# Student Body Racial and Ethnic Composition and Diversity-Related Outcomes in US Medical Schools

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# Student Body Racial and Ethnic Composition and Diversity-Related Outcomes in US Medical Schools

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**Context** Many medical schools assert that a racially and ethnically diverse student body is an important element in educating physicians to meet the needs of a diverse society. However, there is limited evidence addressing the educational effects of student body racial diversity.

**Objective** To determine whether student body racial and ethnic diversity is associated with diversity-related outcomes among US medical students.

**Design, Setting, and Participants** A Web-based survey (Graduation Questionnaire) administered by the Association of American Medical Colleges of 20 112 graduating medical students (64% of all graduating students in 2003 and 2004) from 118 allopathic medical schools in the United States. Historically black and Puerto Rican medical schools were excluded.

**Main Outcome Measures** Students' self-rated preparedness to care for patients from other racial and ethnic backgrounds, attitudes about equity and access to care, and intent to practice in an underserved area.

**Results** White students within the highest quintile for student body racial and ethnic diversity, measured by the proportion of underrepresented minority (URM) students, were more likely to rate themselves as highly prepared to care for minority populations than those in the lowest diversity quintile (61.1% vs 53.9%, respectively; $P<.001$; adjusted odds ratio [OR], 1.33; 95% confidence interval [CI], 1.13-1.57). This association was strongest in schools in which students perceived a positive climate for interracial interaction. White students in the highest URM quintile were also more likely to have strong attitudes endorsing equitable access to care (54.8% vs 44.2%, respectively; $P<.001$; adjusted OR, 1.42; 95% CI, 1.15-1.74). For nonwhite students, after adjustment there were no significant associations between student body URM proportions and diversity-related outcomes. Student body URM proportions were not associated with white or nonwhite students' plans to practice in underserved communities, although URM students were substantially more likely than white or nonwhite/non-URM students to plan to serve the underserved (48.7% vs 18.8% vs 16.2%, respectively; $P<.001$).

**Conclusion** Student body racial and ethnic diversity within US medical schools is associated with outcomes consistent with the goal of preparing students to meet the needs of a diverse population.

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Most medical schools in the United States explicitly seek to engender diversity within their student bodies.[1] Academic leaders assert that diversity within their classrooms creates a robust learning environment, exposes students to a broad array of ideas, experiences, and perspectives, and thereby better prepares them to meet the needs of a multicultural American populace.[2,3] Among the many student characteristics medical schools consider in promoting diversity, race is perhaps the most contentious. Race-conscious policies and programs have been used to achieve racial diversity, and particularly to increase the numbers of black, Latino, and Native American individuals who are underrepresented in the physician workforce.[4] In recent years, however, these policies have come under increasing scrutiny as being unnecessary and discriminatory.[5-7]

In considering race and ethnicity, schools cite the educational benefits of student body diversity and emphasize that racial and ethnic diversity are particularly important.[8] Because of the rap-

**For editorial comment see p 1203.**

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idly increasing racial and ethnic diversity of the US population,[9] and the commitment to eliminating well-documented racial disparities in health care quality and outcomes,[10,11] academic leaders advocate for a more "culturally competent" physician workforce and claim that racially and ethnically diverse student bodies are essential to that goal.[12] There has been little empirical study, however, addressing the hypothesis that racial and ethnic diversity in medical schools produces educational benefits.

We sought to assess whether student body diversity is associated with the educational benefits medical schools seek in promoting it. Specifically, we assessed whether the proportion of minority students within medical schools is associated with students' perceived preparedness to care for diverse patient populations, their attitudes about access to health care, and their plans to care for underserved populations. We also examined whether these outcomes were mediated by the perceived institutional climate for interracial interaction within medical schools, and by students' individual experiences of being influenced by individuals with different perspectives.

## METHODS

### Data Source

We analyzed data from the 2003 and 2004 Graduation Questionnaires (GQ), administered by the Association of American Medical Colleges (AAMC). The Web-based GQ is administered annually to all students graduating from allopathic medical schools in the United States and collects information on student characteristics, attitudes, practice plans, and evaluations of the medical school experience. Beginning in 2003, the AAMC added items addressing students' self-rated preparedness to care for patients from different racial and ethnic backgrounds, changes in attitudes resulting from exposure to diverse perspectives, and perceptions of positive interracial interaction within their medical schools.

Before 2004, GQ response rates were generally high (89% in 2003). In 2004, as a result of a complaint filed with the US Department of Health and Human Services,[13] the AAMC and its constituent medical schools relaxed efforts to promote GQ completion,[14] resulting in a decreased response rate (69% in 2004). In addition, the AAMC required explicit student consent to release GQ data; in 2004, this included 69% of respondents. After 2004, the AAMC redesigned the GQ, creating 2 separate components in an effort to respond to concerns about privacy while enhancing collection of basic, nonsensitive information. After this change, response rates decreased much further (33% in 2005), limiting our ability to use data from more recent years.

We excluded data from historically black and Puerto Rican medical schools because the meaning and measurement of diversity is fundamentally different at these schools, where minority groups comprise the majority of students.

### Measures of Diversity

We categorized students into 3 mutually exclusive groups based on self-reported race/ethnicity: (1) underrepresented minority (URM), (2) other minorities not classified as underrepresented (nonwhite/non-URM), and (3) white. Underrepresented minority students were categorized by the AAMC as all students reporting their race/ethnicity as black, American Indian, Alaska Native, Mexican American/Chicano, mainland Puerto Rican, or Native Hawaiian. Nonwhite/non-URM students included minority students who are not considered to be underrepresented in the physician workforce. These were primarily Asians—Chinese, Korean, Japanese, Vietnamese, other Southeast Asian, Indian or Pakistani, Filipino, other Pacific Islander, or other Asian—as well as non-URM Hispanic/Latino (eg, Cuban) students.

Based on a framework used in higher education studies,[15-19] we measured 2 aspects of medical school diversity: compositional diversity and interactional diversity. Compositional diversity reflects numeric proportions of students from different racial and ethnic backgrounds, and interactional diversity captures the degree to which schools promote and students engage in positive interaction and perspective sharing across diverse backgrounds.

We used 2 separate measures of compositional diversity: (1) the proportion of URM students and (2) the proportion of all nonwhite (URM plus nonwhite/non-URM) students, among GQ respondents from each medical school. We also created 2 measures of interactional diversity, one at the school level and one at the student level. For the first, we measured the institutional climate for interracial interaction within medical schools, by averaging for each school its students' responses to 2 GQ items inquiring about positive interracial interaction and exposure to diverse perspectives (TABLE 1). For the second measure, we used responses to a single item assessing students' individual experience of having their knowledge and opinions influenced by exposure to diverse perspectives (Table 1).

### Main Outcome Variables

We examined 3 main outcome variables based on theoretical considerations about the effects of student body diversity: (1) self-rated cultural competence, (2) attitudes about access to care, and (3) plan to serve the underserved (Table 1). Self-rated cultural competence was based on students' level of agreement about their own preparedness to care for individuals from racial and ethnic backgrounds different from their own. Although the term *cultural competence* is used to address issues beyond racial and ethnic differences, improving care for racial and ethnic minorities has been the driving force behind the promotion of cultural competence and is central to most current definitions of this concept.[21,22] Attitudes about access to care were calculated as the average score for 2 items addressing whether students per-

ceived access to health care in the United States to be problematic and whether they endorsed access to adequate care as a right. Because of skewed distributions, we dichotomized both self-rated cultural competence and attitudes about access to care at their median values. Plan to serve the underserved was determined by a "yes" response to a question inquiring whether students intended to practice in an underserved area.

### Other Student and School Characteristics

Students self-reported their sex and age, which we categorized as 26 years or younger, 27 to 29 years, or 30 years or older. We categorized school region (midwest, northeast, south, west) and ownership (public, private) according to AAMC classifications. We counted the number of respondents to the 2003 GQ for each school and considered this a proxy for class size (<100, 100-150, or >150 students).

To account for the possibility that observed associations of student body diversity might be attributable to students' attitudes, experiences, or practice plans before entering medical school rather than exposure to diversity during medical school, we counted the number of diversity-related activities students reported pursuing during medical school (Table 1). We speculated that students with greater preexisting interest in diversity and in minority and underserved populations would be more likely to pursue such activities. To account for the possibility that schools that value a diverse student body might also promote diversity-related outcomes (and that these school efforts, rather than diversity per se, might be responsible for any observed associations), we calculated school averages of diversity-related activities pursued by students.

### Statistical Analysis

We generated descriptive statistics for student and school characteristics. To assess whether 2004 graduates consenting to have their data released differed from all 2004 respondents, we tabulated responses for students in our data set alongside aggregate data for all students responding to the 2004 GQ, as reported in the GQ All Schools Report.[20] Because aggregate data were only available for the full sample of respondents, including historically black and Puerto Rican schools, we included students from these schools in our comparison table (TABLE 2).

We divided our measures of compositional diversity into quintiles of students. We chose this categorical rather than continuous variable configuration based on the theoretical consideration that diversity confers educational benefits not as a linear function but as a certain threshold (critical mass) of minority students is reached. Our preliminary analysis confirmed a nonlinear relationship with our outcomes. We explored quintile and decile configurations, which produced similar results, and we chose quintiles for simplicity.

We tested for differences in proportions of URM and nonwhite students, and for differences in institutional climate scores, by school characteristics, using analysis of variance tests. To test for unadjusted differences in our out-

**Table 1.** Graduation Questionnaire Survey Items Addressing Diversity-Related Climate, Experiences, and Outcomes

| Analytic Variable | Survey Item(s)[a] | Responses | Variable Configuration | Level |
|---|---|---|---|---|
| Institutional climate | 1. Indicate your level of satisfaction with. . .fostering of positive interaction among people from different racial and ethnic backgrounds by the administration.<br>2. The perspectives of individuals from racial and ethnic groups different than your own were often brought into your medical training. | 1 (Very dissatisfied) to 5 (very satisfied)<br>1 (Strongly disagree) to 5 (strongly agree) | Continuous, average of 2 items (range, 1-5) | School (average of scores for all students within a school) |
| Individual experience | 1. My knowledge or opinion was influenced or changed by becoming aware of a different perspective. | 1 (Strongly disagree) to 5 (strongly agree) | Continuous | Student |
| Self-rated cultural competence | 1. I am prepared to care for individuals from racial and ethnic backgrounds different from my own. | 1 (Strongly disagree) to 5 (strongly agree) | Binary, dichotomized at median (5 vs <5) | Student |
| Attitudes about access to care | 1. Access to medical care continues to be a major problem in the United States.<br>2. Everyone is entitled to receive adequate medical care regardless of his or her ability to pay. | 1 (Strongly disagree) to 5 (strongly agree) | Binary, average of 2 items, dichotomized at median (>4 vs ≤4) | Student |
| Plan to serve the underserved | 1. Do you plan to locate your practice in an underserved area? | 0 = No or undecided<br>1 = Yes | Binary | Student |
| Diversity-related activities | Indicate the activities you will have participated in during medical school on an elective or volunteer (not required) basis:<br>1. International health experiences<br>2. Delivering health services to underserved populations<br>3. Learned another language in order to improve my communication with patients<br>4. Took a seminar on minority health<br>5. Participated in a course/workshop on cultural awareness<br>6. Worked on a project with a community-based multicultural group | 0 = No<br>1 = Yes | Continuous, sum of 6 items (range, 0-6) | Student and school (average number for all students within a school) |

[a] From the Association of American Medical Colleges Medical School Graduation Questionnaire, 2003 and 2004.[20]

come variables across compositional diversity quintiles, we used nonparametric tests for trend.

To adjust for potential confounders and account for clustering of students within schools, we conducted multivariate regression analyses by using population-averaged, generalized estimating equation logit models, with exchangeable correlation matrices. The unit of analysis was the individual student. For school-level variables, all students within a given school were assigned the same value. Because compositional diversity, measured as proportions of minority students within a medical school, is likely to have different implications for white and nonwhite students, we conducted separate analyses for these 2 groups. We tested for associations between compositional diversity and each outcome variable, while controlling for student characteristics (age, sex, graduation year) and school characteristics (region, ownership, class size). For analyses of nonwhite students, we additionally adjusted for student race (URM vs nonwhite/non-URM). For the outcome of plan to serve the underserved, we included students' reported level of educational debt, hypothesizing that debt might influence students' practice plans. We examined compositional diversity quintiles first as categorical variables and secondarily as continuous variables to test for linear trends across quintiles. We also ran models for each outcome variable twice, first using percentage URM quintiles (% URM) and then percentage nonwhite quintiles (% nonwhite) as the principal independent variable. We then reran each model twice, separately adding the student-level and school-level measures of diversity-related activities, to address whether the addition of these variables changed our results.

For significant associations between compositional diversity and outcomes, we wanted to assess whether student body diversity operated as hypothesized (ie, through positive interracial interaction and sharing of different perspectives). We therefore repeated our multivariate models, adding the school-level measure of institutional climate and the student-level measure of individual experience with diverse perspectives, to determine whether positive interracial interaction and sharing of perspectives mediated associations of compositional diversity. We also tested for statistical interactions between compositional diversity and institutional climate using likelihood ratio tests to gauge whether compositional diversity had differential effects based on the level of perceived positive interracial interaction within a school. Where significant interactions were observed, we fitted lines with confidence intervals (CIs) predicting outcomes across compositional diversity quintiles, stratified by tertiles of institutional climate. We chose tertiles as the minimum number of categories that would allow assessment of a graded association (dose effect) of institutional climate.

To account for the possibility of selection bias resulting from lower response and participation rates in 2004, we conducted sensitivity analyses restricting the sample to 2003 GQ data. These results did not differ substantively from analyses using both years; therefore, we present only findings for the entire sample.

All data were anonymous. The study received a certificate of exemption from the institutional review board of the David Geffen School of Medicine at University of California, Los Angeles

**Table 2.** Student Characteristics by Year and Participation in Study[a]

| Characteristics | No. (%) of Students | | |
|---|---|---|---|
| | | 2004 | |
| | 2003 (n = 13 764) | Study Sample (n = 7472) | All Respondents (n = 10 893) |
| Race/ethnicity | | | |
| Black | 924 (6.7) | 465 (6.2) | 692 (6.4) |
| American Indian/Alaska Native | 72 (0.5) | 42 (0.6) | 61 (0.6) |
| Asian/Pacific Islander | 2900 (21.1) | 1462 (19.6) | 2081 (19.1) |
| Hispanic/Latino | 847 (6.2) | 456 (6.1) | 675 (6.2) |
| Native Hawaiian | 7 (0.1) | 7 (0.1) | 8 (0.1) |
| White, non-Hispanic | 8830 (64.2) | 4796 (64.2) | 7002 (64.3) |
| Not reported | 184 (1.3) | 244 (3.3) | 374 (3.4) |
| Underrepresented minority | 1378 (10.0) | 715 (9.6) | 1061 (9.7) |
| Age, y | | | |
| ≤26 | 6503 (47.2) | 3724 (49.8) | 5251 (48.2) |
| 27-29 | 4756 (34.6) | 2560 (34.3) | 3693 (33.9) |
| ≥30 | 2503 (18.2) | 1188 (15.9) | 1949 (17.9) |
| Women | 6271 (45.7) | 3375 (45.2) | 5083 (46.7) |
| Region | | | |
| Midwest | 3730 (27.1) | 2124 (28.4) | 3096 (28.4) |
| Northeast | 4391 (31.9) | 2155 (28.8) | 3239 (29.7) |
| South | 4117 (29.9) | 2531 (33.9) | 3576 (32.8) |
| West | 1526 (11.1) | 662 (8.9) | 982 (9.0) |
| Public medical school | 8132 (59.1) | 4714 (63.1) | 6769 (62.1) |
| Prepared to serve diverse populations (% strongly agree) | 8018 (59.1) | 4424 (60.3) | 6409 (59.9) |
| Access to care is a major problem (% strongly agree) | 5734 (42.0) | 3260 (44.4) | 4786 (44.7) |
| Everyone is entitled to adequate care (% strongly agree) | 5757 (42.2) | 3165 (43.1) | 4594 (43.0) |
| Plan to practice in underserved area | 2882 (21.1) | 1637 (22.3) | 2292 (21.4) |

[a] Because of rounding, percentages may not total 100. For each response, the denominator for percentages includes students without missing data. Data include students from all 125 allopathic US medical schools, including historically black and Puerto Rican schools. For 2003 data, the study sample included all respondents.

(UCLA). All analyses were performed with Stata/SE version 9.0 (StataCorp, College Station, Texas), and significance was set at 2-sided $P < .05$.

## RESULTS

Among 31 370 students graduating in 2003 and 2004 from 125 allopathic US medical schools, 24 657 (78.6%) responded to the GQ. Among the 10 893 respondents in 2004, data were unavailable for the 3421 who did not give consent for their data to be released. Consenting respondents differed minimally from all respondents in 2004 (Table 2). Excluding students from historically black and Puerto Rican medical schools and those individuals with missing data resulted in an analytic sample of 20 112 students (64.1% of all graduating students in 2003 and 2004) from 118 medical schools (1784 URM [8.9%], 4734 nonwhite/non-URM [23.5%], and 13 594 white [67.6%]).

Schools differed in their racial composition across regions; western and northeastern schools had more nonwhite students than schools in the south and midwest. The proportion of URM students varied from 0% to 24%, and the proportion of all nonwhite students varied from 4% to 78%. Schools with the highest proportions of nonwhite students and those in the west region tended to have slightly higher mean institutional climate scores (TABLE 3).

A majority of students strongly agreed that they were prepared to care for patients from racial and ethnic backgrounds other than their own (Table 2). Fewer than half strongly endorsed the notions that adequate health care is a universal right and that lack of access is a problem in the United States. Less than 25% planned to practice in an underserved area.

In unadjusted analyses, white students at more diverse schools (indicated by higher proportions of either URM or nonwhite students) rated themselves as better prepared to care for diverse populations and had more equity-oriented attitudes about access to care (FIGURE 1). There was no association among white students between % URM and intent to serve the underserved. However, white students in schools with higher proportions of nonwhite students overall were less likely to express this intent. Among nonwhite students, higher proportions of URM students were positively associated with all 3 outcomes, although higher proportions of nonwhite students overall were not associated with any outcomes.

After adjusting for student and school characteristics, white students in the 2 highest quintiles for student body compositional diversity had 27% to 43% greater odds of high self-rated cultural competence compared with students at schools in the lowest diversity quintiles (TABLE 4). White students in the highest diversity quintiles also had 42% to 51% higher odds of having strong attitudes endorsing equitable access to care compared with those in the lowest quintiles. Student body URM proportions were not associated with white students' plans to serve the underserved, but white students in schools with more nonwhite students were less likely to plan to serve the underserved. Among nonwhite students, there was a significant trend indicating greater self-rated cultural competence in schools with more nonwhite students, but no other significant associations were found (TABLE 5). Add-

**Table 3.** Student Body Racial Composition and School Institutional Climate by School Characteristics[a]

| | No. (%) | | Mean (SD) | | |
|---|---|---|---|---|---|
| | Schools (n = 118) | Students (n = 20 112) | % URM | % Nonwhite | Institutional Climate Score |
| % URM quintile (range) | | | | | |
| Lowest (0%-4.5%) | 27 (23) | 4244 (21) | 3.3 (1.1) | 20.6 (10.8) | 3.79 (0.19) |
| Low (4.6%-6.8%) | 23 (19) | 3917 (19) | 5.6 (0.74) | 30.7 (14.9) | 3.82 (0.18) |
| Middle (7.0%-10.0%) | 25 (21) | 4023 (20) | 8.5 (1.0) | 28.6 (14.5) | 3.87 (0.19) |
| High (10.2%-12.4%) | 20 (17) | 4101 (20) | 11.2 (0.77) | 37.4 (9.7) | 3.94 (0.12) |
| Highest (12.5%-23.9%) | 23 (19) | 3827 (19) | 16.0 (3.6) | 42.2 (10.9) | 3.95 (0.21) |
| *P* value | | | <.001 | .17 | .16 |
| % Nonwhite quintile (range) | | | | | |
| Lowest (4.0%-20.5%) | 31 (26) | 4255 (21) | 5.2 (2.9) | 14.9 (3.8) | 3.81 (0.14) |
| Low (21.1%-25.4%) | 20 (17) | 4046 (20) | 7.3 (3.2) | 23.2 (1.4) | 3.80 (0.18) |
| Middle (25.6%-36.8%) | 25 (21) | 3908 (19) | 9.2 (4.9) | 31.3 (3.5) | 3.92 (0.20) |
| High (36.9%-46.2%) | 21 (18) | 4062 (20) | 11.2 (4.9) | 40.9 (2.9) | 3.88 (0.12) |
| Highest (47.3%-78.1%) | 21 (18) | 3841 (19) | 11.7 (4.9) | 53.0 (7.2) | 3.97 (0.25) |
| *P* value | | | .02 | <.001 | .006 |
| Region | | | | | |
| Midwest | 31 (27) | 5677 (28) | 7.6 (3.6) | 27.6 (14.5) | 3.84 (0.16) |
| Northeast | 34 (29) | 6263 (31) | 9.5 (4.5) | 36.4 (10.9) | 3.87 (0.18) |
| South | 38 (32) | 6042 (30) | 8.8 (5.7) | 26.0 (11.5) | 3.86 (0.13) |
| West | 15 (13) | 2130 (11) | 8.5 (5.6) | 41.0 (19.2) | 3.97 (0.34) |
| *P* value | | | .06 | .03 | <.001 |
| School ownership | | | | | |
| Public | 73 (62) | 12 376 (62) | 8.4 (5.1) | 28.3 (15.0) | 3.85 (0.20) |
| Private | 45 (38) | 7736 (38) | 9.0 (4.5) | 36.2 (11.9) | 3.90 (0.17) |
| *P* value | | | .38 | .10 | .27 |
| Class size | | | | | |
| <100 | 52 (44) | 5763 (29) | 8.3 (5.6) | 27.7 (15.5) | 3.89 (0.19) |
| 100-150 | 41 (35) | 7530 (37) | 8.8 (4.2) | 32.2 (11.6) | 3.86 (0.19) |
| >150 | 25 (21) | 6819 (34) | 9.2 (4.1) | 37.4 (13.8) | 3.83 (0.19) |
| *P* value | | | .08 | .20 | .98 |

Abbreviation: URM, underrepresented minority.
[a] Because of rounding, percentages may not total 100 for numbers of schools and students. Institutional climate score has possible range of 1 to 5. *P* values reflect results of tests of differences among categories (analysis of variance).

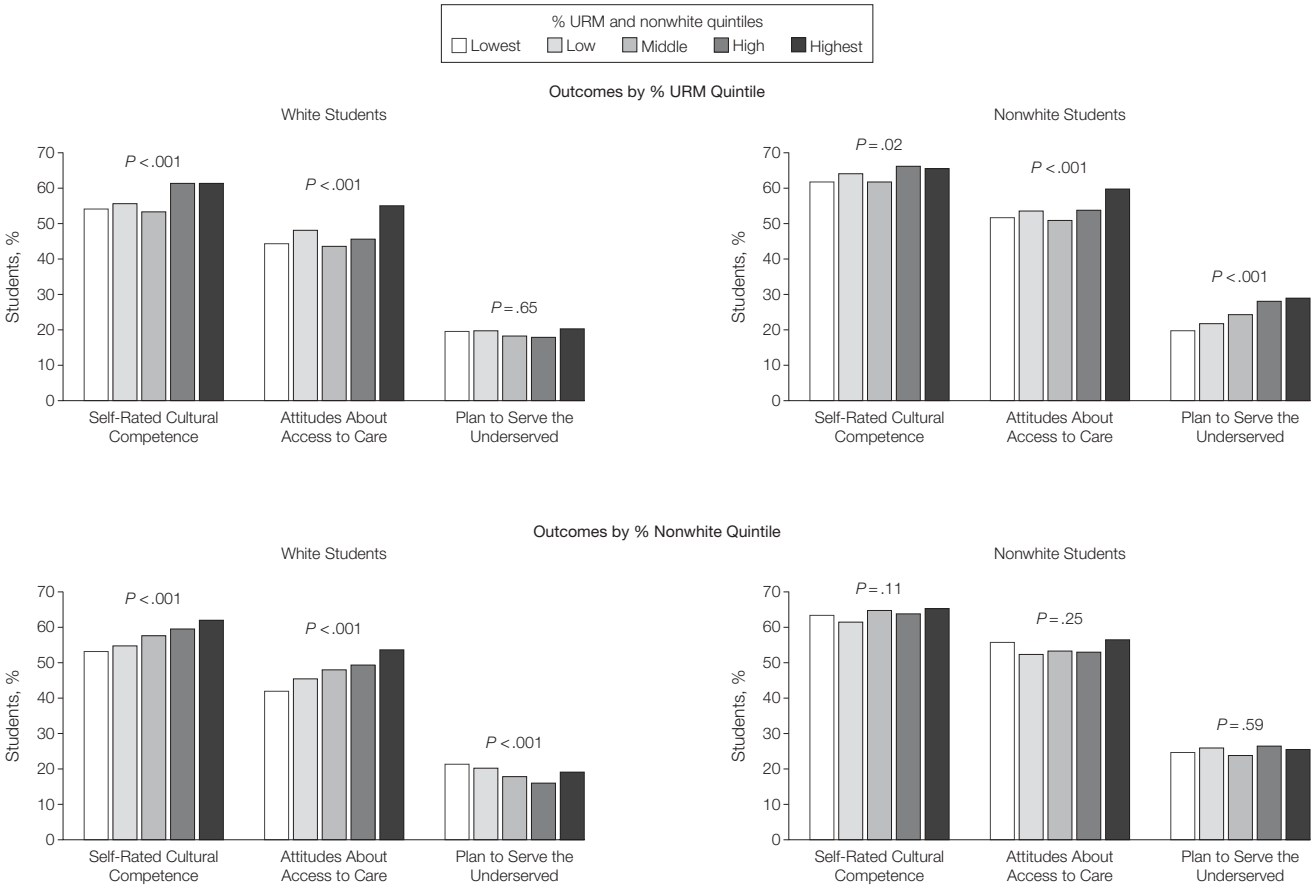
ing student-level and school-level measures of diversity-related activities did not substantively change any of our findings.

Outcomes varied by school region, ownership, and class size, more notably for white than for nonwhite students (Table 4 and Table 5). Among white students, older students tended to have higher rates of all 3 outcomes than students who were 26 years or younger. White and nonwhite women had stronger attitudes than their male counterparts endorsing equitable access to care and were more likely to state an intent to serve the underserved. Among nonwhite students, URM students had higher rates than non-URM students on all outcomes. Underrepresented minority students were substantially more likely than both white and nonwhite/non-URM students to plan to serve the underserved (48.7% vs 18.8% vs 16.2%, respectively; $P < .001$; adjusted odds ratio for URM vs non-URM, 3.95; 95% CI, 3.56-4.39).

We tested whether the significant associations of compositional diversity with diversity-related outcomes among white students were mediated by interactional diversity by adding mean institutional climate and individual experience scores to our models. Higher ratings of institutional climate were positively associated with diversity-related outcomes (TABLE 6). Students' individual experiences of being affected by diverse perspectives were also associated with greater self-rated cultural competence and stronger attitudes about equitable access to care. After adjusting for these measures of interactional diversity, the associations of compositional diversity with self-rated cultural competence and attitudes about access diminished and in many cases were no longer statistically significant. By contrast, interactional diversity did not substantively affect plans to serve the underserved.

We found a significant interaction between school institutional climate and % URM in models predicting white students' self-rated cultural competence ($P = .006$). FIGURE 2 demonstrates that where institutional climate was lowest, white students' self-rated cultural competence was lowest and did not vary much with the proportion of URM students. The presence of higher propor-

**Figure 1.** Unadjusted Association of Student Body Racial Composition With Diversity-Related Outcomes




URM indicates underrepresented minority. Outcomes represent percentage strongly agreeing for self-rated cultural competence, values above median score of 4 (range, 1-5) for attitudes about access to care, and a "yes" response for plan to serve the underserved.

tions of URM students was associated with higher self-rated cultural competence among white students when the institutional climate was perceived to be more positive. There were no significant interactions between compositional diversity and institutional climate for nonwhite students.

## COMMENT

In a cohort of more than 20 000 graduating medical students, white students attending more racially diverse medical schools rated themselves as better prepared than students at less diverse schools to care for racial and ethnic minority patients and had stronger attitudes about inadequate access to health care. These associations became apparent as the proportion of minority students increased above the 60th percentile (10% for URM proportion, 36% for all nonwhite students), suggesting the presence of a threshold effect. The associations of student body diversity appeared to be mediated by more positive interaction and perspective sharing among individuals from different backgrounds within medical schools. The association of student body diversity with white students' self-rated cultural competence was only observed when students perceived a more positive climate for interracial interaction and exchange of diverse perspectives.

Proportion of URM students was not associated with white students' plans to practice in an underserved area. Moreover, white students at schools with high proportions of nonwhite students overall were less likely to plan to serve the underserved. This may reflect confounding by the urban vs rural location of schools. Rural schools are likely to have both fewer nonwhite students and more students who plan to practice in rural, underserved locations.[23] Although we controlled for geographic region in our analyses, we were not able to differentiate rural from urban schools, as schools were de-identified in the GQ data set.

Nonwhite students at high-URM schools compared with low-URM schools had higher rates of diversity-related outcomes in unadjusted analyses. After adjustment, however, these findings were no longer significant. This was not likely due to the smaller sample size for nonwhite students (with a 2-sided $\alpha = .05$, there was 94%-99% power in the nonwhite student sample

**Table 4.** Adjusted Association of Medical School and Student Characteristics With Diversity-Related Outcomes Among White Students[a]

| | Self-Rated Cultural Competence | | Attitudes About Access to Care | | Plan to Serve the Underserved | |
|---|---|---|---|---|---|---|
| | % URM | % Nonwhite | % URM | % Nonwhite | % URM | % Nonwhite |
| **School Characteristic** | | | | | | |
| % URM or % nonwhite quintile | | | | | | |
| Lowest | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Low | 1.04 (0.88-1.22) | 1.06 (0.89-1.25) | 1.17 (0.96-1.45) | 1.20 (0.98-1.48) | 0.92 (0.73-1.17) | 0.88 (0.71-1.10) |
| Middle | 0.94 (0.80-1.11) | 1.15 (0.96-1.39) | 0.89 (0.72-1.09) | 1.16 (0.93-1.46) | 0.95 (0.75-1.20) | 0.84 (0.66-1.07) |
| High | 1.27 (1.07-1.50) | 1.27 (1.05-1.53) | 1.05 (0.85-1.31) | 1.17 (0.93-1.48) | 0.91 (0.71-1.16) | 0.72 (0.55-0.93) |
| Highest | 1.33 (1.13-1.57) | 1.43 (1.17-1.76) | 1.42 (1.15-1.74) | 1.51 (1.18-1.92) | 0.99 (0.79-1.26) | 0.75 (0.58-0.98) |
| *P* for trend | <.001 | <.001 | .02 | .005 | .91 | .009 |
| Region | | | | | | |
| Midwest | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Northeast | 1.18 (1.02-1.37) | 1.18 (1.01-1.40) | 1.14 (0.95-1.37) | 1.15 (0.95-1.41) | 0.82 (0.67-1.02) | 0.89 (0.72-1.11) |
| South | 1.18 (1.03-1.36) | 1.21 (1.05-1.41) | 0.73 (0.61-0.87) | 0.73 (0.61-0.87) | 0.82 (0.67-0.99) | 0.82 (0.68-1.00) |
| West | 1.38 (1.14-1.68) | 1.29 (1.04-1.60) | 1.35 (1.06-1.72) | 1.22 (0.94-1.58) | 1.18 (0.91-1.53) | 1.28 (0.98-1.68) |
| Public vs private school | 0.88 (0.79-0.99) | 0.94 (0.83-1.07) | 0.81 (0.70-0.93) | 0.86 (0.73-1.01) | 1.11 (0.94-1.31) | 1.04 (0.87-1.24) |
| Class size | | | | | | |
| <100 | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| 100-150 | 1.08 (0.95-1.23) | 1.03 (0.90-1.18) | 0.94 (0.80-1.11) | 0.89 (0.76-1.05) | 0.86 (0.71-1.03) | 0.87 (0.73-1.04) |
| >150 | 1.11 (0.96-1.28) | 1.06 (0.90-1.24) | 0.78 (0.65-0.93) | 0.72 (0.59-0.87) | 0.97 (0.79-1.18) | 1.02 (0.83-1.26) |
| **Student Characteristic** | | | | | | |
| Age | | | | | | |
| ≤26 | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| 27-29 | 1.11 (1.03-1.20) | 1.12 (1.03-1.21) | 1.22 (1.13-1.32) | 1.23 (1.13-1.32) | 1.22 (1.11-1.35) | 1.22 (1.11-1.35) |
| ≥30 | 1.11 (1.01-1.23) | 1.12 (1.02-1.23) | 1.27 (1.15-1.39) | 1.27 (1.16-1.40) | 1.40 (1.24-1.57) | 1.40 (1.24-1.57) |
| Women | 1.02 (0.95-1.09) | 1.01 (0.95-1.09) | 1.62 (1.51-1.73) | 1.61 (1.51-1.73) | 1.56 (1.43-1.70) | 1.56 (1.43-1.70) |
| Year (2004 vs 2003) | 1.09 (1.01-1.17) | 1.09 (1.01-1.17) | 1.17 (1.09-1.26) | 1.17 (1.09-1.26) | 1.05 (0.96-1.15) | 1.05 (0.96-1.15) |
| Total educational debt per $1000 | NA | NA | NA | NA | 1.00 (1.00-1.00) | 1.00 (1.00-1.00) |

Abbreviations: NA, not applicable; URM, underrepresented minority.
[a]Outcomes represent percentage strongly agreeing for self-rated cultural competence, values above median score of 4 (range, 1-5) for attitudes about access to care, and a "yes" response for plan to serve the underserved. Results are odds ratios (95% confidence intervals) from logistic regression analyses. Results for % URM and % nonwhite represent results of separate regression analyses.

to detect associations equivalent to those observed in the white student sample). The loss of significance after adjustment in the nonwhite sample appeared to be due largely to higher outcome rates among URM students themselves rather than among other nonwhite students in high-URM schools. In particular, URM students were much more likely than non-URM students to plan to serve underserved populations. Numerous studies have demonstrated that URM medical students are more likely than others—including students from other racial and ethnic groups and those from low socioeconomic backgrounds—to go on to serve underserved communities.[24]

Our findings build on studies of undergraduate institutions suggesting that greater racial diversity on college campuses is associated with a variety of educational benefits, including enhanced critical thinking ability, openness to diversity and challenge, racial and cultural awareness, and satisfaction with the college experience.[16-18] These studies have found that compositional diversity, interactional diversity, and diversity-related initiatives on campuses (workshops, classes, events) work interactively to improve educational outcomes.[15,18]

Prior studies of diversity in medical education have been more limited in scope but have also suggested that student body diversity may confer educational benefits. Surveys have documented that most medical students, particularly those in racially diverse schools, consider diversity to be an important facet of their education.[25-27] In a recent study of 3 medical schools,[19] students' attitudes about culture and health and their perspectives about diversity-related issues were influenced by their interactions and experiences during medical school. In another study,[28] students at the UCLA/Drew Medical Education Program—a program with substantial racial diversity and a strong service mission—were more likely than their colleagues at UCLA's main campus to go on to care for underserved populations. Our study expands these findings by demonstrat-

**Table 5.** Adjusted Association of Medical School and Student Characteristics With Diversity-Related Outcomes Among Nonwhite Students[a]

| | Self-Rated Cultural Competence | | Attitudes About Access to Care | | Plan to Serve the Underserved | |
|---|---|---|---|---|---|---|
| | % URM | % Nonwhite | % URM | % Nonwhite | % URM | % Nonwhite |
| **School Characteristic** | | | | | | |
| % URM or % nonwhite quintile | | | | | | |
| Lowest | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Low | 1.10 (0.90-1.35) | 0.97 (0.77-1.22) | 1.05 (0.85-1.32) | 0.91 (0.71-1.17) | 1.06 (0.81-1.40) | 1.08 (0.81-1.44) |
| Middle | 0.95 (0.78-1.16) | 1.14 (0.91-1.44) | 0.88 (0.70-1.10) | 0.90 (0.69-1.15) | 1.01 (0.76-1.32) | 1.09 (0.82-1.46) |
| High | 1.23 (1.01-1.50) | 1.14 (0.91-0.43) | 1.06 (0.86-1.32) | 0.94 (0.73-1.21) | 1.28 (0.99-1.67) | 1.24 (0.93-1.65) |
| Highest | 1.11 (0.92-1.34) | 1.21 (0.96-0.52) | 1.23 (0.99-1.53) | 1.11 (0.86-1.43) | 1.16 (0.89-1.49) | 1.23 (0.92-1.63) |
| *P* for trend | .15 | .03 | .07 | .25 | .11 | .10 |
| Region | | | | | | |
| Midwest | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Northeast | 0.93 (0.79-1.09) | 0.93 (0.78-1.10) | 0.88 (0.73-1.05) | 0.91 (0.74-1.11) | 1.00 (0.81-1.23) | 0.99 (0.79-1.24) |
| South | 0.88 (0.74-1.04) | 0.89 (0.75-1.06) | 0.79 (0.65-0.95) | 0.79 (0.65-0.97) | 0.76 (0.60-0.95) | 0.78 (0.63-0.97) |
| West | 1.12 (0.91-1.38) | 1.04 (0.83-1.32) | 1.09 (0.87-1.38) | 1.02 (0.79-1.32) | 1.36 (1.04-1.76) | 1.30 (0.98-1.72) |
| Public vs private school | 0.99 (0.99-1.13) | 1.05 (0.92-1.21) | 0.89 (0.77-1.02) | 0.90 (0.77-1.05) | 1.13 (0.95-1.33) | 1.16 (0.97-1.39) |
| Class size | | | | | | |
| <100 | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| 100-150 | 0.95 (0.82-1.11) | 0.93 (0.80-1.09) | 0.90 (0.76-1.06) | 0.89 (0.75-1.06) | 0.89 (0.73-1.07) | 0.87 (0.72-1.06) |
| >150 | 0.87 (0.74-1.02) | 0.87 (0.74-1.03) | 0.79 (0.66-0.94) | 0.77 (0.64-0.93) | 1.02 (0.83-1.25) | 1.01 (0.82-1.25) |
| **Student Characteristic** | | | | | | |
| Age | | | | | | |
| ≤26 | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| 27-29 | 1.04 (0.93-1.17) | 1.05 (0.93-1.17) | 1.09 (0.97-1.21) | 1.09 (0.97-1.21) | 1.23 (1.07-1.41) | 1.23 (1.07-1.41) |
| ≥30 | 1.09 (0.93-1.27) | 1.09 (0.93-1.27) | 1.11 (0.95-1.29) | 1.11 (0.95-1.28) | 1.23 (1.03-1.47) | 1.23 (1.03-1.46) |
| Women | 1.12 (1.01-1.25) | 1.13 (1.02-1.25) | 1.53 (1.38-1.69) | 1.53 (1.38-1.69) | 1.64 (1.45-1.86) | 1.64 (1.45-1.86) |
| Year (2004 vs 2003) | 1.03 (0.93-1.15) | 1.03 (0.93-1.15) | 1.18 (1.06-1.31) | 1.18 (1.06-1.31) | 1.05 (0.92-1.20) | 1.05 (0.92-1.20) |
| Race | | | | | | |
| Nonwhite/non-URM | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| URM | 1.37 (1.21-1.55) | 1.39 (1.23-1.56) | 1.72 (1.53-.94) | 1.74 (1.55-1.96) | 4.51 (3.95-5.14) | 4.58 (4.02-5.21) |
| Total educational debt per $1000 | NA | NA | NA | NA | 1.00 (1.00-1.00) | 1.00 (1.00-1.00) |

Abbreviations: NA, not applicable; URM, underrepresented minority.
[a]Outcomes represent percentage strongly agreeing for self-rated cultural competence, values above median score of 4 (range, 1-5) for attitudes about access to care, and a "yes" response for plan to serve the underserved. Results are odds ratios (95% confidence intervals) from logistic regression analyses. Results for % URM and % nonwhite represent results of separate regression analyses.

**Table 6.** Adjusted Association of Compositional and Interactional Diversity With Diversity-Related Outcomes Among White Students[a]

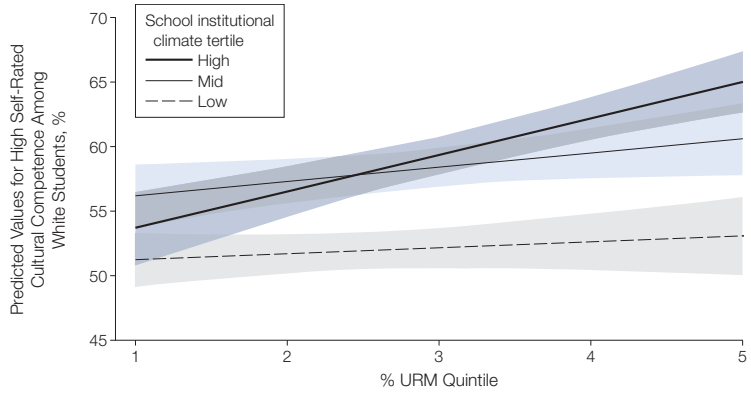
| | Self-Rated Cultural Competence | | Attitudes About Access to Care | | Plan to Serve the Underserved | |
|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 |
| % URM quintile | | | | | | |
| Lowest | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Low | 1.04 (0.88-1.22) | 1.01 (0.87-1.17) | 1.17 (0.96-1.45) | 1.17 (0.96-1.43) | 0.92 (0.73-1.17) | 0.91 (0.72-1.15) |
| Middle | 0.94 (0.80-1.11) | 0.90 (0.78-1.04) | 0.89 (0.72-1.09) | 0.88 (0.72-1.08) | 0.95 (0.75-1.20) | 0.93 (0.74-1.17) |
| High | 1.27 (1.07-1.50) | 1.12 (0.95-1.31) | 1.05 (0.85-1.31) | 0.97 (0.78-1.20) | 0.91 (0.71-1.16) | 0.85 (0.66-1.09) |
| Highest | 1.33 (1.13-1.57) | 1.16 (0.99-1.36) | 1.42 (1.15-1.74) | 1.30 (1.05-1.59) | 0.99 (0.79-1.26) | 0.93 (0.73-1.19) |
| *P* for trend | <.001 | .05 | .02 | .18 | .91 | .47 |
| Interactional diversity | | | | | | |
| Institutional climate[b] | NA | 1.27 (1.22-1.32) | NA | 1.38 (1.33-1.44) | NA | 1.10 (1.05-1.15) |
| Individual experience[b] | NA | 1.94 (1.46-2.59) | NA | 1.47 (1.00-2.15) | NA | 1.36 (0.87-2.10) |
| % Nonwhite quintile | | | | | | |
| Lowest | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] | 1 [Reference] |
| Low | 1.06 (0.89-1.25) | 1.05 (0.90-1.22) | 1.20 (0.98-1.48) | 1.21 (0.99-1.47) | 0.88 (0.71-1.10) | 0.88 (0.71-1.08) |
| Middle | 1.15 (0.96-1.39) | 1.04 (0.88-1.23) | 1.16 (0.93-1.46) | 1.10 (0.88-1.37) | 0.84 (0.66-1.07) | 0.79 (0.62-1.00) |
| High | 1.27 (1.05-1.53) | 1.15 (0.97-1.36) | 1.17 (0.93-1.48) | 1.08 (0.87-1.35) | 0.72 (0.55-0.93) | 0.68 (0.52-0.87) |
| Highest | 1.43 (1.17-1.76) | 1.23 (1.02-1.48) | 1.51 (1.18-1.92) | 1.36 (1.07-1.72) | 0.75 (0.58-0.98) | 0.69 (0.53-0.90) |
| *P* for trend | <.001 | .02 | .005 | .07 | .009 | .001 |
| Interactional diversity | | | | | | |
| Institutional climate[b] | NA | 1.27 (1.22-1.32) | NA | 1.38 (1.33-1.44) | NA | 1.10 (1.05-1.16) |
| Individual experience[b] | NA | 2.05 (1.53-2.75) | NA | 1.48 (1.01-2.15) | NA | 1.50 (0.99-2.29) |

Abbreviations: NA, not applicable; URM, underrepresented minority.
[a]Outcomes represent percentage strongly agreeing for self-rated cultural competence, values above median score of 4 (range, 1-5) for attitudes about access to care, and a "yes" response for plan to serve the underserved. Results are adjusted odds ratios (95% confidence intervals). Results for % URM and % nonwhite quintiles represent results of separate regression analyses. Model 1 adjusted for school characteristics (geographic region, public vs private ownership, class size) and student characteristics (age, sex, academic year). Plan to serve the underserved analysis also adjusted for total educational debt. Model 2 includes all variables in model 1 plus mean school institutional climate scores and student individual experience scores.
[b]Integer scale, 1 to 5.

ing an independent association between student body racial and ethnic composition and diversity-related outcomes across all nonminority US medical schools.

Our study had several limitations. The design was cross-sectional and as such, it is impossible to infer causality. We did not have measures of students' attitudes, experiences, or practice plans before entering medical school. It is possible that students more interested in diverse and underserved populations chose schools with greater student body diversity and that these preexisting attitudes rather than the medical school experience accounted for the observed outcomes. It is also possible that schools that recruit a diverse student body are committed to improving diversity-related outcomes and that this type of school commitment rather than diversity per se accounted for our findings. We hypothesized that students with these preexisting attitudes, and those at schools with a greater commitment to diversity, would be more likely to pursue diversity-related activities during medical school. We found that student body diversity was positively associated with outcomes even after accounting for diversity-related activities.

**Figure 2.** Association of Student Body Racial Composition With White Students' Self-Rated Cultural Competence, Stratified by Level of Medical School Institutional Climate




| No. of Students | | | | | |
|---|---|---|---|---|---|
| High | 1111 | 732 | 1051 | 1869 | 1752 |
| Mid | 1116 | 1333 | 1166 | 1834 | 1257 |
| Low | 2017 | 1852 | 1806 | 398 | 818 |

URM indicates underrepresented minority. Self-rated cultural competence indicates percentage strongly agreeing with statement about preparedness to care for different racial and ethnic groups. Numbers represent students in each of 15 strata defined by percentage URM quintile and institutional climate tertile. Lines represent fitted predictions (with 95% confidence interval shading) of high self-rated preparedness to care for diverse populations, among white students, based on percentage URM quintile and level of school institutional climate.

The fact that the associations of student body diversity with our outcomes were mediated by the climate for positive interracial interaction and the influence of diverse perspectives that students perceived in medical school also supports the notion that exposures during rather than before medical school were responsible for our findings.

Although we found statistically significant results, our sample was large, and the relative importance of these findings is unclear. Student body diversity is an ecological or environmental exposure rather than an individual-level exposure. As with other environmental factors, its importance may be related more to the breadth of the exposure—the size of the population affected—than to the effect size at the individual level. The effect sizes we observed were similar to those found in studies of other environmental exposures.[29-31] If we assumed that the approximately 7% difference in self-rated cultural competence across URM quintiles (Figure 1) was attributable to differences in student body diversity, then increasing the proportion of URM students in the schools of the lower 3 quintiles of students to match those of the upper 2 quintiles would result in approximately 400 additional white students every year considering themselves to be highly prepared to care for racial minority populations. This is particularly significant in light of recent data demonstrating that a large proportion of resident physicians in the United States receive limited instruction in and think they are unprepared to provide cross-cultural care.[32]

Our main outcome measures were based on self-report data. It is unclear how well students' self-rated cultural competence correlates with their actual ability to provide effective care for diverse patient populations. Prior study has established, however, that physicians' self-rated cultural competence is associated with better outcomes among minority patients,[33] even when it is measured using a single question.[34]

We were unable to measure the diversity of the patient populations to whom students were exposed. Patient population diversity may have confounded our results if patients cared for at medical schools with more diverse student bodies were also more diverse, and if exposure to more diverse patient populations was associated with diversity-related outcomes.[19] This represents an important area for future research.

Acknowledging these limitations, we believe our findings have potential policy implications. The consideration of student race in university recruitment programs and admissions has been a source of controversy for decades, and medical schools have been at the heart of that controversy. In 1977, a medical school applicant sued the University of California, Davis School of Medicine, claiming that the school's admission policy giving special consideration to minority students constituted "reverse discrimination."[35] In that landmark case, a divided US Supreme Court struck down the university's policy of reserving spots for minority students but upheld the school's right to consider race in admissions, based on the notion that a diverse student body enhanced the educational environment. Twenty-five years later, in 2 cases brought against the University of Michigan, the Supreme Court further constrained the use of race in admissions by disallowing the assignment of points for race in scoring applicants. But again, by a narrow margin, the Supreme Court affirmed the educational benefits of diversity and allowed for race to be considered as one factor in a holistic review of individual applicants.[5,6]

Our study lends empirical support for the Supreme Court's rationale (ie, that student body racial diversity is associated with measurable, positive, student outcomes). It also indicates that a diverse student body is likely to be necessary but not sufficient. Medical schools may need to actively foster positive interaction among individuals from different backgrounds to derive the benefits of diversity. Additionally, our analysis supports the concept of "critical mass,"[5] whereby a certain proportion of minority students is considered necessary to realize the benefits of diversity. These results can guide medical schools in shaping policies for recruiting, admitting, and retaining URM students as one component of achieving diversity to help them fulfill their educational missions.[1]

**Author Contributions:** Dr Saha had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
*Study concept and design:* Saha, Guiton, Wimmers, Wilkerson.
*Acquisition of data:* Wilkerson.
*Analysis and interpretation of data:* Saha, Guiton, Wimmers, Wilkerson.
*Drafting of the manuscript:* Saha.
*Critical revision of the manuscript for important intellectual content:* Saha, Guiton, Wimmers, Wilkerson.
*Statistical analysis:* Saha, Wimmers.
*Administrative, technical, or material support:* Wilkerson.
*Study supervision:* Saha.
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If we value the pursuit of knowledge, we must be free to follow wherever that search may lead us.
—Adlai E. Stevenson (1900-1965)