










RESEARCH ARTICLE

The impact of neighborhoods and friendships on interracial anxiety among medical students and residents: A report from the medical student CHANGES study

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Abstract

Objective: To examine the experience of interracial anxiety among health professionals and how it may affect the quality of their interactions with patients from racially marginalized populations. We explored the influence of prior interracial exposure—specifically through childhood neighborhoods, college student bodies, and friend groups—on interracial anxiety among medical students and residents. We also examined whether levels of interracial anxiety change from medical school through residency.

Data Source: Web-based longitudinal survey data from the Medical Student Cognitive Habits and Growth Evaluation Study.

Study Design: We used a retrospective longitudinal design with four observations for each trainee. The study population consisted of non-Black US medical trainees surveyed in their 1st and 4th years of medical school and 2nd and 3rd years of residency. Mixed effects longitudinal models were used to assess predictors of interracial anxiety and assess changes in interracial anxiety scores over time.

Principal Findings: In total, 3155 non-Black medical trainees were followed for 7 years. Seventy-eight percent grew up in predominantly White neighborhoods.

Living in predominantly White neighborhoods and having less racially diverse friends were associated with higher levels of interracial anxiety among medical trainees. Trainees' interracial anxiety scores did not substantially change over time; interracial anxiety was highest in the 1st year of medical school, lowest in the 4th year, and increased slightly during residency.

Conclusions: Neighborhood and friend group composition had independent effects on interracial anxiety, indicating that premedical racial socialization may affect medical trainees' preparedness to interact effectively with diverse patient populations. Additionally, the lack of substantial change in interracial anxiety throughout medical training suggests the importance of providing curricular tools and structure (e.g., instituting interracial cooperative learning activities) to foster the development of healthy interracial relationships.

KEYWORDS

diversity equity and inclusion (DEI), interracial anxiety, medical education, medical students, mixed effects longitudinal models, neighborhoods, residents

What is known on this topic

- Interracial anxiety is a feeling of discomfort during interracial interactions that is associated with less willingness to serve marginalized groups among medical students and lower-quality patient interactions among clinicians.
- Interracial anxiety is shaped by prior exposure, such as racial socialization in neighborhoods or through friendships.
- There is limited research on how interracial anxiety is shaped and changes during medical training.

What this study adds

- Prior racial socialization experiences of non-Black medical trainees (i.e., the racial composition of their childhood neighborhoods and friend groups) are associated with their experience of interracial anxiety with Black patients.
- Medical trainees' interracial anxiety did not change substantially during medical school and residency.
- Interracial anxiety and the experiences that shape it may be important considerations in selecting and training medical students and residents.

1 | INTRODUCTION

Interracial anxiety represents feelings of discomfort, uneasiness, and worry resulting from interracial interactions.¹ In general, White people who have higher levels of interracial anxiety are more likely to avoid Black people across a range of settings²⁻⁴: socially,^{5,6} at the neighborhood level,^{7,8} politically,^{9,10} in school settings,¹¹ and professionally.^{12,13} When White people do engage with Black people, interracial anxiety hinders their ability to communicate effectively and develop trust and rapport with Black individuals.¹⁴ While substantial research has focused on the effects of socialization^{15,16} and interracial contact on attitudes between racial groups,^{17,18} there is less knowledge about interracial anxiety among healthcare professionals.

In healthcare, where communication, trust, and rapport between clinicians and patients are critical for effective healthcare delivery,

interracial anxiety can have important consequences.¹⁹⁻²² White medical students with higher levels of interracial anxiety are less willing to serve marginalized populations during their careers.^{23,24} Additionally, physicians with higher levels of interracial anxiety have lower-quality interactions with patients of another race,^{25,26} with physicians providing less information and patients participating less in the clinical encounter.^{27,28} These findings suggest that interracial anxiety may be a critical factor to address in medical training, with implications for the quality and equity of healthcare delivery.

In the United States, interracial anxiety is partly a product of historical and ongoing racial residential segregation.²⁹ Black Americans are more likely to live in racially segregated neighborhoods than are members of other racial or ethnic groups because of historically racist housing policies (e.g., redlining), as well as other factors.³⁰ Individuals from other racial and ethnic groups also tend to live in largely

segregated neighborhoods. For instance, almost three-quarters of White Americans live in predominantly White neighborhoods.³¹ Residential segregation has broad and lasting effects because individuals become socialized into the place they live and the racial group to which they belong, acquiring values, norms, behaviors, perceptions, and problem-solving skills associated with their racial group.^{32,33} This racial socialization is a longitudinal process that largely shapes individuals' race-related feelings, thoughts, and behaviors, even long after moving away from the residential areas where they grew up.^{34,35}

Conversely, exposure to diverse settings, such as a neighborhood, where individuals interact more with other racial groups, produces more positive orientations toward members of other groups.²⁹ When interracial contact occurs, particularly in the context of interracial friendships, it predicts more positive intergroup attitudes toward members of different racial or ethnic groups (e.g., White Americans toward Black Americans).³⁶ Other studies show that interracial friendships have positive impacts on non-White groups as well, citing increased perceptions of commonality.³⁷ Greater contact also produces lower levels of interracial anxiety,³⁸ which reduces avoidance and hostility¹ and improves the quality of intergroup interactions.³⁹ These findings suggest that the racial socialization of students entering medical training is likely to have a powerful impact on the development of interracial anxiety among future physicians.

The present study aims to (1) explore interracial anxiety among medical students and residents, specifically examining the influence of interracial exposure and contact before medical school; and (2) examine whether levels of interracial anxiety change over time during medical school and residency. Specifically, we predicted that individuals with more prior interracial contact would exhibit lower levels of interracial anxiety.^{36,40–42} We also hypothesized that work-related interracial interactions and the emphasis on serving diverse populations in medical training would result in decreased interracial anxiety as trainees progressed through medical school and residency.^{43,44}

2 | METHODS

2.1 | Sample

This study uses data from the Medical Student Cognitive Habits and Growth Evaluation (CHANGES) Study. The sample is based on four waves of a longitudinal web-based survey of trainees who attended 49 randomly selected US medical schools, between 2010 and 2018. The CHANGES team used a multistage design, where the same participants were surveyed throughout training for 7 years.^{45,46} For the parent study, 4732 first-year medical students were surveyed and followed throughout medical training. Participants were surveyed in the fall 2010 (first semester of medical school), spring 2014 (final semester of medical school), spring 2016 (second year of medical residency), and spring 2017 (third year of medical residency).

For the current study, 4417 first-year medical trainees were initially selected for analysis. Because this study focuses on the orientations of non-Black medical trainees toward Black Americans, Black students were

excluded from analyses. The final sample included 3155 trainees completing three or more survey waves. The Mayo Clinic Institutional Review Board (IRB) approved the CHANGES study.

2.2 | Measures

2.2.1 | Interracial anxiety

Interracial Anxiety was measured using the Interracial Anxiety Scale (IAS), which has been validated in previous studies.^{1,45} Questions were asked in each of the 4 waves about medical students' and residents' general discomfort when interacting with Black people.¹ The IAS comprises six items, including: "When interacting with Black patients, I am unsure how to act in order to show them that I am not prejudiced"; "When interacting with Black patients, I am concerned they may not trust me"; and "I suspect Black patients are watching my behavior closely for prejudice." Each response was scored on a 7-point Likert scale, and possible responses ranged from 1 = Strongly Disagree to 7 = Strongly Agree. Scores were determined by calculating the mean values of the items assessed, weighted by factor loadings from a confirmatory factor analysis of the interracial anxiety items that we conducted within the current study. Higher interracial anxiety scores reflected greater anxiety in interacting with Black patients. The IAS demonstrated satisfactory internal reliability for all survey waves [α 0.89 (Y1), 0.88 (Y4), 0.88(R2), and 0.87 (R3)].

2.2.2 | Prior interracial exposure

Childhood neighborhood racial composition was assessed by asking trainees to describe the "Racial composition of your neighborhood where you grew up." *College composition* was assessed by asking trainees to describe the "Racial composition of the college from which you graduated." *Friend group composition* was assessed by asking trainees to describe the "racial composition of your friends in college?" Response options for all 3 interracial exposure variables were "Nearly All Minorities," "Mostly Minorities," "50–50," "Mostly White," and "Nearly All White."

2.2.3 | Demographics and stage of training

Trainees self-reported their age, gender, race, and ethnicity. Year of training was represented by the timing of the survey wave (medical school years 1 and 4, residency years 2 and 3) and was operationalized as year 1, 4, 6, and 7.

2.3 | Statistical analysis

We analyzed interracial anxiety scores across years of medical training, the predictors of interracial anxiety, and changes in scores over time, with mixed effects longitudinal models. One challenge of longitudinal

TABLE 1 Demographic data for participants in a longitudinal study of interracial anxiety stratified by year of training (waves 1 and 3).

	Wave one, year 1 medical school (N = 4417)		Wave three, year 2 residency (N = 3155)	
	Mean	SD (range)	N	%
Age (years)	23.9	2.59 (19–49)		
Gender				
Male			2256	51.08
Female			2352	48.77
Other			7	0.16
Race				
American Indian/Alaska Native			58	1.35
East Asian			660	15.31
South Asian			488	11.32
Native Hawaiian/ Pacific Islander			46	1.07
White			3191	74.04
Other			93	2.16
Ethnicity				
Hispanic or Latino			269	6.15
Not Hispanic or Latino			4024	91.96
Unknown			83	1.90

studies is the loss of participants over time (i.e., nonresponse). Therefore, maximum likelihood estimation (MLE) approaches, which do not use list-wise deletion at the person level, were employed to address missing data at each survey wave and account for attrition.^{47,48} Furthermore, to ensure reasonable person-level continuity, only persons with complete data for at least 3 of the 4-time points were included in the analysis. We removed students in two race groups (mixed, unknown) from the final analyses, as those groups may have included Black students; our goal was to examine non-Black students' interracial anxiety with Black patients.

In our primary longitudinal analysis, we tested associations of childhood neighborhood composition, college composition, and friend group composition with interracial anxiety, accounting for year of training (1, 4, 6, 7) and the subject-level (time-invariant) covariates of age at baseline, gender, and race. (Age was not treated as a time-varying predictor because it was collinear with the year of training within subjects). We computed one full model including the predictor variables for childhood neighborhood, college, and friend group compositions simultaneously, to assess their influence (adjusted for each other) on interracial anxiety. We also included interactions between year of training and each of the three interracial exposure variables, to evaluate their influence on change in interracial anxiety over time. The random effect predictor in the model was trainees, with unrestricted covariation across time. Modeling and analyses were conducted using Stata 16.0 and SAS (Version 9.4) statistical software.

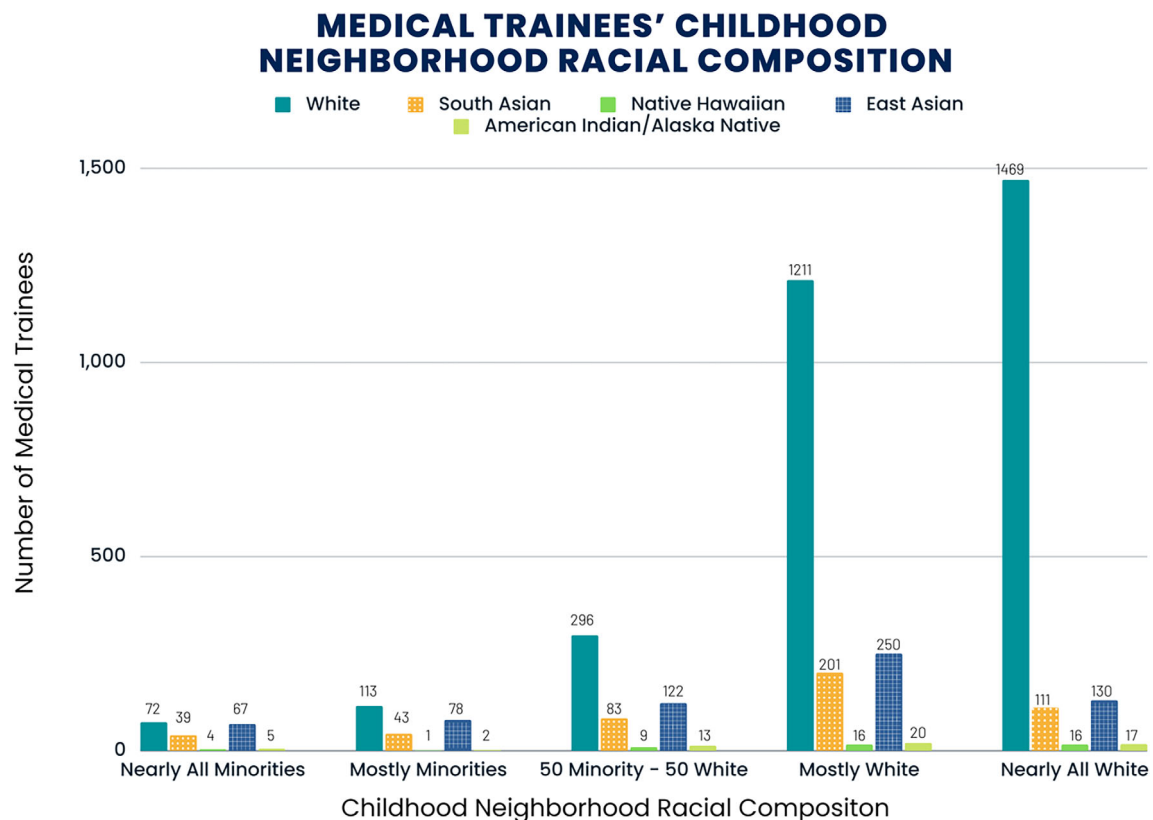


FIGURE 1 Medical trainees' racial composition of childhood neighborhood. [Color figure can be viewed at wileyonlinelibrary.com]

3 | RESULTS

3.1 | Sample characteristics

Demographic data are summarized in Table 1. There were 4417 non-Black trainees eligible in Wave 1. We analyzed 3155 trainees' scores (i.e., those who completed three or more CHANGES assessments). The sample was predominantly White. Overall, the sample distribution represented the racial, gender, and ethnic composition of US non-Black medical students.⁴⁹

3.2 | Medical trainees' prior interracial exposure

At the beginning of medical school, 78% of medical trainees reported growing up in "Mostly White" or "Nearly All White" neighborhoods (Figure 1). In comparison, 10% ($n = 448$) reported growing up in "Nearly All Minority" or "Mostly Minority" neighborhoods. Sixty-four percent reported the racial composition of their college as "Mostly White" or "Nearly All White," 30% reported an even distribution, and 7% reported "Nearly All Minority" or "Mostly Minority." For the racial

TABLE 2 Results of full mixed effects longitudinal models predicting interracial anxiety levels among medical trainees.

Effect	Adjusted mean (SE) ^a	β (95% CI) ^b
Childhood neighborhood composition		
Nearly all White	2.517 (0.033)	Ref
Mostly White	2.446 (0.033)	-0.071 (-0.148, 0.007)
50-50	2.373 (0.054)	-0.144 (-0.262, -0.025)
Mostly minority	2.306 (0.077)	-0.210 (-0.372, -0.049)
Nearly all minority	2.602 (0.093)	0.085 (-0.109, 0.279)
College composition		
Nearly all White	2.456 (0.061)	Ref
Mostly White	2.420 (0.036)	0.0338 (-0.155, 0.084)
50-50	2.440 (0.041)	0.09612 (-0.148, 0.116)
Mostly minority	2.530 (0.078)	0.218 (-0.118, 0.267)
Nearly all minority	2.248 (0.188)	-0.293 (-0.599, 0.184)
Friend group composition		
Nearly all White	2.616 (0.053)	Ref
Mostly White	2.434 (0.036)	-0.426 (-0.562, -0.290)
50-50	2.369 (0.039)	-0.549 (-0.698, -0.399)
Mostly minority	2.358 (0.050)	-0.343 (-0.521, -0.166)
Nearly all minority	2.456 (0.091)	-0.151 (-0.420, 0.118)
Other predictors/covariates		
Age		-0.005 (-0.019, 0.009)
Female gender		0.017 (-0.050, 0.085)

^aModel adjusted means and SE are given for levels of categorical variables (with all other predictors set at their means).

^bBolded results indicate statistically significant differences compared with the reference group (nearly all White).

composition of college friends, 55% reported "Mostly White" or "Nearly All White," 27% reported "Fifty-Fifty," and 18% reported, "Nearly All Minority" or "Mostly Minority."

3.3 | Independent associations of interracial exposure variables with interracial anxiety

The results of the final mixed effects models are presented in Table 2. As hypothesized, there was a significant association between childhood neighborhood composition and interracial anxiety. Medical trainees who previously lived in *Mostly Minority* neighborhoods exhibited the lowest overall mean of interracial anxiety scores. Trainees who grew up in 50-50 neighborhoods had significantly lower levels of interracial anxiety compared with those from *Nearly All White* neighborhoods. Finally, non-Black trainees who grew up in *Nearly All Minority* neighborhoods had non-significantly higher levels of interracial anxiety. The association of college racial composition with interracial anxiety was not significant.

Also consistent with expectations, as shown in Table 2, the association of college friend group racial composition with interracial anxiety was statistically significant. Medical trainees with *Nearly All White* friends had the highest level of interracial anxiety; those who had *Mostly Minority* friends exhibited the lowest levels of interracial anxiety. Trainees with 50-50 and *Mostly White* college friend groups also had lower interracial anxiety levels, compared to those with *Nearly All White* friends. Trainees with *Nearly All Minority* friends did not significantly differ from those with *Nearly All White* friends.

3.3.1 | Changes in interracial anxiety over time

Interracial anxiety scores varied slightly across years of medical training, with a small decrease during medical school and a small increase

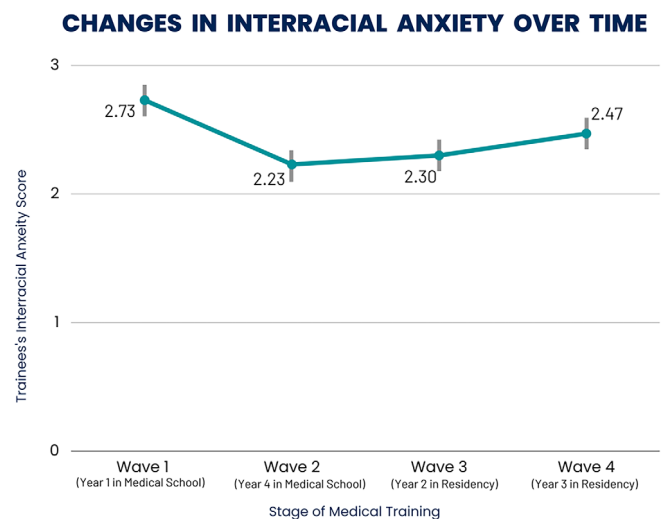


FIGURE 2 Mean changes in interracial anxiety over time (waves 1-4). Error bars indicate standard error. [Color figure can be viewed at wileyonlinelibrary.com]

Changes in Interracial Anxiety Over Time Among Trainees by Friend Group Composition

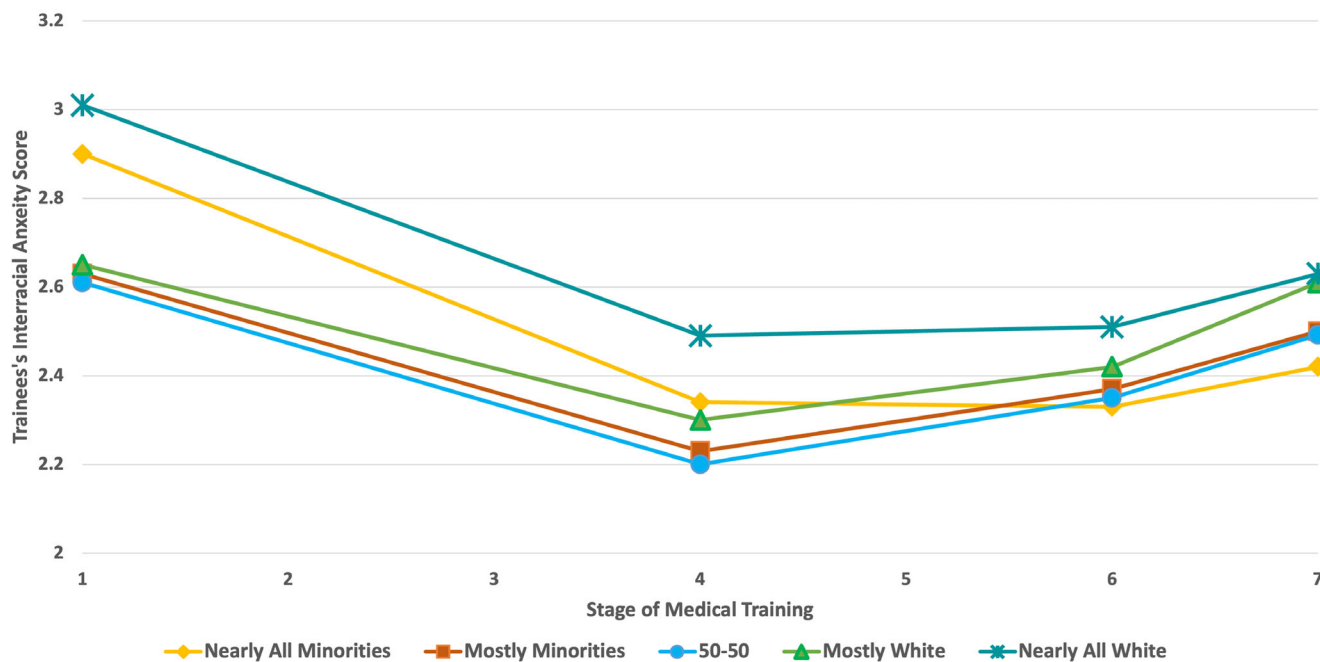


FIGURE 3 Model predicted values for interracial anxiety over years of medical education, by categories of friend composition. [Color figure can be viewed at wileyonlinelibrary.com]

in residency. As illustrated in Figure 2, average interracial anxiety scores were 2.74 (SD 0.04) at the beginning of medical school, dropped to 2.23 (SD 0.04) at the end of medical school, and then rose to 2.47 (SD 0.03) by 3rd year of residency ($p < 0.0001$ for differences across time points).

In addition, we found a significant interaction between college friend group composition and year of medical training ($p < 0.0001$). As shown in Figure 3, students with *Nearly All White* college friends had the highest interracial anxiety levels when entering medical school, while students with 50-50 friend groups had the lowest levels. Interracial anxiety scores, however, converged somewhat throughout medical school and into residency.

4 | DISCUSSION

We explored differences in interracial anxiety in a cohort of 3155 non-Black medical trainees followed over 7 years. Specifically, we examined how childhood neighborhood racial composition, college composition, and friend group composition were associated with feelings about interracial interactions with Black patients, and how interracial anxiety changed over time (from the first year of medical school to the third year of residency).

Neighborhood racial composition and friend group composition had independent effects on interracial anxiety. Our results show that living in predominantly White neighborhoods and having White homogenous friend networks were associated with higher levels of interracial anxiety among the medical trainees in our study. Christ

et al. proposed and found that personal experiences of contact, and residing in an area where diverse interactions occur, are independently associated with more positive intergroup orientations and may have their effects through different processes.⁵⁰ For example, personal experiences of contact, which are particularly potent when they occur through intergroup friendships,⁵¹ tend to increase empathy and perspective-taking.³⁸ In contrast, exposure to interactions among others (represented by a more diverse neighborhood composition in our research) communicates information about the normativeness of positive intergroup interaction.⁵¹

Our findings related to the impact of racial socialization and formative experiences on interracial anxiety are consistent with prior findings from the CHANGES study concerning other negative interracial orientations. For instance, a prior analysis from the CHANGES study demonstrated that interracial contact with Black people before medical school was associated with lower levels of pro-White implicit bias among White participants at the end of medical school and during residency.⁵² Other studies have demonstrated the negative impact of implicit biases among health professionals on the quality of patient care.^{53,54} Collectively, these findings signal the value of understanding how the different experiences of medical trainees prior to medical training can potentially influence the quality of care they provide to Black Americans, and how programs to address trainees' racial biases and interracial anxiety in medical school might effectively incorporate the range of experiences individuals bring to their medical training. This is especially important in medicine as we move toward a more diverse American population.

Our findings highlight the need to explore further the associations of formative neighborhood characteristics and friendship experiences with interracial anxiety. We found that most trainees grew up in racially homogeneous neighborhoods. While those who grew up in “nearly all White” neighborhoods displayed the highest level of interracial anxiety, trainees from “nearly all minority” neighborhoods also exhibited relatively high levels; trainees from “50–50” neighborhoods had the lowest levels. A similar pattern occurred for friendship experiences. These findings suggest that the modeling that likely occurs through exposure to neighborhood intergroup interactions and varied intergroup experiences (e.g., through multiracial friendship networks) may be important factors leading non-Black individuals to feel more comfortable in interracial settings (i.e., less interracial anxiety). This provides insight into how geographic heterogeneity and friendships may influence the thoughts and feelings about Black patients among medical trainees.

In addition to the interracial anxiety experienced by medical trainees, we also observed changes over time in training. Although we found, as hypothesized, that medical trainees with more diverse friend groups in college had lower levels of interracial anxiety than students with more homogenous friend groups, this finding was most apparent in the first year of medical school and lessened by the end of medical school and into residency. Although we could not determine the underlying causes of this observation, it may be that experiences during medical school, interactions with diverse classmates and patients, and/or more formal aspects of medical training lessen the influence of past friendship experiences over time. Examining how medical school curricula and training address and reduce trainee anxiety is crucial, since it is related to patient trust, engagement, and satisfaction.^{55,56}

Whereas greater duration of medical training reduced the impact of prior friendship experiences on interracial anxiety, we did not observe a consistent decrease, which we hypothesized, on interracial anxiety as trainees progressed through their medical training. We found that interracial anxiety scores were highest in the first year of medical school and significantly decreased by the end of medical school. However, interracial anxiety increased in residency. Although our analysis cannot explain why interracial anxiety scores fluctuated over time in medical school and residency, it is possible that influences and exposures related to training, including patient encounters and senior physician-patient interactions, differ in medical school versus residency.

Residency training differs from medical school in that increased clinical interaction offers more opportunities for exposure to diverse people, which one might expect to reduce interracial anxiety. Residency programs, however, are smaller than medical school classes and may be less diverse, diminishing the opportunity for collegial interracial interactions. In addition, the significant demands of medical residency training may adversely affect interracial anxiety. Anxiety research suggests that feelings toward Black people can, in some circumstances, worsen with increased interaction,^{57,58} particularly when stress levels are high. Notably, medical residents who report higher levels of burnout exhibit greater racial bias.⁵⁸ Thus, the pressures of residency, and potentially stressful interactions with patients from other racial groups, may lead

to the increases in interracial anxiety that we observed. Additional research on racial socialization in residency programs is essential to improve the medical training of future physicians as they prepare to deliver health care to diverse populations.

We found that racial diversity in the student bodies medical trainees were exposed to during college was not associated with lower interracial anxiety, but diversity within their friend groups was. This suggests that simply increasing Black representation in student bodies is unlikely to directly affect the orientation of non-Black medical trainees toward Black Americans, and that what may be necessary for changing these orientations is leveraging this diversity to increase interracial contact, particularly in developing diverse friend groups, during college and medical training. While diverse friend groups did not eliminate the effects of childhood neighborhood composition in our study, they may offer a countervailing influence for the widespread residential segregation that characterizes America, by independently improving interracial orientation before and during medical training. Beyond having formal curricula in medical education to improve the quality of medical care for diverse populations, it may be important to provide tools and structure for how trainees learn (e.g., by instituting interracial cooperative learning activities) to foster the development of interracial relationships.

Our study had several limitations. As with most longitudinal studies, we were impacted by missing data and time-varying factors. However, we used robust methods (i.e., maximum likelihood methods) to help address this limitation. Our study was observational, and we therefore cannot draw firm causal inferences. In addition, although our large sample and longitudinal design allowed us to examine the independent impact of prior exposures on interracial anxiety, we could not evaluate how these relationships were shaped. Future studies using different methodologies (e.g., qualitative methods) are needed to better understand how formative experiences and interactions lead to different levels of interracial anxiety. Our data were self-reported and may have been influenced by student perception and interpretation of survey questions. Our large sample size produced statistically significant results for sometimes small absolute differences. For instance, the largest difference in mean interracial anxiety scores across years of training was 0.39 (between 1st and 4th years of medical school), on a 7-point scale. The importance of this difference in terms of real-world interracial interactions is unclear. Finally, our study examined interracial anxiety only among training physicians. Future studies are needed to explore interracial anxiety in other health professions (e.g., nursing, dentistry).

5 | CONCLUSION

Our findings demonstrate the impact of neighborhood composition and prior interracial friendships on interracial anxiety among medical trainees. These findings may have relevance for the recruitment and selection of trainees more or less likely to have positive interactions with diverse patient populations. Additionally, our results support the need for additional resources, in medical school and residency

training, to address interracial anxiety and promote optimal patient encounters. Future research should examine how interracial anxiety manifests in patient-clinician encounters and its contribution to racial inequities in health care delivery.

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