grades that were .29 standard deviations higher. The main effect of school-level school climate on grades was negative and not statistically significant, suggesting that schools with higher mean levels of perceived school climate did not have higher grades on average. School-level school climate did, however, significantly moderate all of the race effects. With the exception of the school climate x Asian effect, all of these interactions suggest race differences in grades were smaller at schools with higher mean climate scores. Figure 2 illustrates the cross-level interactions of school climate and race differences in student reported grades. The y-axis represents standardized race differences in grades, and schools are ordered along the x-axis in terms of their ranking with respect to school climate scores. The slope of the lines for each racial group, excluding Asian students, shows that in higher climate schools, the magnitude of the race gap in grades was smaller compared to low climate schools. The results are in the opposite direction for Asian students. As shown in Table 2, school-level variation in race effect is no longer significant in the model with school climate as an explanatory variable. This finding suggests that, in this model, school climate largely explains across-school variation in the magnitude of race differences in grades.

The direct and moderation effects of school poverty are shown in Model 3 in Table 2. The main effect of school poverty was not significant overall. With respect to whether school poverty was associated with the magnitude of race effects on grades, the difference in grades for Multiracial students compared to White students was significantly smaller in high poverty schools, while the difference in grades for Latinx, Native American, and Pacific Islander students compared to White students is larger in high poverty schools. There were no significant effects of school poverty on school variation in the size of the difference in grades for Black or Asian students compared to White students. Significant variance in race effects across schools remains unexplained in Model 3. Estimates for Native American effects in this model are not trustworthy due to the non-positive definite first order derivative product matrix. This is likely due to the small sample of Native American students being unevenly distributed over schools. The association between school poverty and between-school variation in race differences in grades is illustrated in Figure 3. The y-axis represents race differences in grades and schools are ordered along the x-axis from high to low poverty. The slope of the lines shows that in lower poverty schools, there is a smaller difference in grades for Latinx, Native American, and Pacific Islander students compared to White students. The slope is the opposite for Multiracial students and not significant for Asian students.

To examine whether including school poverty in the model diminishes the effect of climate on the magnitude of race differences in grades, school climate and school poverty were entered into the same model (Model 4 of Table 2). Cross-level interactions of race by school climate remain the same after adjusting for school poverty. Models with both school climate

and school poverty accounted for the largest portion of variance across schools. Variation in race effects was no longer significant except for the Pacific Islander effect. These findings suggest that school climate is associated with race differences in grades, over and above the effect of school poverty.

Because of the possible association between student age or grade level and both race differences in grades and perception of school climate, we conducted two sensitivity analyses to examine whether school climate was confounded with grade level or school level (elementary, middle, or high). The types of schools are color-coded by grade band in Figure 2, showing that elementary schools generally have the highest school climate scores, which corresponds to having smaller differences between racial groups on self-reported grades. The correlation of school-level school climate with student's grade level was also very high ($r = .62$). To examine whether race differences in grades increased as students progress through school, confounding the results, we tested whether race x grade level interactions were significant as individual-level fixed effects. The results indicate that all race x grade interaction terms were significant for all racial groups, such that smaller race differences in grades were found for students in lower grade levels. We then included these interaction terms in the models with school climate x race cross level interactions. The pattern of results for the cross-level interactions remained largely the same, except that the effect sizes were half as large for all racial effects and the effect of climate on race differences for Native American students was no longer significant (results not shown). These analyses suggest that the effect of school climate on race differences in grades is still significant after accounting for the fact that race differences in grades increase at higher grade levels, when grade level is considered as a continuous individual-level variable with a linear relationship with the magnitude of race differences in achievement.

The second sensitivity test we conducted was to include dummy variables for the school grade band (elementary, middle, and high school). In order to do this, K-8 schools and alternative schools that had more than one school level were excluded, reducing the school sample size to 85. Distributions of school climate scores by school grade band are reported in Figure 4 and show how school climate drops on average in middle school, but then slightly increases in high school, and the distribution widens. In models predicting grades, dummy variables for middle and high school were entered at the school level with both direct effects on grades and as moderators of race effects on grades. Results of this sensitivity test are reported in Table 2, Model 5. Main effects for both the Middle and High dummy variables were significant and negative, reflecting students' reporting lower grades in high grade level schools than in elementary schools. Including the effect of school grade band results in a diminished and less clear picture of the moderation of grade differences by school climate, with most of school climate x race effects no longer significant. Higher school climate was still significantly associated with smaller race differences in grades for Multiracial and Pacific Islander students after accounting for school grade band; for the Asian vs White difference, the moderation effect was still significant but reversed in direction. The estimates of school climate by Black, Latinx, and Native American interactions were all smaller and nonsignificant. With respect to school grade band by race interactions in Model 5, middle and high school dummies showed positive moderation of the Asian vs White difference, reflecting the fact that Asian students performed increasingly

better than White students as they progressed across grade bands. Moderation of the Black and Native American effect reflected the opposite, with grade disparities growing larger for each of these groups compared to White students in middle and high school.

Discussion

Findings from this study suggest that school climate may play a role in racial equity in grades, but that school climate is difficult to disentangle from school grade band. Schools with more positive school climates also had smaller differences in grades between White students and Black, Latinx, Native American, and Pacific Islander students. Moreover, school climate explains more between-school variation in race difference in grades than does school poverty, and school climate is important above and beyond individual students' own experiences of climate. This study provides initial evidence that focusing on improving the social experience of school as measured by school climate may help improve racial equity in academic outcomes. As such, improved school climate may contribute to lessening the burden of the education debt for students of color. The strength of confidence in this interpretation of these findings is, however, tempered by the fact that the association between school climate and disparities in grades may be partly attributable to larger race differences in grades found in secondary school compared to primary school.

The fact that effects of school climate are difficult to separate from that of grade bands calls attention to the decline in school climate in middle school, which might also be related to race differences in grades. Climate decrements in middle school point to some of the ways in which schools are not meeting the needs of students as they change during development (Wang & Eccles, 2011). Although the analysis herein does not allow distinguishing the effect of climate separately from that of school level, it does show that race differences in grades increase in middle and high school, which corresponds to a decrease in school climate. The fact that middle school and high school are qualitatively different is no surprise, but it does not diminish the role of school climate. In fact, this finding is aligned with literature about the difficulty students face in the transition to secondary school. School climate could be a factor that might support students in adjusting to middle school and may highlight areas where the school climate is not aligned to the needs of students (Wang & Eccles, 2011). Looking at the subconstructs of school climate might provide secondary schools with information about the areas where students' needs with regard to the social experience of school are not being met. Improving climate in secondary school may have the added benefit of contributing to racial equity, though future research with more secondary schools is necessary to extricate the effect of school climate from the known decrements in school climate that happen in secondary school (Wang & Degol, 2016; Wang & Eccles, 2011).

This analysis, which focuses on school-level influences on race differences in grades, is particularly helpful within a school district to highlight bright spots where the school climate is conducive to promoting racial equity. In comparison to Voight and colleagues' (2015) study, which found that individual-level school climate was associated with within-school (i.e., individual) differences in achievement, the present results show that school climate at the whole school level was associated with race differences. This highlights the need for

additional research on the relationship between school climate and racial differences in academic outcomes, especially as to the level of analysis for school climate and the generalizability of these findings across geographic locations with different racial dynamics. Our results also raise questions about why school-level climate, the collective experience of the climate of schools, is important. Future studies into the specific components of school climate that have the largest impact on reducing the education debt are warranted. It may be that having a positive social environment at school characterized by positive relationships with teachers and peers, a sense of belonging and community, feelings of safety, and teachers skilled at motivating and engaging students provides a foundation for learning that compensates for some of the negative effects of the education debt experienced by many students of color. The implications of these results for school practitioners suggest that efforts to create a more positive social experience for students can also contribute to racial equity. Similar to the case of the relationship between low socioeconomic status and school climate (Berkowitz et al., 2016), positive school climates may compensate for the negative experiences students of color face in schools. Further, school climate matters above and beyond the contribution of school poverty to student grades. In this way, it may be that a focus on school climate is aligned to the interests of all students.

It is important to interpret findings in terms of educational equity and the education debt. The analysis herein suggests that climate may contribute to racial equity and that racial differences in grades increase as students progress through school. Yet, conducting this analysis required an examination of differences among racial groups. We recognize the problems involved with an explicit focus on achievement gaps (Gutierrez, 2008; Ladson-Billings, 2006; Milner, 2008). Having weighed the pros and cons of conducting this analysis given the risks, we concluded that it was still worth doing. By theorizing the reasons for gaps as the result of structural inequities and systemic racism, we refocused the analyses on characteristics of schools and away from student deficits. We also shifted the language focus away from the achievement gap. Rather than assuming school climate is important for all, we demonstrated with empirical evidence that school climate may be a school characteristic with potential to improve racial equity in academic outcomes. This type of analysis is especially critical for school district decision-makers and policymakers who are deciding where to allocate resources (Lubienski & Gutierrez, 2008). In this case, the findings show that improving school climate may benefit all students, and that it may also contribute to racial equity. Although we want to be careful not to promote factors where the interests of White students are prioritized, this is one case where interests among students of color and White students do converge (Milner, 2012; Powell, 2012). In schools and districts that are focused on racial equity, all programs should be put to the test as to whether they contribute to equity. This analysis provides some support for investments in school climate to promote racial equity in academic outcomes.

Limitations and Future Directions

This study’s analyses also highlight the problems inherent in the Multiracial category. There are problems of categorization of any racial group, since the experiences of all racial groups are highly heterogeneous and there tends to more differences within racial groups than between them (Betancourt & Lopez, 1993; Powell, 2012). However, for Multiracial students

the categorization issue is exacerbated. For example, a biracial student of Asian and White parents has a different school experience that that of a biracial student of Black and White parents due to the way racial groups are differentially racialized (Delgado & Stefancic, 2017). This problem is evident in the current findings as well, in which multiracial students perform better in schools characterized by high poverty. We are unable to interpret this finding because it is impossible to draw conclusions about the experiences of such a diverse group of students.

The data are also limited in that the number of students of Pacific Islander and Native American descent at some schools are small. Students of these backgrounds are not evenly distributed across schools, and there are ten schools where there are no students of either group. These data issues caused problems with the model in some places. Rather than removing these groups from the model, we chose instead to highlight where the model problems exist so that some conclusions can be made for these groups for whom so little research has been published.

The outcome of student self-reported grades is subject to reporting bias by students and the limitations of students' knowledge of their grades. This outcome limits the ability to interpret the findings in terms of expected grades, especially since grades may not be very meaningful to elementary school students. By comparing the measure of the magnitude of race differences in grades to school level objectively measured achievement, we found that the race differences were smaller in the measure of grades compared to standardized achievement. This provides some level of confidence that the self-reports of grades are measuring important race differences. It is also imperative that future analyses address the role of students' own socioeconomic status. This level of data was unavailable for this analysis but is likely to influence the current findings. Future research would also benefit from investigating the perceptions of school climate from other informants, especially teachers, school administrators, and families.

The generalizability of this study's findings is limited because the analyses were conducted within a single school district. This limited the sample size of schools, which is critical for conducting multilevel analyses across all developmental levels. Having only 10 middle schools and 15 high schools in the sample limited the ability to disentangle the effect of being in middle or high school from that of school climate. Future research with larger samples of schools should look both cross-sectionally and longitudinally at how school climate changes as students progress through school and how it effects race differences in grades.

The direction of effects is not evident from these analyses, so we cannot draw conclusions about whether school climate influences student grades or vice versa. It may be that climate at schools with smaller differences between different racial groups of students is better because students perceive schools to be more equitable. Previous analyses have shown evidence that academic success drives improvement in school climate (Benbenishty et al., 2016), and the other way around (Berkowitz et al., 2016). It is likely that this relationship is bidirectional, since research has confirmed the importance of relationships, belonging, and teacher practices with academic outcomes (Thapa et al, 2013). Future longitudinal research

is important to establish the direction of causality and role of school climate in the etiological chain of events in order to identify prevention interventions targets. Ultimately, the goal is to prevent the development of educational inequities, making it critical to identify school characteristics that are malleable and within the purview of schools to change.

Acknowledgments

This research was supported by the National Center for Advancing Translational Sciences of the National Institutes of Health under award number TL1 TR002318. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. This research was part of a doctoral dissertation.

References

Benbenishty R, Astor R, Roziner I, & Wrabel S (2016). Testing the causal links between school climate, school violence, and school academic performance: A cross-lagged panel autoregressive model. Educational Researcher, 45(3), 197–206. 10.3102/0013189X16644603

Berkowitz R, Glickman H, Benbenishty R, Ben-Artzi E, Raz T, Lipshtat N, & Astor RA (2015). Compensating, mediating, and moderating effects of school climate on academic achievement gaps in Israel. Teachers College Record, 117, 1–34. EID: 2-s2.0–84938264520

Berkowitz R, Moore H, Astor RA, & Benbenishty R (2016). A research synthesis of the associations between socioeconomic background, inequality, school climate, and academic achievement. Review of Educational Research, 87(2), 425–469. 10.3102/0034654316669821

Betancourt H, & López SR (1993). The study of culture, ethnicity, and race in American psychology. American Psychologist, 48(6), 629–637. 10.1037/0003-066X.48.6.629

Bond L, Butler H, Thomas L, Carlin J, Glover S, Bowes G, & Patton G (2007). Social and school connectedness in early secondary school as predictors of late teenage substance use, mental health, and academic outcomes. Journal of Adolescent Health, 40(4), 357–e9. 10.1016/j.jadohealth.2006.10.013

Brookover WB, Schweitzer JH, Schneider JM, Beady CH, Flood PK, & Wisenbaker JM (1978). Elementary school social climate and school achievement. American Educational Research Journal, 15(2), 301–318. 10.3102/00028312015002301

Burchinal M, McCartney K, Steinberg L, Crosnoe R, Friedman SL, McLoyd V, & Pianta R (2011). Examining the Black–White achievement gap among low-income children using the NICHD study of early child care and youth development. Child Development, 82(5), 1404–1420. 10.1111/j.1467-8624.2011.01620.x [PubMed: 21790543]

Brown-Jeffy S (2006). The race gap in high school reading achievement: Why school racial composition still matters. Race, Gender & Class, 13, 268–294. www.jstor.org/stable/41675185

Carter P, Skiba R, Arredondo M, & Pollock M (2016). You can't fix what you don't look at: Acknowledging race in addressing racial discipline disparities. Urban Education, 52(2), 207–235. 10.1177/0042085916660350

Chapman RL, Buckley L, Sheehan M & Shochet I (2013). School-based programs for increasing connectedness and reducing risk behavior: A systematic review. Educational Psychology, 25(1), 95–114. 10.1007/s10648-013-9216-4

Cohen J, McCabe L, Michelli N, & Pickeral T (2009). School climate: Research, policy, practice, and teacher education. Teachers College Record, 111(1), 180–213.

Crosnoe R (2009). Low-income students and the socioeconomic composition of public high schools. American Sociological Review, 74(5), 709–730. https://www.jstor.org/stable/27736091 [PubMed: 21546987]

Delgado R, & Stefancic J (2017). Critical race theory: An introduction (Vol. 20). NYU Press.

Demmert WG, Grissmer D, & Towner J (2006). A review and analysis of the research on Native American students. Journal of American Indian Education, 45(3), 5–23. https://www.jstor.org/stable/24398592

Farrington CA, Roderick M, Allensworth E, Nagaoka J, Keyes T, Johnson DW, & Beechum NO (2012). Teaching adolescents to become learners: The role of noncognitive factors in shaping school performance—A critical literature review. University of Chicago Consortium on Chicago School Research. https://ccrscenter.org/products-resources/resource-database/teaching-adolescents-become-leaders-role-noncognitive-factors

Fiel JE (2013). Decomposing school resegregation: Social closure, racial imbalance, and racial isolation. American Sociological Review, 78(5), 828–848. 10.1177/0003122413496252

Garibaldi M, Ruddy S, Kendziora K, & Osher D (2015) Assessment of climate and conditions for learning. In Durlak JA, Domitrovich CE, Weissberg RP, & Gullotta TP (Eds.), Handbook of social and emotional learning: Research and practice (pp. 348–359). Guilford.

Gutiérrez R (2008). A "gap-gazing" fetish in mathematics education? Problematizing research on the achievement gap. Journal for Research in Mathematics Education, 39(4), 357–364. https://www.jstor.org/stable/40539302

Herrenkohl TI, Jones TM, Lea CH & Malorni A (2019). Leading with data: Using an impact-driven research consortium model for the advancement of social emotional learning in schools. American Journal of Orthopsychiatry. 10.1037/ort0000435

Hopson L, Lee E, & Tang N (2014). A multi-level analysis of school racial composition and ecological correlates of academic success. Children and Youth Services Review, 44, 126–134. 10.1016/j.childyouth.2014.05.026

Jones TM (2018). Understanding Race Differences in Academic Outcomes, School Climate and Social Emotional Learning to Promote Racial Equity and Policy Reform [Doctoral dissertation, University of Washington]. ProQuest Dissertations Publishing.

Kao G, & Thompson J (2003). Racial and ethnic stratification in educational achievement and attainment. Sociology, 29(1), 417–442 10.1146/annurev.soc.29.010202.100019

Kim HY, Schwartz K, Cappella E, & Seidman E (2014). Navigating middle grades: Role of social contexts in middle grade school climate. American Journal of Community Psychology, 54(1–2), 28–45. 10.1007/s10464-014-9659-x [PubMed: 24830348]

Kuncel NR, Credé M, & Thomas LL (2005). The validity of self-reported grade point averages, class ranks, and test scores: A meta-analysis and review of the literature. Review of Educational Research, 75(1), 63–82. 10.3102/00346543075001063

Kwong D, & Davis J (2015). School climate for academic success: A multilevel analysis of school climate and student outcomes. Journal of Research in Education, 25(2), 68–81.

Ladson-Billings G (2006). From the achievement gap to the education debt: Understanding achievement in US schools. Educational Researcher, 35(7), 3–12. 10.3102/0013189X035007003

Ladson-Billings G (2007). Pushing past the achievement gap: An essay on the language of deficit. The Journal of Negro Education, 76(3), 316–323. https//doi.org/www.jstor.org/stable/40034574

Ladson-Billings G (2013). Lack of achievement or loss of opportunity? In Carter P & Welner K (Eds.), Closing the opportunity gap: What America must do to give every child an even chance (pp. 11–22). Oxford University Press.

Lee J (2002). Racial and ethnic achievement gap trends: Reversing the progress toward equity? Educational Researcher, 31(1), 3–12. 10.3102/0013189X031001003

Love B (2004). Brown plus 50 counter-storytelling: A critical race theory analysis of the "Majoritarian Achievement Gap" Story. Equity & Excellence in Education, 37(3), 227–246. 10.1080/10665680490491597

Lubienski ST, & Gutiérrez R (2008). Bridging the gaps in perspectives on equity in mathematics education. Journal for Research in Mathematics Education, 39(4), 365–371. www.jstor.org/stable/40539303

Milner HR IV (2008). Critical race theory and interest convergence as analytic tools in teacher education policies and practices. Journal of Teacher Education, 59(4), 332–346. 10.1177/0022487108321884

Milner HR IV (2012). Rethinking achievement gap talk in urban education. Urban Education, 48(1), 3–8. 10.1177/0042085912470417

Monahan KC, Oesterle S, & Hawkins JD (2010). Predictors and consequences of school connectedness. The Prevention Researcher, 17(3), 3–6. https//doi.org/GALE|A259750109

Muthén LK, & Muthén BO (2010). Mplus User's Guide (6th ed.). Los Angeles, CA.

Palardy G (2013). High school socioeconomic segregation and student attainment. American Educational Research Journal, 50(4), 714–754. 10.3102/0002831213481240

Pang VO, Han PP, & Pang JM (2011). Asian American and Pacific Islander students: Equity and the achievement gap. Educational Researcher, 40(8), 378–389. 10.3102/0013189X11424222

Perry LB, & McConney A (2010) Does the SES of the school matter? An examination of socioeconomic status and student achievement using PISA 2003. Teachers College Record, 112(4), 1137–1162.

Powell JA (2012). Racing to justice: Transforming our conceptions of self and other to build an inclusive society. Indiana University Press.

Reardon SF, Robinson-Cimpian JP, & Weathers EF (2015). Patterns and trends in racial/ethnic and socioeconomic academic achievement gaps. In Ladd HA & Goertz ME (Eds.), Handbook of research in education finance and policy (2nd ed.) (pp. 491–509). Routledge.

Reid JL, & Ready DD (2013). High-quality preschool: The socioeconomic composition of preschool classrooms and children's learning. Early Education & Development, 24(8), 1082–1111. 10.1080/10409289.2012.757519

Schwerdt G, & West MR (2012). The impact of alternative grade configurations on student outcomes through middle and high school. Journal of Public Economics, 97, 308–326. 10.1016/j.jpubeco.2012.10.002

Seidman E, Allen L, Aber L, Mitchell C, & Feinman J (1994). The impact of school transitions in early adolescence on the self-system and perceived social context of poor urban youth. Child Development, 65(2), 507–522. 10.1111/j.1467-8624.1994.tb00766.x [PubMed: 8013237]

Thapa A, Cohen J, Guffey S, & Higgins-D'Alessandro A (2013). A review of school climate research. Review of Educational Research, 83(3), 357–385 10.3102/0034654313483907

U.S. Department of Education. (2008). New race and ethnicity guidance for the collection of federal education data. https://www2.ed.gov/policy/rschstat/guid/raceethnicity/index.html

Voight A, Hanson T, O'Malley M, & Adekanye L (2015). The racial school climate gap: Within-school disparities in students' experiences of safety, support, and connectedness. American Journal of Community Psychology, 56(3–4), 252–267. 10.1007/s10464-015-9751-x [PubMed: 26377419]

Voight A, & Hanson T (2017). How are middle school climate and academic performance related across schools and over time? REL 2017–212. Regional Educational Laboratory West. Retrieved from https://eric.ed.gov/?id=ED572366

Wang M-T, & Dishion TJ (2012). The trajectories of adolescents' perceptions of school climate, deviant peer affiliation, and behavioral problems during the middle school years. Journal of Research on Adolescence, 22(1), 40–53. 10.1111/j.1532-7795.2011.00763.x [PubMed: 22822296]

Wang MT, Selman RL, Dishion TJ, & Stormshak EA (2010). A tobit regression analysis of the covariation between middle school students' perceived school climate and behavioral problems. Journal of Research on Adolescence, 20(2), 274–286. 10.1111/j.1532-7795.2010.00648.x [PubMed: 20535244]

Wang MT, & Eccles JS (2011). Adolescent behavioral, emotional, and cognitive engagement trajectories in school and their differential relations to educational success. Journal of Research on Adolescence, 22(1), 31–39. 10.1111/j.1532-7795.2011.00753.x

Wang W, Vaillancourt T, Brittain HL, McDougall P, Krygsman A, Smith D, Cunningham CE, Haltigan J & Hymel S (2014). School climate, peer victimization, and academic achievement: Results from a multi-informant study. School Psychology Quarterly, 29(3), 360. 10.1037/spq0000084 [PubMed: 25198617]

Wang M-T, & Degol J (2016). School Climate: A review of the construct, measurement, and impact on student outcomes. Educational Psychology Review, 28(2), 315–352. 10.1007/s10648-015-9319-1

Way N, Reddy R, & Rhodes J (2007). Students' perceptions of school climate during the middle school years: Associations with trajectories of psychological and behavioral adjustment. American Journal of Community Psychology, 40(3–4), 194–213. 10.1007/s10464-007-9143-y [PubMed: 17968655]

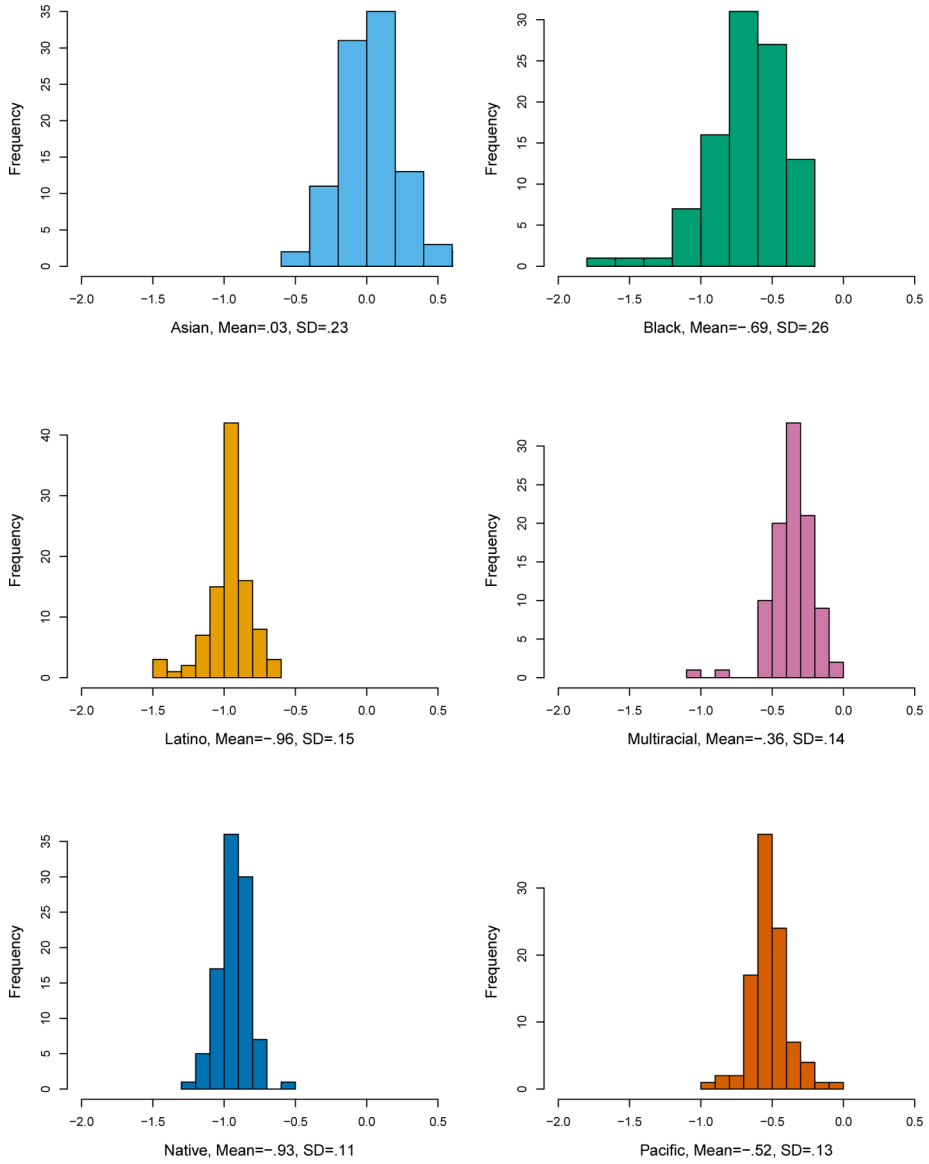

Figure 1.

Histograms Representing Variation in the Association of Race with Grades Across Schools in Standard Deviation Units

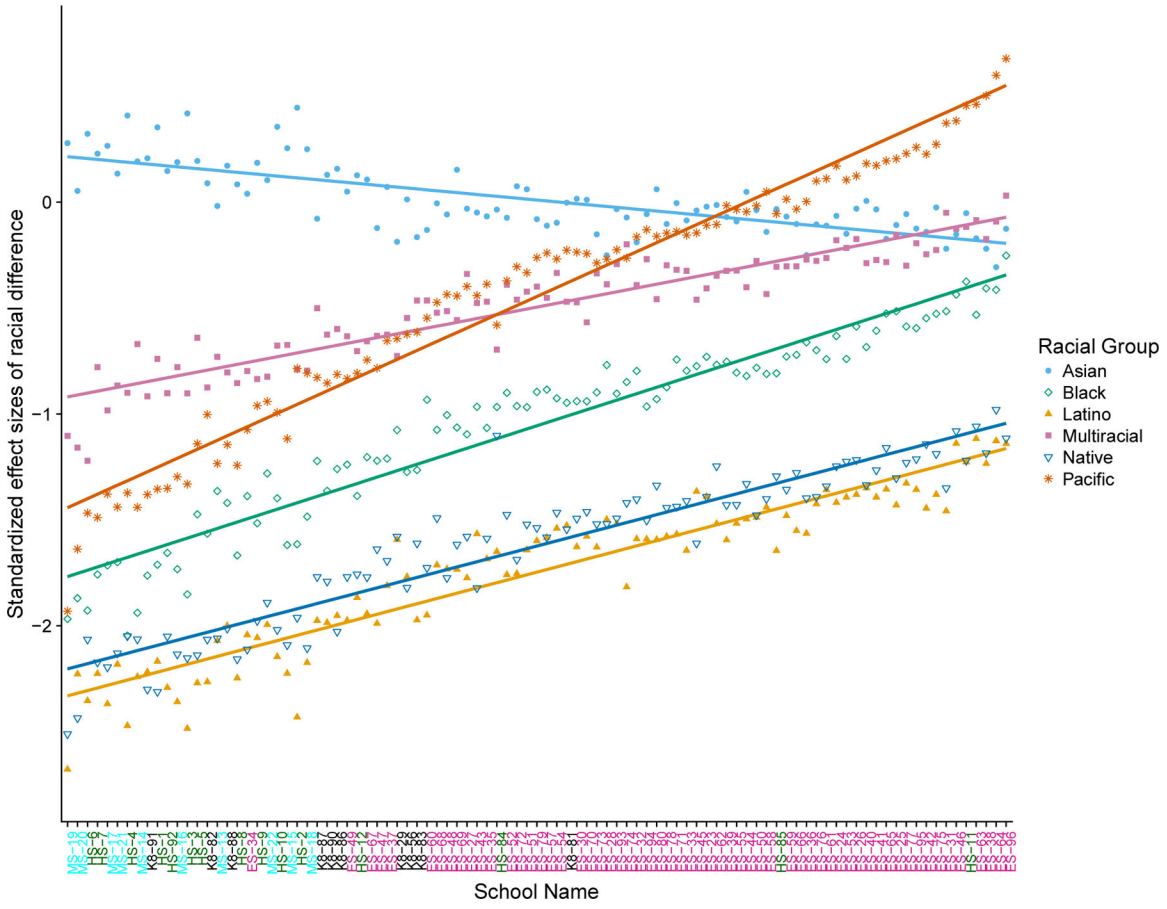

Figure 2. Model Estimates of the Magnitude of Race Differences in Grades by School Climate

Note: Lowest school climate on the left and highest school climate on the right, in standard deviation units. The slope is significant for all racial groups, the intercept is significant for all groups except Asian students. ES=Elementary School (pink), MS=Middle School (Blue), HS=High School (Green), K8=K8 School (Black).

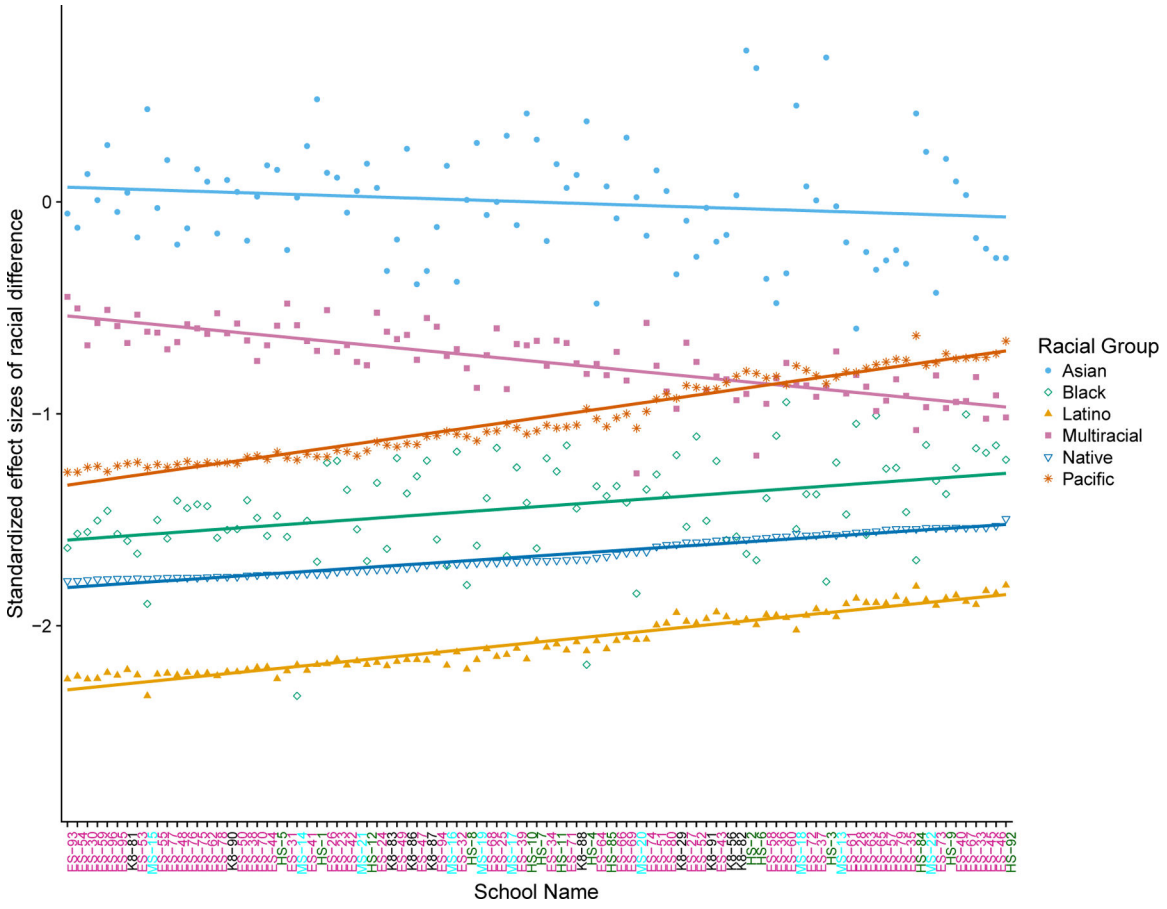

Figure 3. Model Estimates of the Magnitude of Race Differences in Grades by School Poverty

Note: Highest school poverty on the left to lowest school poverty on the right, in standard deviation units. The intercept is significant for all groups except Asian students, the slope is significant for all groups except Asian and Black students. ES=Elementary School (pink), MS=Middle School (Blue), HS=High School (Green), K8=K8 School (Black).

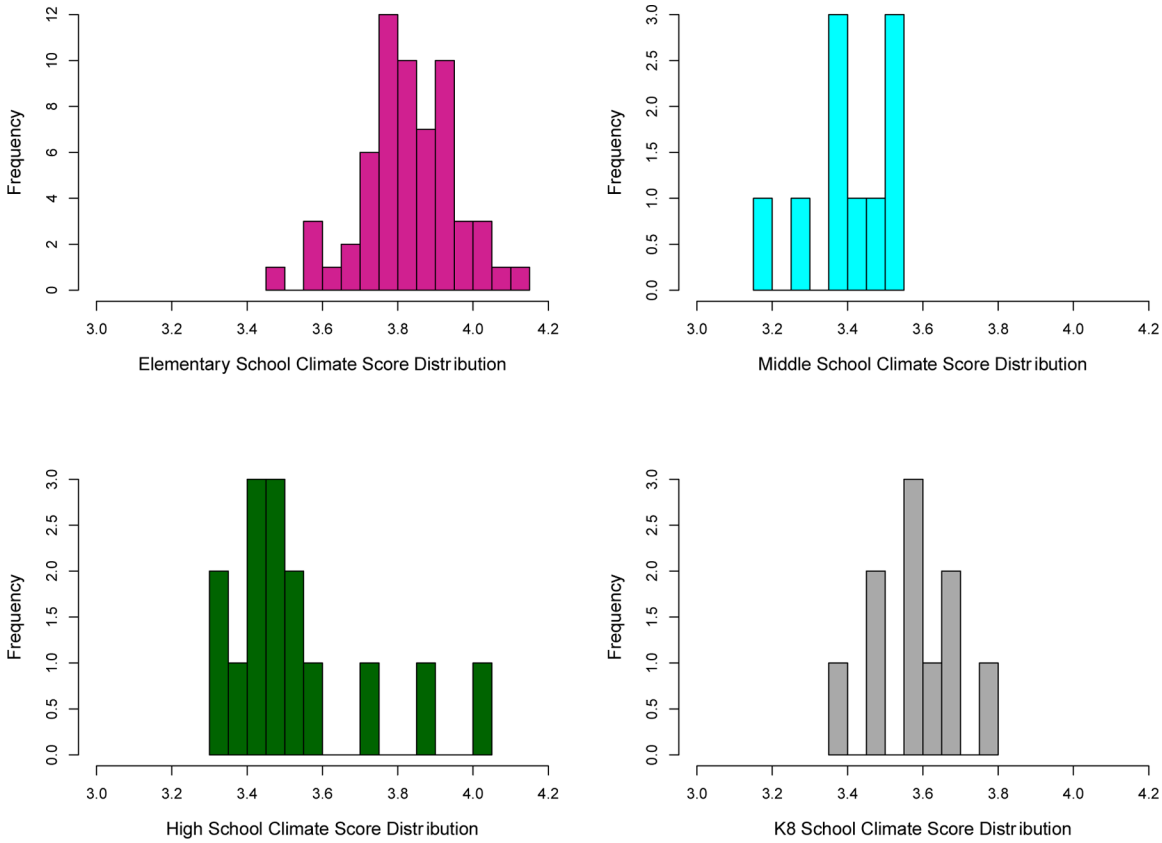

Figure 4.
Distribution of Climate Scores Across Schools in Original Scale Units

Table 1.

Correlations among Model Variables and Descriptive Statistics

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Self-reported grades	-														
2	Asian	0.08	-													
3	Black	−0.12	−0.17	-												
4	Latino	−0.14	−0.12	−0.10	-											
5	Multiracial	−0.03	−0.20	−0.17	−0.12	-										
6	Native American	−0.07	−0.06	−0.05	−0.03	−0.06	-									
7	Pacific Islander	−0.03	−0.06	−0.05	−0.04	−0.06	−0.02	-								
8	White	0.13	−0.40	−0.34	−0.25	−0.40	−0.11	−0.12	-							
9	Student climate	0.14	0.02	−0.01	0.01	−0.01	0.01	−0.01	−0.01	-						
10	School climate	0.00	−0.03	−0.02	−0.02	0.08	0.05	−0.02	−0.02	0.35	-					
11	School poverty	−0.13	0.22	0.27	0.17	0.00	0.03	0.08	−0.46	−0.02	−0.07	-				
12	School percentage white	0.10	−0.25	−0.27	−0.15	0.00	−0.02	−0.09	0.47	0.02	0.06	−0.97	-			
13	Grade level (3–12)	−0.05	0.05	0.01	0.03	−0.09	−0.07	0.03	0.02	−0.25	−0.62	0.07	−0.06	-		
14	Male=1	−0.10	0.00	−0.01	0.01	−0.03	0.02	0.01	0.01	−0.01	−0.02	0.02	−0.02	0.02	-	
15	No gender=1	−0.05	−0.02	−0.03	−0.03	0.06	0.02	0.00	0.01	−0.08	0.08	−0.06	0.05	−0.09	−0.24	
	Mean/Percentage	3.35	16.3%	12.2%	7.2%	16.3%	1.5%	1.8%	44.7%	3.59	3.77	42%	44%	6.67	46.3%	6.4%
	Standard Deviation	0.76	-	-	-	-	-	-	-	0.64	0.21	0.28	0.26	0.95	-	-

Note: Mean of scale variables are provided here as raw means and standard deviations (#9–13), though variables entered in the model are standardized and centered.

Table 2.

Results of Multilevel Models Estimating School Random Effects of Race on Grades and Cross Level Interactions in Standard Deviation Units

	Model 1		Model 2		Model 3		Model 4		Model 5	
Fixed effects	**β**	**S.E.**	**β**	**S.E.**	**β**	**S.E.**	**β**	**S.E.**	**β**	**S.E.**
Individual-level variables										
Grade level	**−0.05**	0.02	−0.04	0.02	**−0.04**	0.02	−0.05	0.04		
Gender										
Male=1	**−0.56**	0.04	**−0.55**	0.04	**−0.56**	0.04	**−0.55**	0.04	**−0.55**	0.05
No gender=1	**−0.59**	0.09	**−0.46**	0.08	**−0.59**	0.09	**−0.45**	0.08	**−0.47**	0.09
Main effects of race										
Intercept Asian	0.02	0.06	0.01	0.05	0.04	0.06	0.11	0.13	−0.28	0.16
Intercept Black	**−0.69**	0.08	**−0.53**	0.06	**−0.72**	0.08	**−0.51**	0.13	**−0.32**	0.10
Intercept Latinx	**−1**	0.07	**−0.87**	0.08	**−1.04**	0.04	**−0.7**	0.05	**−0.70**	0.18
Intercept Multiracial	**−0.35**	0.05	**−0.25**	0.04	**−0.38**	0.05	−0.19	0.13	−0.24	0.12
Intercept Native American	**−0.92**	0.13	**−0.81**	0.15	**−0.84**	0	**−0.99**	0.03	−0.59	0.40
Intercept Pacific Islander	**−0.56**	0.14	**−0.22**	0.09	**−0.51**	0.03	−0.18	0.14	−0.12	0.40
Student perceptions of climate			**0.29**	0.02			**0.28**	0.02	**0.30**	0.02
School-level variables										
School climate			−0.18	0.13			**−0.27**	0.06	**−0.31**	0.15
School poverty					−0.08	0.07	**−0.28**	0.06		
Middle School Intercept									−0.33	0.26
High School Intercept									**−0.66**	0.13
School-level variables X race interactions										
School Climate X Asian			**−0.12**	0.04			−0.09	0.08	**0.25**	0.06
School Climate X Black			**0.42**	0.05			**0.43**	0.11	0.12	0.11
School Climate X Latinx			**0.35**	0.08			**0.41**	0.04	0.19	0.14
School Climate X Multiracial			**0.25**	0.04			0.28	0.2	**0.27**	0.10
School Climate X Native American			**0.34**	0.17			**0.48**	0.08	0.07	0.09
School Climate X Pacific Islander			**0.59**	0.17			**0.59**	0.09	**0.44**	0.17
School Poverty X Asian					−0.04	0.07	0.1	0.1		
School Poverty X Black					0.1	0.07	**0.21**	0.05		
School Poverty X Latinx					**0.14**	0.04	**0.2**	0.04		
School Poverty X Multiracial					−0.13	0.05	0.01	0.08		
School Poverty X Native American					0.09 *	0 *	**0.24**	0.06		
School Poverty X Pacific Islander					**0.19**	0.02	**0.3**	0.09		
Middle School X Asian									**0.77**	0.18
Middle School X Black									−0.64	0.41
Middle School X Latinx									−0.37	0.35
Middle School X Multiracial									0.07	0.25
Middle School X Native American									**−0.80**	0.23
Middle School X Pacific Islander									−0.45	0.24

	Model 1		Model 2		Model 3		Model 4		Model 5	
Fixed effects	**β**	**S.E.**	**β**	**S.E.**	**β**	**S.E.**	**β**	**S.E.**	**β**	**S.E.**
High School X Asian									**1.14**	0.14
High School X Black									**−0.81**	0.24
High School X Latinx									−0.55	0.29
High School X Multiracial									0.01	0.18
High School X Native American									−0.81	0.46
High School X Pacific Islander									−0.27	0.40
Random effects	**Var.**		**Var.**		**Var.**		**Var.**		**Var.**	
Intercept	**0.29**		**0.28**		**0.26**		**0.23**		**0.26**	
Asian	**0.13**		0.05		**0.15**		0.08		0.02	
Black	**0.16**		0.04		**0.13**		0.04		0.09	
Latinx	**0.11**		0.06		**0.01**		0.00		**0.10**	
Multiracial	**0.06**		0.03		**0.04**		0.02		0.04	
Native American	0.13		**0.11**		0.00 *		0.00		0.04	
Pacific Islander	**0.16**		0.05		**0.01** *		**0.14**		0.16	

Note: Bold estimates are significant at p<.05.

* Estimates of standard errors for the effect of school poverty on the slope for Native students may not be trustworthy. Estimates of residual variance for Pacific Islander students may not be trustworthy. In both cases, it is likely that the distribution of students of these racial backgrounds is uneven and sparse across schools.