The Effects of Racism in Medical Education on Students' Decisions to Practice in Underserved or Minority Communities

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Abstract

Purpose
The purpose of this study was to examine the relationship between manifestations of racism in medical school and subsequent changes in graduating medical students' intentions to practice in underserved or minority communities, compared with their attitudes and intentions at matriculation.

Method
The authors used repeated-measures data from a longitudinal study of 3,756 students at 49 U.S. medical schools that were collected from 2010 to 2014. They conducted generalized linear mixed models to estimate whether manifestations of racism in school curricula/policies, school culture/climate, or student attitudes/behaviors predicted first- to fourth-year changes in students' intentions to practice in underserved communities or primarily with minority populations. Analyses were stratified by students' practice intentions (no/undecided/yes) at matriculation.

Results
Students' more negative explicit racial attitudes were associated with decreased intention to practice with underserved or minority populations at graduation. Service learning experiences and a curriculum focused on improving minority health were associated with increased intention to practice in underserved communities. A curriculum focused on minority health/disparities, students' perceived skill at developing relationships with minority patients, the proportion of minority students at the school, and the perception of a tense interracial environment were all associated with increased intention to care for minority patients.

Conclusions
This study provides evidence that racism manifested at multiple levels in medical schools was associated with graduating students' decisions to provide care in high-need communities. Strategies to identify and eliminate structural racism and its manifestations in medical school are needed.

Health disparities based on race persist despite decades of efforts to eliminate them.[1,2] One barrier to health equity is structural racism, defined as the institutions, policies, and norms that are deeply embedded in society and perpetuate racial inequality.[3,4]

Differing access to high-quality care is one of the ways that structural racism can contribute to health disparities. Many communities lack care options, so patients must travel long distances, endure long waits, and face a limited selection of primary and specialty providers.[5] These communities, many of which are designated as health professional shortage areas (HPSAs), include a disproportionate number of racial minority residents.[6] Increasing the number of physicians working in underserved and/or primarily minority communities could improve health in those communities and reduce disparities.[7]

The Health Resources & Services Administration estimated that 8,200 additional primary care physicians alone are needed to eliminate existing HPSAs.[5] Meeting that need will require a significant increase in the number of graduating medical students who choose to practice in underserved or primarily minority communities. Several factors, such as perceived quality of life, burnout,[8] debt,[9] socioeconomic background,[10] and demographic characteristics,[11,12] are known to be associated with students choosing to practice in an underserved area. There is also some evidence that participating in medical school and graduate medical education learning experiences that focus on caring for an underserved population increases the likelihood that a learner will practice in an underserved area.[11,13–16] However, despite extensive research identifying the factors that are associated with students choosing to care for underserved populations, the gap between the number of physicians needed and the number practicing in underserved communities remains large, and the role of medical education in influencing such choices is poorly understood. This gap in understanding may be due to a lack of a conceptual framework for studying this topic. Evaluating the medical school factors that influence students' decisions as they relate to or result from experiences with historical or current structural racism may help identify previously unknown contributors and provide a novel framework to inform the development of interventions. These medical school factors may systematically influence students' attitudes about

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Acad Med. 2019;94:1178–1189.
First published online March 26, 2019
doi: 10.1097/ACM.0000000000002719

Supplemental digital content for this article is available at http://links.lww.com/ACADMED/A659.

working in underserved communities, contributing to variation in the proportion of graduating students who make this career decision.

These medical school factors may operate at multiple intersecting levels.[17] For example, a lack of emphasis in the curriculum on minority health or health equity may reflect a structural, or institutionalized, form of racism that can potentially influence medical students' interest in working with underserved populations.[4,18] In addition, less formal curricula and the learning environment,[3,19–21] as well as personal attitudes regarding race, can influence students' intentions to practice in underserved areas.[18,22] In this study, we examined three intersecting levels at which racism may manifest in medical education—medical school curricula and policies, medical school culture and climate, and medical student attitudes and behaviors—and we assessed whether these factors predicted changes between students' first- and fourth-year intentions to practice in underserved or minority communities.

Method

Sample

We used repeated-measures data from the Medical Student Cognitive Habits and Growth Evaluation Study (CHANGE Study) of medical students matriculating at a stratified random national sample of 49 U.S. medical schools in the fall of 2010. The CHANGE Study, designed and carried out by the coauthors of this report, is a longitudinal survey study of the impact of medical education on learners' biases and attitudes.[23,24]

Sampling and recruitment methods have been previously described.[25,26] Briefly, we randomly selected 50 U.S. medical schools stratified by public/private status and region of the country (six regions total). One school was later excluded because it had a nontraditional schedule that limited generalizability, leaving 49 schools in the sample. We ascertained matriculating students' email addresses via (1) an item included on the Association of American Medical Colleges (AAMC) Matriculation Questionnaire; (2) an incomplete list of matriculating students provided by the American Medical Association; and (3) a snowball sampling strategy, whereby respondents were asked to forward recruitment materials to their classmates. We identified and invited 5,823 first-year students (68% of all matriculating students at the sampled schools) to participate in a web-based survey (baseline, MS1). After excluding 32 invalid/incomplete surveys, the sample (n = 4,732) consisted of 81% of the invited first-year students and 55% of all first-year students at the included schools. The sample had similar gender and race distributions to the student populations at the included schools.[24] Follow-up surveys (MS4) were completed by 3,959 students (80% of the students who completed the baseline survey) in the spring of 2014. Students not in their third or fourth year of medical school (n = 203) were excluded, leaving a longitudinal sample of 3,756 students.

The institutional review boards at the Mayo Clinic and the University of Minnesota approved this study.

Measures

Dependent variables were responses to two survey items included at baseline (MS1) and follow-up (MS4): "Do you plan to locate your practice in an underserved area?" and "Regardless of location, do you plan to work primarily with racial or ethnic minority patients?" Response options were "no," "undecided," and "yes." We stratified analyses by students' responses to these questions at the beginning of medical school (MS1).

We organized the independent variables into categories that aligned with the ways racism can manifest in educational institutions: racism in medical school curricula/policies, racism in medical school culture/climate, and medical student attitudes/behaviors toward race. When a factor could fall into multiple categories, we selected the category that we believed best represented its level of influence in relation to students. If the item was included on both the baseline and follow-up surveys, we included the change score in our model. If the item was included on the follow-up survey only, we included that value in our model.

Manifestations of racism in medical school curricula and policies. These variables consisted of the curricula and policies that communicate a school's values related to racial inequalities and may reflect a historical emphasis on the health care needs of the white majority. These variables were measured on the follow-up (MS4) survey only.

We measured the number of hours of training students received related to racial disparities and bias, which consisted of a mean score of responses to the items measuring hours of training received on "racial disparities in health care," "identifying cultural customs that might affect clinical care," and "the potential effect of unintended racial biases on the care you provide" (scale reliability: Cronbach alpha [α] = 0.88). Each item was measured with a slider that recorded the number of hours as a whole number between 0 and 49 or 50+. Responses of 50+ (1.9%) were assigned a value of 50.

We measured the number of hours of training students received related to interpersonal skills as a mean score of responses to the items measuring hours of training on "communication," "partnership-building," "seeing things from your patient's perspective," "working effectively in interprofessional teams," and "working with difficult patients" (α = 0.84). Sliders were used as described above.

Single yes/no items assessed whether students "participated in structured service learning," "took a seminar on minority health," "participated in a cultural awareness course/workshop," "received information on unconscious racial bias or stereotyping," and "completed an Implicit Association Test (IAT) of unconscious racial bias."

Additional items asked, "How prepared do you feel to handle a racial or ethnic minority patient?" and "How skilled are you at developing positive relationships with racial minority patients?" as measures of the effectiveness of the curriculum focused on readying students to care for diverse patients. Responses were measured using a four-point scale (very unprepared to prepared and very unskilled to skilled, respectively).

We also calculated a mean score of responses to three items measuring students' perceptions of their school's policies and procedures intended to recruit and retain minority students, indicating their school's commitment to diversity: My school "makes a genuine

effort to recruit racial and ethnic minority students," "fosters respect for cultural differences," and "makes a special effort to help racial and ethnic minority students feel like they 'belong' on campus" ($\alpha = 0.81$). Responses were measured on a seven-point scale (strongly disagree to strongly agree).

As a measure of diversity, we obtained the proportion of racial or ethnic minority students at each school in 2010 from the AAMC FACTS website.[27]

Manifestations of racism in medical school culture and climate. These variables represented informal norms and observed behaviors (i.e., hidden curriculum) that indicate the "climate" of the organization and how race and racial equity are discussed and understood among faculty and students.[28] These factors were measured on the follow-up (MS4) survey only.

Two items measured faculty role modeling: "I have witnessed racial insensitivity from faculty" and "How often have you heard professors or residents make negative comments about black patients?" Responses were measured on a seven-point scale (strongly disagree to strongly agree) and on a four-point scale (never to very often), respectively. To adjust for social desirability bias, we dichotomized responses to compare the most positive response category (strongly disagree and never, respectively) with all other response categories.

We measured perceived climate with one item, "The interracial climate on this campus is tense," using a seven-point scale (strongly disagree to strongly agree).

We used a mean score of responses to two items to measure the school's learning orientation to interracial interactions[29]: "Students in this medical school have the opportunity to learn how to interact more effectively with members of another race" and "Students in this medical school are encouraged to learn from their mistakes in interacting with members of another race" ($\alpha = 0.78$). Responses were measured on a seven-point scale (strongly disagree to strongly agree).

To measure students' observations of racism from any source in a medical setting, we asked how often they had "witnessed discriminatory treatment of racial or ethnic minority patients" using a four-point scale (never to very often). Again, we dichotomized responses to compare the most positive response category (never) with all other response categories.

Racial or ethnic minority students were asked whether they had experienced each of six microaggressions: I "received lower evaluation or grades for unfair reasons," "was treated in an unfriendly way, as if not welcome," "was subjected to offensive remarks/names," "was treated with less respect than other medical students," "was publicly humiliated," and "was ignored by a resident or attending physician." Any student who responded "yes" then was asked to report the likelihood that the microaggression was due to their race/ethnicity (five-point scale, not at all likely to extremely likely). We created a school-level variable representing the average attribution of microaggressions to race/ethnicity by nonwhite students within each school.

Manifestations of racism in medical student attitudes and behaviors. Implicit and explicit racial biases and attitudes are strong predictors of behavior.[30] These attitudes and preferences may change during medical school and influence students' career choices with regard to minority patients. Attitude was measured as either change in attitude between MS1 and MS4 or, if not measured at MS1, attitude reported at MS4.

Explicit racism was measured on the follow-up survey with items from two scales: the Attitudes Towards Blacks Scale (ATBS)[31] (e.g., "If I had a chance to introduce Black visitors to my friends and neighbors, I would be pleased to do so" [reverse coded, two items, $\alpha = 0.55$]) and the Symbolic Racism Scale (SRS)[32] (e.g., "Most Blacks who receive money from welfare programs could get along without it if they tried" [four items, $\alpha = 0.73$]). Students who identified as black did not complete these items. Responses were measured on a seven-point scale (strongly disagree to strongly agree).

Change in implicit bias was measured as the difference between IAT scores at baseline and follow-up. The IAT is a validated measure that compares time required to pair positive and negative words with images of black or white faces.[33]

Change in anxiety about treating black patients was measured as the difference between Interracial Anxiety Scale scores at baseline ($\alpha = 0.88$) and follow-up ($\alpha = 0.88$).[34] For example, one such item was "When interacting with Black patients, I am unsure how to act in order to show them that I am not prejudiced." Students who identified as black did not complete these items. Responses were measured on a seven-point scale (strongly disagree to strongly agree).

Changes in attitudes about social justice were measured as the difference between medical authoritarianism scale scores at baseline ($\alpha = 0.89$) and follow-up ($\alpha = 0.89$).[35] For example, one such item was "Those who contribute the most to society should get better health care." Responses were measured on a seven-point scale (strongly disagree to strongly agree).

Change in desire to behave in an unprejudiced way was measured as the difference between internal and external motivation to control prejudice scales at baseline (internal $\alpha = 0.74$; external $\alpha = 0.88$) and follow-up (internal $\alpha = 0.74$; external $\alpha = 0.88$).[36] Items included "I am personally motivated by my beliefs to be non-prejudiced toward people who are not of my race" (internal) and "I attempt to appear non-prejudiced toward people who are not of my race in order to avoid disapproval from others" (external). Students who identified as black did not complete these items. Responses were measured on a seven-point scale (strongly disagree to strongly agree).

Interactions with black people were measured on the follow-up survey only. Students reported the amount of interaction they had with black people who were (1) medical students, (2) faculty, (3) attending physicians and/or residents, (4) allied health staff, or (5) clerical/administrative/secretarial staff. Responses were measured on a four-point scale (none to substantial). Students then reported how favorable those interactions were (four-point scale, very unfavorable to very favorable).

Covariates. Covariates included self-reported demographic characteristics and resources. We measured sex, age, and race/ethnicity using standard survey items. We compared black students, Hispanic/Latino

students (of any race), Asian students, and unknown race/other race students with white students. We categorized family income into < $50,000, $50,000–$99,999, and ≥ $100,000. We measured school-related distress using three items that are based on a review of the literature on medical student burnout[8,37–42] (seven-point scale, strongly disagree to strongly agree) and asked students if they owed more than $1,000 in educational loans (yes/no). We measured social desirability bias using items from the Marlowe–Crowne scale.[43]

Analysis

As we stratified our analyses by students' responses (no, undecided, yes) to the two dependent-variable questions at baseline, each respondent was included in two strata, one for each of their responses. We considered the follow-up survey responses to these questions to be ordinal and used generalized linear mixed regression with a logit link and multinomial distribution to model the odds of each response relative to the next less positive one (e.g., yes compared with undecided, undecided compared with no), accounting for within-school clustering and the student's response at baseline.

We calculated bivariate associations between each independent and dependent variable. Variables associated at $P < .20$ were carried forward into domain-specific models for school curricula/policies, school culture/climate, and student attitudes/behaviors. Only the tested independent variables that met this cutoff are reported below. Multivariate models were created using sequential analyses to identify a parsimonious set of predictors, adjusted for covariates. We used a high P value cutoff to avoid eliminating variables whose association was masked by confounding. A consistent dummy value was used for black students for the variables from the scales that they did not complete (e.g., explicit racism). Because race was also modeled, this dummy value was redundant with black race, and thus black students were excluded from only these comparisons, while they were included in the models for all other comparisons.

We examined variance decomposition to identify collinear predictors within each domain, and none were found.[44] We did not combine domains into a single model because of likely mediation between domains that may have been masked if modeled together. As a secondary analysis, we examined interactions between all key independent variables and student race, and we report those results in Supplemental Digital Appendix 1 (available at http://links.lww.com/ACADMED/A659).

All analyses were conducted with SPSS Statistics v22 (IBM, Armonk, New York).

Results

Demographic characteristics of respondents to both the baseline (MS1) and follow-up (MS4) surveys and descriptive information about the independent and dependent variables are shown in Table 1. At baseline, 846 students (22.8% of the 3,700 students who answered this question) indicated their intention to work in an underserved area, and 603 (of 3,697; 16.3%) indicated their intention to work with minority populations; 2,197 (of 3,700; 59.3%) and 1,997 (of 3,697; 54.0%) were undecided, respectively. At follow-up, 1,374 students (of 2,197; 62.5%) remained undecided about working in an underserved area, and 1,197 (of 1,997; 59.9%) remained undecided about working with minority populations. Additionally, 1,104 students (of 3,756; 29.4%) gained or maintained their intention to work in an underserved area, and 1,183 (of 3,756; 31.5%) gained or maintained their intention to work with minority populations. However, 1,161 students (of 3,756; 30.9%) lost their intention or maintained their lack of intention to work in an underserved area, and 1,247 (of 3,756; 33.2%) lost their intention or maintained their lack of intention to work with minority populations. See Table 2 for the breakdown of baseline to follow-up survey changes for each response combination.

Altogether, 846 students (of 3,756; 22.5%) at baseline and 867 (of 3,756; 23.1%) at follow-up indicated their intention to practice in an underserved area; 584 students (of 3,756; 16.1%) at baseline and 771 students (of 3,756; 20.5%) at follow-up indicated their intention to work primarily with minority patients.

Intention to practice in an underserved area

The following associations are from the multivariate models. Among those students who did not plan to practice in an underserved area at baseline, stronger medical school commitment to diversity (OR = 1.15, $P = .04$); the school's learning orientation toward interracial interactions (OR = 1.29, $P < .001$); and the number of interactions students had with black

Table 1

Descriptive Statistics of Respondent Characteristics and Dependent and Independent Variables Regarding Medical Students' Intentions to Practice in Underserved or Minority Communities, From the Medical Student Cognitive Habits and Growth Evaluation Study (CHANGE Study), 2010–2014[a]

Variable, domain, response options	No. (%)
Respondent characteristics	
Age (MS1) (n = 3,727)	
19 to 49	23.87 (2.55)[b]
Sex (MS1) (n = 3,756)	
Female	1,883 (50.14)
Male	1,873 (49.86)
Race/ethnicity (MS1) (n = 3,756)	
Asian	874 (23.27)
Black	209 (5.56)
Hispanic/Latino	197 (5.24)
Unknown/other	82 (2.18)
White	2,394 (63.74)
Total family income (MS1) (n = 3,648)	
< $50,000	533 (14.61)
$50,000 to $99,999	1,102 (30.21)
≥ $100,000	2,013 (55.18)

(Table continues)

Table 1
(Continued)

Variable, domain, response options	No. (%)
Dependent variables	
MS1: Do you plan to locate your practice in an underserved area? (n = 3,700)	
No	657 (17.67)
Undecided	2,197 (59.09)
Yes	864 (23.23)
MS1: Regardless of location, do you plan to work primarily with racial or ethnic minority patients? (n = 3,697)	
No	1,097 (29.67)
Undecided	1,997 (54.02)
Yes	603 (16.31)
MS4: Do you plan to locate your practice in an underserved area? (n = 3,687)	
No	889 (24.11)
Undecided	1,931 (52.37)
Yes	867 (23.51)
MS4: Regardless of location, do you plan to work primarily with racial or ethnic minority patients? (n = 3,678)	
No	1,074 (29.20)
Undecided	1,833 (49.84)
Yes	771 (20.96)
Independent variables	
Domain 1: Medical school curricula/policies	
Hours of training related to racial disparities and bias (n = 3,573)	
0 to 50	12.14 (10.12)[b]
Hours of training related to interpersonal skills (n = 3,662)	
0 to 50	21.10 (12.26)[b]
Participated in structured service learning (i.e., a structured opportunity to examine service in the context of educational goals and personal reflection) (n = 3,704)	
No	1,600 (43.20)
Yes	2,104 (56.80)
Took a seminar on minority health (n = 3,704)	
No	1,740 (46.98)
Yes	1,964 (53.02)
Participated in a cultural awareness course/workshop (n = 3,704)	
No	2,997 (76.77)
Yes	907 (23.23)
Received information on unconscious racial bias (n = 3,703)	
No	862 (23.27)
Yes	2,842 (76.73)
Completed an Implicit Association Test (IAT) of unconscious racial bias (n = 3,703)	
No	2,779 (75.05)
Yes	924 (24.95)
Feeling prepared to handle a patient who is a member of a racial or ethnic minority (n = 3,697)	
1 to 4: Very unprepared to prepared	2,152 (58.20)
Feeling skilled at developing positive relationships with racial minority patients (n = 3,690)	
1 to 4: Very unskilled to skilled	2,698 (73.10)
Proportion of racial/ethnic minority students at the medical school (n = 3,756)	
School range: 0.03 to 0.23	0.09 (0.03)[b]

(Table continues)

students, faculty, and staff (OR = 1.53, $P = .002$) were all associated with gained intention at follow-up. The student-level factors that were associated with a persistent intention not to practice in an underserved area were increased implicit racial bias (OR = 0.56, $P = .001$) and more negative fourth-year explicit racial attitudes (ATBS: OR = 0.84, $P = .02$; SRS: OR = 0.77, $P < .001$) (see Table 3).

Among those who were undecided at baseline, gained intention at follow-up was associated with participation in a structured service learning experience (OR = 1.26, $P = .02$). A greater percentage of minority students at the school (OR = 0.02, $P = .008$) and more negative fourth-year explicit racial attitudes (ATBS: OR = 0.81, $P < .001$; SRS: OR = 0.76, $P < .001$) were associated with lost intention to practice in an underserved area at follow-up.

Among those who intended to practice in an underserved area at baseline, persistent intention was associated with taking a seminar on minority health (OR = 1.48, $P = .02$). Student-level factors associated with lost intention were more negative fourth-year explicit racial bias (ATBS: OR = 0.83, $P = .03$; SRS: OR = 0.79, $P < .001$) and increased medical authoritarianism (OR = 0.86, $P = .03$).

Intention to work primarily with minority patients

Among students who reported at baseline that they did not intend to work primarily with minority patients, gained intention at follow-up was associated with having taken a seminar on minority health (OR = 1.32, $P = .04$); more hours of training related to racial disparities and bias (OR = 1.02, $P = .01$); and more interactions with black students, faculty, and staff (OR = 1.31, $P = .009$). The student-level factors associated with persistent intention not to work with minority patients were both measures of negative explicit racial bias (ATBS: OR = 0.85, $P = .005$; SRS: OR = 0.78, $P < .001$) (see Table 4).

Among students who were undecided at baseline, gained intention at follow-up was associated with self-reported skill in developing a relationship with minority patients (OR = 1.45, $P = .002$); a tenser interracial climate at the medical school (OR = 1.11, $P = .01$); the school's learning orientation toward intergroup interaction

Table 1
(Continued)

Variable, domain, response options	No. (%)
Medical school commitment to diversity (n = 3,756)	
1 to 7: Strongly disagree to strongly agree	5.56 (1.22)[b]
Domain 2: Medical school culture/climate	
Witnessed racial insensitivity from faculty (n = 3,659)	
1: Strongly disagree	1,727 (47.20)
2 to 7: Slightly disagree to strongly agree	1,932 (52.80)
Frequency of negative comments about black patients from professors or residents (n = 3,660)	
1: Never	1,787 (48.83)
2 to 4: Rarely to very often	1,873 (51.17)
Interracial climate on campus is tense (n = 3,661)	
1 to 7: Strongly disagree to strongly agree	2.04 (1.35)[b]
Medical school learning orientation (n = 3,667)	
1 to 7: Strongly disagree to strongly agree	5.34 (1.36)[b]
Frequency of witnessing discriminatory treatment of racial or ethnic minority patients (n = 3,662)	
1: Never	2,258 (61.66)
2 to 4: Rarely to very often	1,404 (38.34)
Experienced microaggressions attributed to race/ethnicity (school mean among racial/ethnic minority students) (n = 3,756)	
1 to 5: Not at all likely to extremely likely	1.44 (0.65)[b]
Domain 3: Medical student attitudes/behaviors	
Attitudes Towards Blacks Scale (MS4) (n = 3,465)	
1 to 7: Strongly disagree to strongly agree	2.03 (1.12)[b]
Symbolic Racism Scale (MS4) (n = 3,463)	
1 to 7: Strongly disagree to strongly agree	3.42 (1.24)[b]
Change in IAT race score from MS1 to MS4 (n = 3,539)	
−2 to 2	−0.013 (0.50)[b]
Change in interracial anxiety from MS1 to MS4 (n = 3,441)	
1 to 7: Strongly disagree to strongly agree	−0.41 (1.22)[b]
Change in medical authoritarianism from MS1 to MS4 (n = 3,691)	
1 to 7: Strongly disagree to strongly agree	0.18 (1.27)[b]
Change in internal motivation to control prejudice from MS1 to MS4 (n = 3,444)	
1 to 7: Strongly disagree to strongly agree	−0.05 (1.19)[b]
Change in external motivation to control prejudice from MS1 to MS4 (n = 3,440)	
1 to 7: Strongly disagree to strongly agree	−0.08 (1.67)[b]
Number of interactions with black students, faculty, allied health staff, etc. (n = 3,681)	
1 to 4: None to substantial	3.05 (0.65)[b]
Favorability of interactions with black students, faculty, allied health staff, etc. (n = 3,665)	
1 to 4: Very unfavorable to very favorable	3.42 (0.52)[b]
Other covariates	
Burnout from medical school (n = 3,744)	
1 to 7: Strongly disagree to strongly agree	4.32 (1.37)[b]
Still owes $1,000 or more in total educational loans (n = 3,696)	
Yes	3,248 (87.88)
No	448 (12.12)

[a]MS1 and MS4 refer to the first (baseline) and fourth (follow-up) year of medical school, respectively, which is when the two surveys were administered. All variables were measured in the fourth year (follow-up) unless otherwise noted.
[b]These data are means (standard deviations).

(OR = 1.10, $P = .008$); and more favorable interactions with black students, faculty, and staff (OR = 1.25, $P = .03$). Both measures of negative explicit racial bias were associated with lost intention to work with minority populations at follow-up (ATBS: OR = 0.80, $P < .001$; SRS: OR = 0.83, $P < .001$).

Among students who intended to work primarily with minority populations at baseline, maintaining that intention was associated with perceived skill in developing a positive relationship with minority patients (OR = 1.64, $P = .02$), the percentage of minority students at the school (OR = 1.07, $P = .03$), and more frequent experiences of race-based microaggressions reported by racial minority students at the school (OR = 1.44, $P = .01$). Both measures of negative explicit racial bias were associated with lost intention to work with minority populations at follow-up (ATBS: OR = 0.75, $P = .005$; SRS: OR = 0.60, $P < .001$).

Across models, there was no consistent pattern of interactions to suggest that these associations differed across groups by students' race (see Supplemental Digital Appendix 1 at http://links.lww.com/ACADMED/A659).

Discussion

Ultimately, we found little change in the overall percentage of matriculating (22.5%) and graduating (23.1%) medical students who reported their intention to work in an underserved area and in the overall percentage of matriculating (16.1%) and graduating (20.5%) medical students who reported their intention to provide care primarily to minority populations. However, the intentions of many students changed between matriculation and graduation.

Gaining interest in both working in an underserved area and caring primarily for minority patients was associated with taking part in a seminar on minority health; the medical school's learning orientation toward interracial interactions; and the number of interactions students had with black students, faculty, and staff. Service learning and the students' perception that their school was committed to diversity were associated with gaining interest in working in an underserved area.

Table 2

Matrix of Responses to the Dependent-Variable Questions at Baseline (MS1) and Follow-up (MS4) in a Study of Medical Students' Intentions to Practice in Underserved or Minority Communities, From the Medical Student Cognitive Habits and Growth Evaluation Study (CHANGE Study), 2010–2014[a]

MS1 response[b]	Intention to practice in an underserved area: MS4 response				
	No	Undecided	Yes	Missing	Total
No					
N	369	245	34	9	657
Row %	56.2	37.3	5.2	1.4	100
Total %	9.8	6.5	0.9	0.2	17.5
Undecided					
N	454	1,374	331	38	2,197
Row %	20.7	62.5	15.1	1.7	100
Total %	12.1	36.6	8.8	1.0	58.5
Yes					
N	51	287	494	14	846
Row %	6.0	33.9	58.4	1.7	100
Total %	1.4	7.6	13.2	0.4	22.5
Missing					
N	15	25	8	8	56
Row %	26.8	44.6	14.3	14.3	100
Total %	0.4	0.7	0.2	0.2	1.5
Total					
N	889	1,931	867	69	3,756
Total %	23.7	51.4	23.1	1.8	100

MS1 response[b]	Intention to work with minority populations: MS4 response				
	No	Undecided	Yes	Missing	Total
No					
N	576	426	73	22	1,097
Row %	52.5	38.8	6.7	2.0	100
Total %	15.3	11.3	1.9	0.6	29.6
Undecided					
N	434	1,197	337	29	1,997
Row %	21.7	59.9	16.9	1.5	100
Total %	11.6	31.9	9.0	0.8	54.3
Yes					
N	51	186	347	19	603
Row %	8.5	30.8	57.5	3.2	100
Total %	1.4	5.0	9.2	0.5	16.1
Missing					
N	13	24	14	8	59
Row %	22.0	40.7	23.7	13.6	100
Total %	0.3	0.6	0.4	0.2	1.6
Total					
N	1,074	1,833	771	78	3,756
Total %	28.6	48.8	20.5	2.0	100

[a]MS1 and MS4 refer to the first (baseline) and fourth (follow-up) year of medical school, respectively, which is when the two surveys were administered.
[b]Row % indicates the proportion within those students with the same response at baseline.

Students' perceived skill in developing positive relationships with racial minority patients; students' hours of training related to racial disparities and bias; students' perceptions that their school's interracial climate was tense; minority students' reports that they experienced microaggressions likely because of their race; and students' favorable interactions with black students, faculty, staff, and patients were associated with either gaining or maintaining interest in caring primarily for minority patients. In addition, more negative fourth-year explicit racial attitudes and increased medical authoritarianism were associated with losing or maintaining no interest in providing care in an underserved area or for minority patients.

Interestingly, the percentage of students at each medical school who were members of underrepresented minority groups was associated with students maintaining interest in caring primarily for minority patients as well as with their losing interest in working in an underserved area. Furthermore, a tenser interracial climate at the medical school and more frequent experiences of race-based microaggressions reported by racial minority students were associated with gained interest in caring for minority patients. These associations might stem from increased awareness of racial discrimination, which could drive both the likelihood of students noticing tension and their interest in working with minority patients. Further studies exploring these findings are warranted.

Racism operates at different levels; it can be embedded in social structures (such as the distribution of physicians across geographical areas), institutions (including potentially in the formal, informal, and hidden curricula of medical schools), and individuals (with respect to racial prejudice). We suggest that, within medical education, the types of courses that medical schools require and the information that they prioritize for training new physicians can critically shape students' interest in practicing in underserved areas. The lack or underemphasis of information relevant to the care of underserved communities may leave students underprepared for caring for diverse populations or may subtly communicate to students that such practice is not important. Conversely,

Table 3

Results of Domain-Specific Models Predicting Graduating Medical Students' Intentions (MS4) to Practice in an Underserved Area by Their Matriculation (MS1) Responses, From a Study of Medical Students' Intentions to Practice in Underserved or Minority Communities, From the Medical Student Cognitive Habits and Growth Evaluation Study (CHANGE Study), 2010–2014[a]

Variable	Reported "no" at MS1, odds ratio (*P* value)	Reported "undecided" at MS1, odds ratio (*P* value)	Reported "yes" at MS1, odds ratio (*P* value)
Domain 1: Medical school curricula/policies[a]			
Feeling prepared to handle a patient who is a member of a racial or ethnic minority			
Very prepared	1.22 (.29)	1.04 (.69)	1.16 (.40)
All other responses	Ref	Ref	Ref
Feeling skilled at developing positive relationships with racial minority patients			
Very skilled	1.09 (.70)	1.20 (.11)	1.24 (.27)
All other responses	Ref	Ref	Ref
Took a seminar on minority health		1.16 (.13)	1.48 (.02)
Participated in a cultural awareness course/workshop		1.02 (.87)	0.94 (.75)
Completed an Implicit Association Test (IAT) of unconscious racial bias		1.10 (.38)	
Participated in structured service learning (i.e., a structured opportunity to examine service in the context of educational goals and personal reflection)		1.26 (.02)	1.34 (.07)
Hours of training related to racial disparities and bias	1.01 (.24)		
Proportion of racial/ethnic minority students at the medical school	0.99 (.99)	0.02 (.008)	1.03 (.38)
Medical school commitment to diversity	1.15 (.04)	0.95 (.20)	1.01 (.92)
Medical student race/ethnicity			
Asian	1.04 (.83)	0.82 (.07)	1.00 (.99)
Black	1.60 (.30)	1.38 (.15)	1.97 (.02)
Hispanic/Latino	1.85 (.14)	1.60 (.04)	0.12 (.42)
Unknown/other	1.16 (.87)	0.90 (.79)	0.87 (.79)
White	Ref	Ref	Ref
Domain 2: Medical school culture/climate[a]			
Frequency of negative comments about black patients from professors or residents			
Never			0.91 (.56)
All other responses			Ref
Frequency of witnessing discriminatory treatment of racial or ethnic minority patients			
Never			0.90 (.54)
All other responses			Ref
Experienced microaggressions attributed to race/ethnicity (among minority students)			1.24 (.14)
Medical school learning orientation	1.29 (< .001)		
Medical student race/ethnicity			
Asian	1.09 (.67)	0.80 (.03)	1.03 (.87)
Black	1.71 (.32)	1.42 (.12)	1.89 (.02)
Hispanic/Latino	1.93 (.12)	1.47 (.09)	1.34 (.29)
Unknown/other	1.00 (1.00)	0.89 (.78)	1.02 (.96)
White	Ref	Ref	Ref
Domain 3: Medical student attitudes/behaviors[a]			
Number of interactions with black students, faculty, allied health staff, etc.	1.53 (.002)	1.09 (.29)	
Favorability of interactions with black students, faculty, allied health staff, etc.	1.20 (.30)	1.12 (.25)	1.29 (.11)
Change in internal motivation to control prejudice from MS1 to MS4[b]	1.05 (.45)		
Change in IAT race score from MS1 to MS4	0.56 (.001)		

(Table continues)

Table 3
(Continued)

Variable	Reported "no" at MS1, odds ratio (*P* value)	Reported "undecided" at MS1, odds ratio (*P* value)	Reported "yes" at MS1, odds ratio (*P* value)
Change in external motivation to control prejudice from MS1 to MS4		1.01 (.74)	0.95 (.20)
Change in interracial anxiety from MS1 to MS4[b]		1.06 (.016)	0.93 (.32)
Attitudes Towards Blacks Scale (MS4)[b]	0.84 (.02)	0.81 (< .001)	0.83 (.03)
Symbolic Racism Scale (MS4)[b]	0.77 (< .001)	0.76 (< .001)	0.79 (.001)
Change in medical authoritarianism from MS1 to MS4	0.94 (.29)	0.94 (.10)	0.86 (.03)
Medical student race/ethnicity			
Asian	1.06 (.79)	0.83 (.10)	1.11 (.62)
Black	0.36 (.10)	0.41 (.001)	0.76 (.44)
Hispanic/Latino	1.53 (.33)	1.42 (.12)	1.34 (.31)
Unknown/other	0.80 (.81)	0.84 (.66)	0.92 (.88)
White	Ref	Ref	Ref

[a]MS1 and MS4 refer to the first (baseline) and fourth (follow-up) year of medical school, respectively, which is when the two surveys were administered. All models are adjusted for medical student race, age, sex, family income, student debt, burnout, and social desirability bias. Independent variables not associated with the outcome at $P < .20$ in the bivariate models were not included in the multivariate models.
[b]Black students did not complete these items; parameter estimates show the effect in all other students.

Table 4
Results of Domain-Specific Models Predicting Graduating Medical Students' Intentions (MS4) to Practice With Minority Populations by Their Matriculation (MS1) Responses, From a Study of Medical Students' Intentions to Practice in Underserved or Minority Communities, From the Medical Student Cognitive Habits and Growth Evaluation Study (CHANGE Study), 2010–2014[a]

Variable	Reported "no" at MS1, odds ratio (*P* value)	Reported "undecided" at MS1, odds ratio (*P* value)	Reported "yes" at MS1, odds ratio (*P* value)
Domain 1: Medical school curricula/policies[a]			
Feeling prepared to handle a patient who is a member of a racial or ethnic minority			
Very prepared		1.07 (.53)	1.20 (.35)
All other responses		Ref	Ref
Feeling skilled at developing positive relationships with racial minority patients			
Very skilled		1.45 (.002)	1.64 (.02)
All other responses		Ref	Ref
Took a seminar on minority health	1.32 (.04)		
Participated in a cultural awareness course/workshop	1.06 (.73)	1.03 (.81)	
Completed an Implicit Association Test (IAT) of unconscious racial bias		1.11 (.34)	
Participated in structured service learning (i.e., a structured opportunity to examine service in the context of educational goals and personal reflection)		1.17 (.11)	
Hours of training related to racial disparities and bias	1.02 (.01)		
Hours of training related to interpersonal skills			0.99 (.09)
Proportion of racial/ethnic minority students at the medical school	0.98 (.93)	1.03 (.13)	1.07 (.03)
Medical school commitment to diversity	0.95 (.36)	1.02 (.73)	
Medical student race/ethnicity			
Asian	0.43 (.03)	0.91 (.42)	1.17 (.47)
Black	1.30 (.50)	1.48 (.10)	2.19 (.007)
Hispanic/Latino	1.75 (.15)	2.05 (.002)	2.20 (.011)
Unknown/other	1.32 (.69)	1.93 (.10)	0.65 (.45)
White	Ref	Ref	Ref

(Table continues)

Table 4
(Continued)

Variable	Reported "no" at MS1, odds ratio (*P* value)	Reported "undecided" at MS1, odds ratio (*P* value)	Reported "yes" at MS1, odds ratio (*P* value)
Domain 2: Medical school culture/climate[a]			
Witnessed racial insensitivity from faculty			
Strongly to slightly disagree			0.78 (.22)
Neither agree nor disagree to strongly agree			Ref
Frequency of negative comments about black patients from professors or residents			
Never	0.78 (.06)	0.92 (.46)	
All other responses	Ref	Ref	
Interracial climate on campus is tense		1.11 (.01)	0.99 (.83)
Frequency of witnessing discriminatory treatment of racial or ethnic minority patients			
Never	0.92 (.55)	0.96 (.69)	1.13 (.54)
All other responses	Ref	Ref	Ref
Experienced microaggressions attributed to race/ethnicity (among minority students)			1.44 (.01)
Medical school learning orientation		1.10 (.008)	0.93 (.29)
Medical student race/ethnicity			
Asian	1.36 (.06)	0.92 (.47)	2.35 (.005)
Black	1.53 (.26)	1.49 (.09)	2.27 (.005)
Hispanic/Latino	1.74 (.15)	2.13 (.001)	2.35 (.005)
Unknown/other	1.74 (.45)	1.98 (.09)	0.88 (.82)
White	Ref	Ref	Ref
Domain 3: Medical student attitudes/behaviors[a]			
Number of interactions with black students, faculty, allied health staff, etc.	1.31 (.009)	1.14 (.11)	
Favorability of interactions with black students, faculty, allied health staff, etc.	1.07 (.61)	1.25 (.03)	1.17 (.43)
Change in interracial anxiety from MS1 to MS4[b]	0.95 (.27)	1.05 (.27)	1.10 (.27)
Attitudes Towards Blacks Scale (MS4)[b]	0.85 (.005)	0.80 (< .001)	0.75 (.005)
Symbolic Racism Scale (MS4)[b]	0.78 (< .001)	0.83 (< .001)	0.60 (< .001)
Change in medical authoritarianism from MS1 to MS4	0.96 (.35)	0.98 (.53)	0.98 (.79)
Medical student race/ethnicity			
Asian	1.38 (.06)	1.06 (.62)	1.55 (.06)
Black	0.48 (.10)	0.58 (.05)	0.39 (.02)
Hispanic/Latino	2.00 (.07)	2.07 (.002)	3.30 (< .001)
Unknown/other	1.49 (.57)	1.83 (.13)	0.79 (.69)
White	Ref	Ref	Ref

[a]MS1 and MS4 refer to the first (baseline) and fourth (follow-up) year of medical school, respectively, which is when the two surveys were administered. All models are adjusted for medical student age, sex, family income, student debt, burnout, and social desirability bias. Independent variables not associated with the outcome at $P < .20$ in the bivariate models were not included in the multivariate models.
[b]Black students did not complete these items; parameter estimates show the effect in all other students.

schools that prioritize learning about health equity and preparing students to care for diverse patients may communicate to students that such practice is important, and this instruction may give students the skills they need to feel confident in their decision to provide care for underserved populations. Our finding that several elements of the curriculum, including course work in minority health and service learning, are associated with gained interest in this area supports this assertion.

The culture and climate of medical schools, including the behaviors that are role modeled and considered acceptable or normative, also exert a significant influence on students' career decisions. Several studies have demonstrated the importance of the hidden curriculum in medical education,[21,45,46] and these findings support the notion that students' decisions may be influenced by the climate of the medical school and the behaviors they observe and seek to emulate. For example, observing microaggressions against minority students and feeling less encouraged to interact with people from different

cultures and racial groups were associated with lost interest in practicing in underserved areas.

At the student level, explicit racial attitudes were associated with lost interest in providing care in underserved areas. However, it is also important to consider the effects of racism at the structural or cultural level on students' attitudes. For instance, the association of lost interest in practicing in an underserved area with increased medical authoritarianism during medical school suggests that experiences within the context of medical education may reinforce a belief in the importance of social hierarchy and dissuade students from seeking a career focused on caring for those they perceive to be lower in that hierarchy.

These results also point to several potential intervention strategies. For example, medical schools may be able to encourage students to provide care in underserved areas by requiring seminars and curricula in minority health and health disparities, requiring service learning, strengthening communication skills training to build students' competence in positive relationship building with minority patients, fostering collaboration among diverse students, and facilitating discussions of racial inequity where students are encouraged to learn from each other's experiences in both the classroom and casual settings.[47–49]

Despite the large size of our sample, there are limitations to this study that must be addressed by future research. First, the school-level factors we included were not exhaustive of all the ways racism manifests in medical education, and the measures we included were restricted to attitudes about and interactions with black individuals only. That we did not measure students' racial attitudes at baseline limited our ability to precisely describe the influence of changes in these attitudes on students' intentions. To minimize respondent burden, we selected items from validated scales, so we may have missed important indicators of the constructs being measured. Also, all information on structural factors was provided by the respondents; we did not confirm this information with the medical schools. Additionally, the number of comparisons we made raised the possibility that some of the associations we found were spurious, so they should be interpreted with caution.

Despite these limitations, this study included a large and nationally representative sample of medical schools, and it provides an empirical framework for future studies to adapt and improve upon so that the study of racism in medical education can move forward. These findings suggest that medical education leaders can take action to affect students' decisions to work with underserved populations.

Structural racism is deeply embedded in all areas of society, and medical education is no exception.[17,50] Understanding how the topics that are prioritized in a medical school's curriculum; the values and norms that permeate the school's culture; and the attitudes, beliefs, and behaviors of medical students affect students' intent to practice in an underserved area or with minority populations can help illuminate not only the factors that perpetuate structural racism but also how it may influence the institutional priorities of medical schools, premedical programs, other training institutions, and accrediting organizations.[51,52]

Funding/Support: Support for this research was provided by the National Heart, Lung, and Blood Institute under awards R21HL135070 and R01HL085631.

Other disclosures: None reported.

Ethical approval: The institutional review boards at the Mayo Clinic and the University of Minnesota approved this study.

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