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FULL REPORT:

The Roots and Fruits of Positive School Climate

A multilevel examination of school climate's mediating role in the relations among student risk factors and student performance outcomes

A final report to the Pennsylvania Department of Education
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**Research and
Evaluation**

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Abstract

The school experience of a student is molded by relations and interactions that occur within the school, also known as school climate. Positive school climate may improve achievement and serve as a protective factor for students. This study sought to examine the extent to which one commonly used measure of school climate, The PA School Climate Survey, operates comparably across diverse student groups. In addition, this study utilized a multilevel, multifaceted analytic approach to better understand differences in school climate, and subsequent associations with academic achievement, across different contexts. Findings suggest that slightly modified scores from the PA School Climate Survey may better assess the intended domains of school climate. Further, findings suggest that school climate, particularly high expectations and a safe and respectful school climate, are associated with improvements in academic achievement for students from all backgrounds. Finally, learning in a safe and respectful school climate may confer a particular benefit for racial minority students in regard to achievement in mathematics.



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The Pennsylvania Department of Education (PDE) Evaluation and Research project is an effort that was established through a State Longitudinal Data System (SLDS) Grant from the Institute of Education Sciences (IES), National Center for Education Statistics (NCES), awarded in October 2015. The Research and Evaluation project is an initiative to make full use of the P-16+ system data and other data sources to answer priority questions from the PDE research agenda, to form collaborative research partnerships, and to increase PDE's capacity to conduct research. Our mission is to evaluate and analyze data to provide insight that can be used to positively impact policy, inform decision making and lead to improved student outcomes.

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There is a need for multilevel, multifaceted analyses to better understand differences in school climate, and subsequent associations with academic achievement, across different contexts.

Introduction

A school building holds far more within than desks, smart boards, and pencils. A student's school experience is shaped by the relationships and interactions that occur within the building. According to the National School Climate Center, school climate can be defined as “the quality and character of school life based on patterns of students’, parents’ and school staffs’ experience of school life; it also reflects standards, goals, values, interpersonal relationships, teaching and learning practices and organizational structures” (NSCC, 2018).

A compelling body of literature suggests that maintaining a positive school climate and developmentally supportive school culture not only enhances student achievement in general but also improves school safety and buffers otherwise vulnerable students against a wide array of potential risk factors (e.g., adverse home experiences, low socioeconomic status (SES); Masten, Herbers, Cutuli, & Lafavor, 2008; O’Malley, Voight, Renshaw, & Eklund, 2015). However, the mechanisms by which school climate may impact outcomes, and ways that racial minority students may be differentially impacted by issues related to school climate, are unclear. Thus, there is a need for multilevel, multifaceted analyses to better understand differences in school climate, and subsequent associations with academic achievement, across different contexts.

Hereinafter, findings from three key studies are presented. Each represents an important step in better understanding the measurement of, and consequences and antecedents related to, positive school climate across racial groups. The PA School Climate Survey is used to assess school climate across the state of Pennsylvania. Study 1 examined the validity of the PA School Climate Survey as well as the measurement equivalence of the scale across racial groups. Study 2 examined baseline mean differences in academic achievement and exposure to exclusionary discipline across racial groups. Finally, in Study 3, we conducted a nuanced evaluation to determine whether the four dimensions of school climate mediate known relationships between race/SES and an array of outcomes including reading and math achievement and use of exclusionary discipline practices. A summary of key findings from all analyses are presented hereinafter. Key statistical information is provided in the Appendix and a detailed overview of all technical procedures is available by request.

Study 1 – Validity of the PA School Climate Survey Across Racial Groups

Study 1 Overview

In order to understand a construct, such as school climate, the construct first must be measured. School climate is most commonly measured by surveying members of the school community, particularly students. However, surveys do not always measure constructs with the same level of accuracy, reliability, and validity across racial and gender groups. At times, students may respond to items differently as a function of race and gender, and, if this occurs, comparisons of mean scores across groups may be inaccurate, and decisions based on said scores could be less appropriate. Thus, it is important to evaluate the validity of measurements across cultural groups. In this study we, (a) conducted exploratory factor analysis to identify the ideal set of items to include in factor scores for use with the sample as a whole, (b) conducted confirmatory factor analysis to further evaluate the factor structure and scores identified in the exploratory analyses, and (c) conducted measurement equivalence analyses to evaluate the validity of the newly derived factor scores across racial groups.

Sample Descriptive Statistics

A total of 29,729 high school students were included in the sample. Students attended schools across the state of Pennsylvania representing 33 counties. Monroe County contributed the greatest number of students (8.8% of the sample) with the fewest number of students (.2%) coming from Washington County. Approximately 48% of respondents identified as female. The sample was roughly proportional across grade level for 9th to 12th grade students. Students included in the study were racially and ethnically diverse: 4% American Indian/Alaskan Native; 11% Black/African American; 9.2% Hispanic; 4.6% Multi-Racial; 76.4% White/Caucasian; 2.4% Asian; .9% Native Hawaiian/ Pacific Islander.

Results

Factor Analysis. Exploratory factor analysis (principal axis factoring, promax rotation) was used to identify an optimal set of factors and items to assess each of the domains of school climate that are measured using the PA School Climate Survey. Our findings generally supported the four-factor structure that has been identified by the scale developers. Factor loadings from the exploratory factor analysis are presented in Table 1 in the Appendix. However, some items were not meaningfully associated with any factor and others fell

on a different factor than in the original scale. This suggests that alternative formulas for subscale calculation may be more appropriate. The alternative subscales were examined further in the confirmatory factor analysis and were found to be a good fit to the data: CFI=.92 and RMSEA=.06. These findings suggest that alternative scores may best reflect the four subscales assessed on the PA School Climate Survey. Formulas for these alternative scores are provided in Table 1 in the Appendix.

Validity Across Racial Groups. Although findings from our factor analysis broadly supported the validity of the scale, particularly with the alternative subscales, the extent to which the tool is valid across racial groups is also an important consideration. Black/African American and Hispanic students comprised the largest two racial minority groups in the sample. Therefore, analyses were conducted to examine the measurement equivalence for these two groups as compared to the sample as a whole. Detailed findings are presented in the Appendix, Table 2. The findings supported the measurement equivalence (configural, metric, and scalar/threshold) of scores across racial groups and suggest that valid mean comparisons of school climate scores can be made across groups.

Summary and Implications. In summary, the PA School Climate Survey appears to assess four central aspects of school climate: Student Support; Safe and Respectful School Climate; Social Emotional Learning; and High Expectations, Academic Rigor, & Challenge. These four factors are consistent with the model originally posited by the scale developers. However, alternative subscale calculations (provided in the Appendix, Table 1) appear to be more appropriate for students in Pennsylvania. Our findings suggest that the scores have sufficient measurement equivalence across racial groups. Given that the measurement equivalence of scores from the PA School Climate Survey was established in Study 1, Studies 2 and 3 utilize these scores to better understand the antecedents and outcomes associated with school climate.



The findings supported the measurement equivalence of scores across racial groups and suggest that valid mean comparisons of school climate scores can be made across groups.

Study 2 – Relationships between Race, Academic Achievement, and Exclusionary Discipline

Study 2 Overview

Before examining the role of school climate, it was first necessary to examine the baseline relationships between race, academic achievement, and exclusionary discipline. These findings are presented below.

Results

Academic Achievement. Chi-square analyses were used to examine the relationship between race and achievement categories (Advanced, Proficient, Basic, Below Basic) on the PSSA. In both English/Language Arts and math, African American, Hispanic, and Multi-Racial students were significantly and disproportionately more likely to achieve at a Basic or Below Basic level relative to their peers.

Exclusionary Discipline. African American and Multi-racial students were disproportionately likely to have experienced exclusionary discipline. For example, African American students comprised approximately 10% of the sample, but 24.5% of students who had experienced exclusionary discipline. Likewise, Multi-racial students comprised 3.7% of the sample 10.2% of students who had experienced exclusionary discipline. Similar patterns exist for economically disadvantaged students whereby 53% of the students in the sample were economically disadvantaged, compared to 61.2% of students who had be subjected to exclusionary discipline. Subsequent analyses examined the role of school climate in mediating the relationships between race and economic status in predicting disciplinary and academic



African American students comprised approximately 10% of the sample, but 24.5% of students who had experienced exclusionary discipline.

FIGURE 1. Racial background of students included in sample.

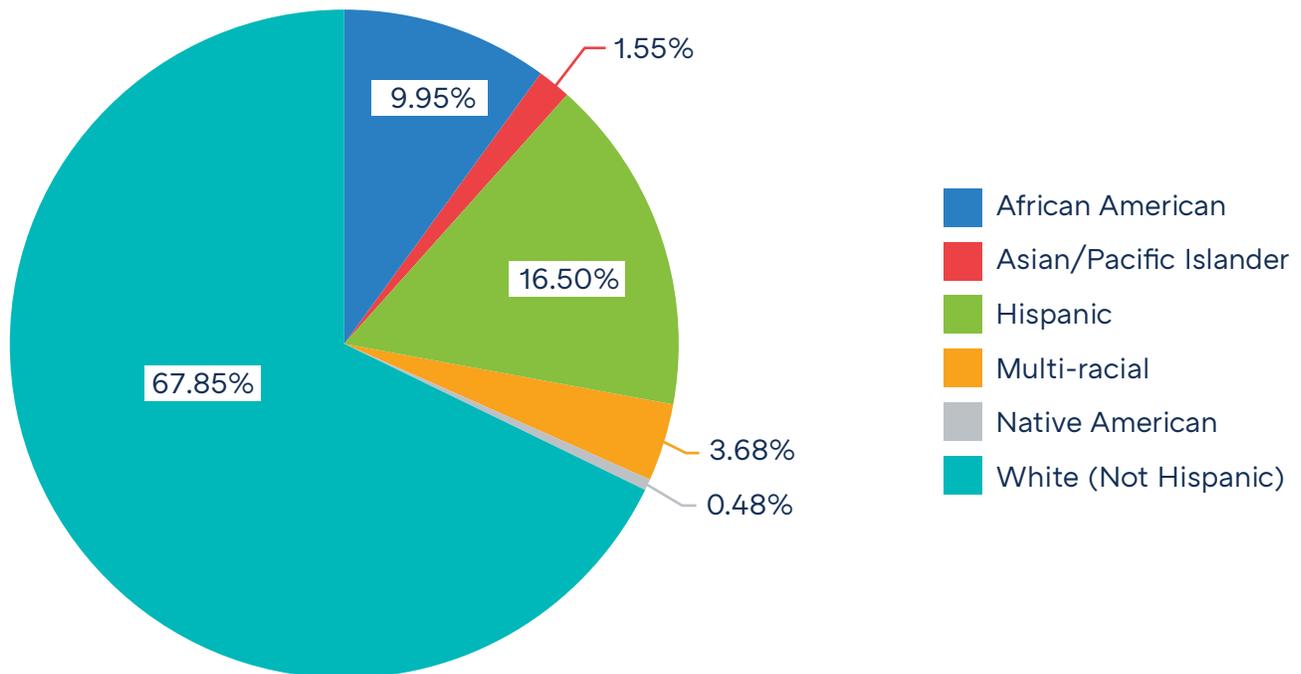
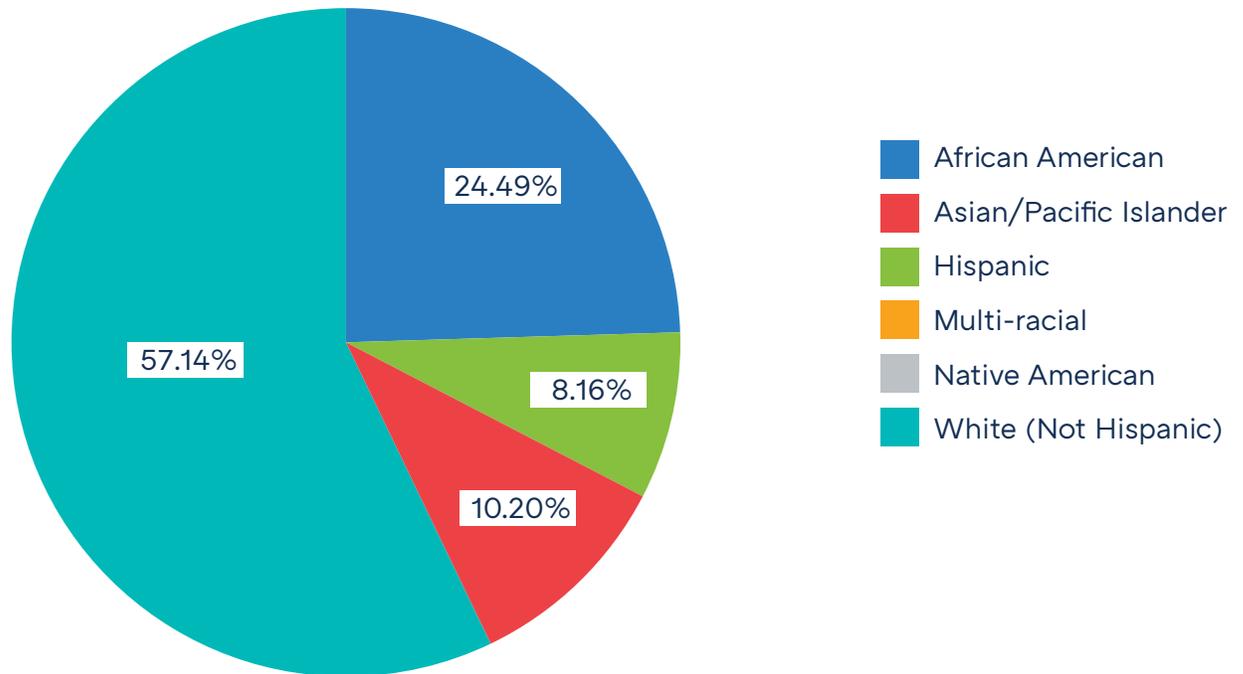


FIGURE 2. Racial background of students who have experienced exclusionary discipline.



Study 3 – Antecedents and Outcomes of Positive School Climate

Study 3 Overview

The present analyses were intended to provide a nuanced understanding of the relationships between demographic variables (race/ethnicity and SES) and academic outcomes (academic performance in reading and mathematics as reflected by the PSSA ELA and math scores) and exposure to exclusionary discipline, and the ways in which each of the four school climate variables (Student Support; Safe and Respectful School Climate; Social Emotional Learning; and High Expectations, Academic Rigor, & Challenge) influence the relationship between demographic variables and academic and disciplinary outcomes. Multi-level path analysis was utilized to assess these relationships.

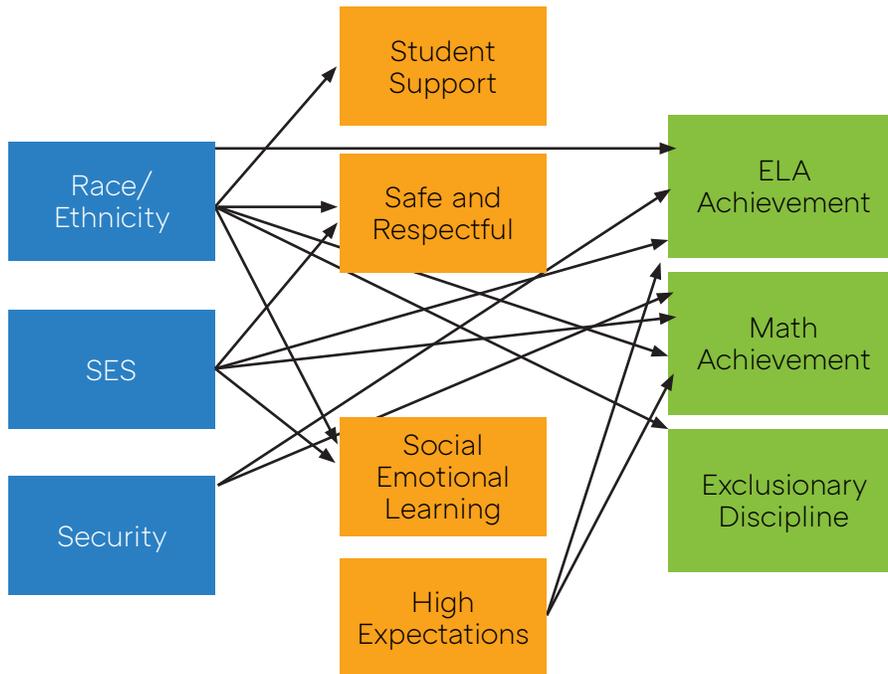
Sample Descriptive Statistics

A sample of 4,000 students was randomly selected from the larger population for the purposes of this study. It was necessary to select a random sample due to the limits of the software required to conduct this type of complex analysis. The demographic statistics of the sample were comparable to those of the larger population: 68% White (Not Hispanic), 17% Hispanic, 10% African American, 4% Multi-Racial, 1.5% Asian, and less than 1% Native American or Pacific Islander. Approximately 47% of the students were female.

Findings

Overall, the findings suggest that the model explained variation in the data well (CFI=.97; RMSEA=.10). Many of the hypothesized pathways were statistically significant. A model displaying all statistically significant relationships is depicted in Figure 3.

FIGURE 3. Path Analytic Model for Predictors and Outcomes of School Climate



In regard to ELA achievement, students who were African American, Hispanic, or Multi-Racial; lower SES; or attending a school with a school security officer had lower PSSA scores in English/ Language Arts. School climate did not impact this relationship. However, regardless of a student's race, SES, or whether their school had a security officer, students had higher ELA achievement when they attended a school where most students perceived that their teachers had high expectations for them.

In regard to math achievement, students who were African American, Hispanic, or Multi-Racial; lower SES; or attended a school with a school security officer, had significantly lower PSSA scores in math. Regardless of a student's race, SES, or whether their school had a security officer, students had higher math achievement when they perceived that attended a school where (a) most students perceived that their teachers had high expectations for them, and (b) most students considered the climate to be safe and respectful. In particular, attending a schools that most students view as having a safe and respectful



Regardless of a student's race, SES, or whether their school had a security officer, students had higher ELA achievement when they attended a school where most students perceived that their teachers had high expectations for them.

climate, while important for all students, may confer additional benefit to African American, Hispanic, and Multi-Racial students.

Notably, in the context of these analyses, a student's risk for exclusionary discipline did not seem to be meaningfully related to overall climate at the school level. However, this may be largely attributable to the low frequency of exclusionary discipline in the sample combined with the measurement of school climate at the school (rather than the individual) level.

Implications, Limitations, and Recommendations for Practice and Future Research

In summary, these findings indicate that slightly modified scores from the PA School Climate Survey may better assess the intended domains of school climate (see the Appendix for formulas). Further, findings from analyses utilizing these alternative scores suggest that school climate, particularly high expectations and a safe and respectful school climate, are associated with improvements in academic achievement for students from all backgrounds. Finally, learning in a safe and respectful school climate may confer a particular benefit for racial minority students in regard to achievement in mathematics.

Notably, this research does have limitations. Most notably, due to the nature of the datasets, item-level school climate data was available only for the psychometric analyses and could not be tied to outcome variables (e.g., PSSA scores, disciplinary outcomes). Therefore, mean school climate scores were calculated at the school level, which could have potentially masked important variation within schools. Future research should examine school climate both at the individual and at the school levels. In addition, future research using more targeted analytic approaches may be useful to better understand thresholds and to establish cut-off scores. Such research could assist practitioners in determining when interventions targeting school climate are necessary and likely to impact key outcome variables, and would enhance the practical utility of the present findings.



A student's risk for exclusionary discipline did not seem to be meaningfully related to overall climate at the school level.

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Appendix

Table 1. Pattern Coefficients and Items Corresponding to Factors based on Exploratory Factor Analysis.

Items	Student Support	Safe and Respectful School Climate	Social Emotional Learning	High Expectations, Academic Rigor, & Challenge
Encourage students to share their ideas about things we are studying in class.	.76	-.016	-.051	-.034
Often connect what I am learning to life outside the classroom.	.68	.015	.004	-.017
Really care about me.	.67	.063	.006	.012
Often assign homework that helps me learn.	.67	-.019	.046	.006
Will help me improve my work if I do poorly on an assignment.	.66	.041	.022	-.007
Help me make up work after an excused absence.	.66	.019	.047	-.025
Adults in this school are usually willing to take the time to give students extra help.	.64	-.006	.086	-.029
The topics we are studying are interesting and challenging.	.61	.060	-.001	-.006
Notices if I have trouble learning something.	.61	.071	-.024	.006
Often require me to explain my answers.	.59	-.039	-.143	.008
This class really makes me think.	.57	.042	-.051	.057
I can get extra help at school outside of my regular classes.	.49	-.005	.049	.025
Think all students can do challenging school work.	.44	-.027	-.064	.027
Adults in this school apply the same rules to all students equally.	.42	.034	.238	-.035

Items	Student Support	Safe and Respectful School Climate	Social Emotional Learning	High Expectations, Academic Rigor, & Challenge
When students already know material, the teacher gives more advanced work.	.33	-.093	.151	.039
Students at this school are expected to learn challenging math material.	.32	-.084	.049	.057
Students at this school are often bullied.	-.07	.847	-.082	.011
Students at this school are often teased or picked on.	-.11	.798	-.005	.020
Students are often bullied because of characteristics (race, religion, weight)?	-.06	.797	-.068	.054
Students at this school are often threatened.	-.01	.793	-.067	.021
Like to put others down.	-.07	.627	.239	.015
Don't get along together well.	-.01	.591	-.182	.128
I worry about crime and violence in school.	.04	.588	-.182	.005
Just look out for themselves.	.03	.493	.140	-.033
I sometimes stay home because I don't feel safe at school.	.15	.488	-.245	-.035
Don't really care about each other.	.06	.474	.187	-.005
In the hallways and bathrooms of the school?	.19	.410	-.001	-.022
Get into arguments when they disagree with people.	-.09	.405	.289	-.023
Outside around school?	.18	.382	-.026	.023
Try to do a good job on school work even when it is not interesting.	.06	-.079	.723	.012
Do their best,even when their school work is difficult.	.04	-.075	.713	.031
Do all their homework.	-.02	-.048	.696	.003

Items	Student Support	Safe and Respectful School Climate	Social Emotional Learning	High Expectations, Academic Rigor, & Challenge
Try to work out their disagreements with other students by talking to them.	-.02	-.050	.681	.004
Stop and think before doing anything when they get angry.	-.06	.023	.650	-.031
Treat each other with respect.	.04	.096	.603	.013
Do their share of the work when we have group projects.	.08	-.041	.578	-.045
Think it's OK to cheat if other students are cheating.	-.02	.295	.369	-.023
Talked to an adult at school about something that was bothering you.	-.02	-.102	.049	.626
Talked to an adult at school about something outside of school important to you.	.03	-.013	.020	.611
Talked to a counselor at school in depth about planning for college.	-.03	.062	.050	.514
Talked to a teacher about a problem you were having in class.	.09	-.066	.019	.484
Write a research paper of 5 or more pages.	-.04	.069	-.032	.448
Make a formal presentation to a class about something you read or researched.	.01	.076	-.067	.438
Write a paper in which you defended your own point of view or ideas.	.08	.034	-.072	.411

Note: Factor scores can be calculated by adding together responses from items in each of the four colored categories separately.

Table 2. Fit Statistics for Measurement Equivalence/Invariance of SABRS Scores Across Racial Groups

Analyses Comparing Black Students with All Non-Black Students

Model	χ^2	<i>df</i>	<i>p</i>	CFI	Δ CFI	RMSEA	Δ RMSEA
Configural Model	41261.84	1735	<.001	.916	-	.055	-
Metric Model	38692.43	1775	<.001	.921	.005	.052	-.003
Scalar/Threshold Model	39234.57	1857	<.001	.921	.005	.051	-.004

Analyses Comparing Hispanic* Students with All Non-Hispanic Students

Model	χ^2	<i>df</i>	<i>p</i>	CFI	Δ CFI	RMSEA	Δ RMSEA
Configural Model	42557.97	1735	<.001	.915	-	.055	-
Metric Model	38796.31	1775	<.001	.923	.008	.052	-.003
Scalar/Threshold Model	39068.22	1857	<.001	.923	.008	.051	-.004

Note: CFI = comparative fit index; RMSEA = root mean square error of approximation;

*The term “Hispanic” reflects the term used in the survey data collection instruments and census. Other terms that some members of this group may prefer include but are not limited to Latino/Latina/Latinx.

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