# Reports of Burnout Among Historically Marginalized and Female Graduating Medical Students During the COVID-19 Pandemic

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## Abstract

### Purpose
To examine graduating medical student reports of burnout by sex, race and ethnicity, and sexual orientation and explore trends within intersectional demographic groups from 2019–2021 in a national sample.

### Method
The authors obtained medical student responses to the 2019–2021 Association of American Medical Colleges (AAMC) Graduation Questionnaires (GQs) linked to data from other AAMC sources. The dataset included year of GQ completion, responses to a modified Oldenburg Burnout Inventory (exhaustion subscale range: 0–24; disengagement subscale range: 0–15), and demographics previously shown to relate to the risk of burnout in medical students, residents, or physicians. Multivariable linear regression analysis was performed to evaluate independent associations between demographics and burnout.

### Results
Overall response rate was 80.7%. After controlling for other factors, mean exhaustion scores were higher among Asian (parameter estimate [PE] 0.38, 95% confidence interval [CI] 0.21, 0.54), bisexual (PE 0.97, 95% CI 0.76, 1.17), and gay or lesbian (PE 0.55, 95% CI 0.35, 0.75) students than those who did not identify with each of those respective groups. Mean disengagement scores were lower among female (PE –0.47, 95% CI –0.52, –0.42), Hispanic (PE –0.11, 95% CI –0.22, –0.01), and White (PE –0.10, 95% CI –0.19, 0.00) students and higher among Asian (PE 0.17, 95% CI 0.07, 0.27), Black or African American (PE 0.31, 95% CI 0.18, 0.44), bisexual (PE 0.54, 95% CI 0.41, 0.66), and gay or lesbian (PE 0.23, 95% CI 0.11, 0.35) students than those who did not identify with each of those respective groups. From 2019–2021, mean exhaustion and disengagement scores were relatively stable or improved across nearly all intersectional groups.

### Conclusions
Male, Asian, Black or African American, and sexual minority students had a higher risk of burnout, while female, Hispanic, White, and heterosexual or straight students had a lower risk of burnout.


Burnout is a well-recognized stress-related occupational phenomenon impacting medical students. Medical students' experiences vary by their visible and less visible differences, with those from historically underrepresented in medicine groups (e.g., those belonging to racial, ethnic, or sexual minority groups) and female medical students more often reporting suboptimal experiences inside and outside the classroom that may contribute to higher stress.[1–3] Some medical students may also be more socially isolated, resulting in lower social support, an established buffer against burnout.[4,5] However, some previous research involving medical students has not consistently found differences in the prevalence of burnout by demographics.[6]

Some, but not all,[7,8] studies have found female medical students to be at higher risk for burnout than male medical students.[8] Other studies suggest there may be differences by gender in which domain of burnout—emotional exhaustion or depersonalization (on the Maslach Burnout Inventory)—is most prominent among medical students.[1,3,7] Findings from studies exploring differences in the prevalence of burnout among medical students by racial and ethnic groups have reported inconsistent findings. Some have found non-Hispanic White medical students to be at higher risk of burnout than combined groups of individuals with historically underrepresented in medicine identities,[2,7,8] while others have reported non-White medical students to be at higher risk of burnout than non-Hispanic White medical students.[3] Other studies have found that medical students who belong to a sexual minority group (i.e., lesbian, gay, bisexual, asexual) have a higher prevalence of burnout than heterosexual students.[1,3,9–11]

Little is known about the experiences of medical students with intersectional identities as previous studies have not simultaneously examined relationships between severity of burnout, assessed as a continuous variable; disaggregated racial and ethnic groups; and sexual orientation, while controlling for other variables associated with burnout risk (i.e., age, marital status, debt, and number of dependents).[6] In recognition of this knowledge gap, the National Academies of Sciences, Engineering, and Medicine (NASEM) 2019 consensus study report on clinician burnout called for foundational epidemiological research to better define the prevalence of burnout among historically underrepresented in medicine groups.[6]

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Table 1

**Demographics of Responders to the 2019–2021 Association of American Medical Colleges Graduation Questionnaires (GQs)**

| Characteristic | 2019 GQ (n = 16,427)[a] | 2020 GQ (n = 16,253)[a] | 2021 GQ (n = 16,217)[a] |
|---|---|---|---|
| **Sex** | | | |
| Female | 8,114 (49.4%) | 8,403 (51.7%) | 8,470 (52.2%) |
| Male | 8,311 (50.6%) | 7,846 (48.3%) | 7,741 (47.7%) |
| Missing | 2 (0.0%) | 4 (0.0%) | 6 (0.0%) |
| **Age (in years), mean (SD)** | 27.7 (2.8) | 27.7 (2.7) | 27.8 (2.8) |
| **Age range** | | | |
| < 26 | 2,097 (12.8%) | 2,010 (12.4%) | 1,894 (11.7%) |
| 26–27 | 7,833 (47.7%) | 7,695 (47.3%) | 7,690 (47.4%) |
| 28–29 | 3,602 (21.9%) | 3,705 (22.8%) | 3,737 (23.0%) |
| 30–31 | 1,531 (9.3%) | 1,516 (9.3%) | 1,534 (9.5%) |
| > 31 | 1,364 (8.3%) | 1,327 (8.2%) | 1,362 (8.4%) |
| **Sexual orientation** | | | |
| Bisexual | 489 (3.0%) | 558 (3.4%) | 735 (4.5%) |
| Gay or lesbian | 609 (3.7%) | 621 (3.8%) | 636 (3.9%) |
| Heterosexual or straight | 14,137 (86.1%) | 13,631 (83.9%) | 13,470 (83.1%) |
| Missing | 1,192 (7.3%) | 1,443 (8.9%) | 1,376 (8.5%) |
| **Race and ethnicity[b]** | | | |
| AI/AN | 146 (0.9%) | 120 (0.7%) | 117 (0.7%) |
| Asian | 4,106 (25.0%) | 4,074 (25.1%) | 4,256 (26.2%) |
| Black or AA | 1,171 (7.1%) | 1,180 (7.3%) | 1,180 (7.3%) |
| Hispanic[c] | 1,236 (7.5%) | 1,313 (8.1%) | 1,434 (8.8%) |
| NH/PI | 56 (0.3%) | 49 (0.3%) | 54 (0.3%) |
| White | 10,514 (64.0%) | 10,343 (63.6%) | 10,013 (61.7%) |
| Other race[d] | 510 (3.1%) | 574 (3.5%) | 635 (3.9%) |
| **Marital status** | | | |
| Single (never legally married) | 11,548 (70.3%) | 11,397 (70.1%) | 11,513 (71.0%) |
| Legally married | 3,592 (21.9%) | 3,423 (21.1%) | 3,360 (20.7%) |
| Common law or civil union | 54 (0.3%) | 55 (0.3%) | 61 (0.4%) |
| Divorced | 139 (0.8%) | 106 (0.7%) | 104 (0.6%) |
| Separated, but still legally married | 33 (0.2%) | 19 (0.1%) | 26 (0.2%) |
| Widowed | 4 (0.0%) | 4 (0.0%) | 1 (0.0%) |
| Missing | 1,057 (6.4%) | 1,249 (7.7%) | 1,152 (7.1%) |
| **No. of dependents** | | | |
| 0 | 14,150 (86.1%) | 13,877 (85.4%) | 13,948 (86.0%) |
| 1 | 684 (4.2%) | 680 (4.2%) | 677 (4.2%) |
| ≥ 2 | 500 (3.0%) | 421 (2.6%) | 416 (2.6%) |
| Missing | 1,093 (6.7%) | 1,275 (7.8%) | 1,176 (7.3%) |
| **Premedical education debt (in US $)** | | | |
| 0 | 10,307 (62.7%) | 10,052 (61.8%) | 10,161 (62.7%) |
| 1–99,999 | 4,193 (25.5%) | 4,145 (25.5%) | 3,995 (24.6%) |
| 100,000–199,999 | 414 (2.5%) | 393 (2.4%) | 411 (2.5%) |
| 200,000–299,999 | 151 (0.9%) | 164 (1.0%) | 168 (1.0%) |
| Over 300,000 | 63 (0.4%) | 69 (0.4%) | 78 (0.5%) |
| Missing | 1,299 (7.9%) | 1,430 (8.8%) | 1,404 (8.7%) |
| **Medical school debt (in US $)** | | | |
| 0 | 4,424 (26.9%) | 4,409 (27.1%) | 4,480 (27.6%) |
| 1–99,999 | 1,608 (9.8%) | 1,493 (9.2%) | 1,592 (9.8%) |
| 100,000–199,999 | 3,529 (21.5%) | 3,344 (20.6%) | 3,386 (20.9%) |

*(Table continues)*

Table 1
(Continued)

| Characteristic | 2019 GQ (n = 16,427)[a] | 2020 GQ (n = 16,253)[a] | 2021 GQ (n = 16,217)[a] |
|---|---|---|---|
| 200,000–299,999 | 3,998 (24.3%) | 3,764 (23.2%) | 3,630 (22.4%) |
| Over 300,000 | 1,409 (8.6%) | 1,655 (10.2%) | 1,556 (9.6%) |
| Missing | 1,459 (8.9%) | 1,588 (9.8%) | 1,573 (9.7%) |
| **Noneducation debt (in US $)[e]** | | | |
| 0 | 12,160 (74.0%) | 11,773 (72.4%) | 12,290 (75.8%) |
| 1–99,999 | 2,405 (14.6%) | 2,529 (15.6%) | 2,015 (12.4%) |
| 100,000–199,999 | 278 (1.7%) | 225 (1.4%) | 236 (1.5%) |
| 200,000–299,999 | 124 (0.8%) | 129 (0.8%) | 149 (0.9%) |
| Over 300,000 | 96 (0.6%) | 98 (0.6%) | 133 (0.8%) |
| Missing | 1,364 (8.3%) | 1,499 (9.2%) | 1,394 (8.6%) |

Abbreviations: SD, standard deviation; AI/AN, American Indian or Alaska Native; AA, African American; NH/PI, Native Hawaiian or other Pacific Islander.

[a]Data given as no. (%) unless otherwise noted. Percentages may not add up to 100% due to rounding.

[b]Respondents were able to select multiple race and ethnicity categories. Thus, these percentages indicate the proportion of respondents who selected this race or ethnicity category compared to no selection. The sum of the values reported will exceed the total number of responders.

[c]Hispanic includes Hispanic, Latino, or of Spanish origin.

[d]Other race was a response option on the GQ that individuals could select either alone or in combination with other response options.

[e]Noneducation debt includes mortgages.

After the release of the NASEM consensus study report, the COVID-19 pandemic occurred with morbidity and mortality disproportionally impacting individuals from minority groups.[12] In addition, exacerbations of racial and ethnic tensions in the United States during this time period may have contributed to patients, families, and visitors harassing and discriminating against health care workers of color.[13] There is little doubt that, during these events, most medical students experienced substantial disruptions to their learning experiences, particularly early on in the pandemic when little was known about the virus and personal protective equipment was often scarce.[14] Although the overall prevalence of burnout among U.S. medical students did not substantially worsen from 2019 to 2021 (the main years of the COVID-19 pandemic),[15] it is possible that demographic subgroups of medical students experienced higher stress and subsequently higher burnout rates during this time.

A goal in medical education should be to provide an equitable training experience to all segments of the medical student population. Doing so requires identifying inequities (e.g., in prevalence of burnout), developing tailored interventions, and optimizing educational experiences to meet diverse needs. Further exploration of such inequities is needed to fuel additional research and innovation that may ultimately lead to interventions that promote equity and social justice.

Therefore, we studied graduating medical student reports of burnout by sex, race and ethnicity, and sexual orientation during the pandemic (2019–2021) in a national sample, and explored for trends over this same time period within intersectional demographic groups.

## Method

The methods we used in this study have been previously described in our prior studies.[15,16] Briefly, we obtained deidentified medical student responses to the 2019–2021 Association of American Medical Colleges (AAMC) Graduation Questionnaires (GQs). Newer medical schools that did not have 3 consecutive years of data were excluded (n = 5), as were schools in Puerto Rico (n = 4), resulting in a national sample of medical students attending 139 medical schools. The AAMC electronically sends all individuals graduating from a U.S. MD-granting medical school an invitation to complete the GQ. Individual responses to the questionnaire are linked by the AAMC to other AAMC data sources prior to deidentification of a dataset for research purposes. The race and ethnicity data in this dataset stem from the most recently reported demographic information provided by GQ responders to the AAMC (e.g., when filling out the Medical College Admission Test, American Medical College Application Service [AMCAS], or Electronic Residency Application Service). The sex variable in this dataset comes from the AMCAS, which collected one's sex (male/female options), rather than gender during this time. Our dataset included year of GQ completion, responses to a modified Oldenburg Burnout Inventory (OBI; see below), and demographics (from the GQ: age at graduation, marital status, number of dependents, sexual orientation [bisexual, gay or lesbian, heterosexual or straight], premedical school debt, medical school debt, and noneducation debt; and from other AAMC sources: sex and race and ethnicity) previously shown to relate to the risk of burnout in medical students, residents, or practicing physicians.[6,17]

The study was deemed exempt by the University of Colorado and Mayo Clinic institutional review boards. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

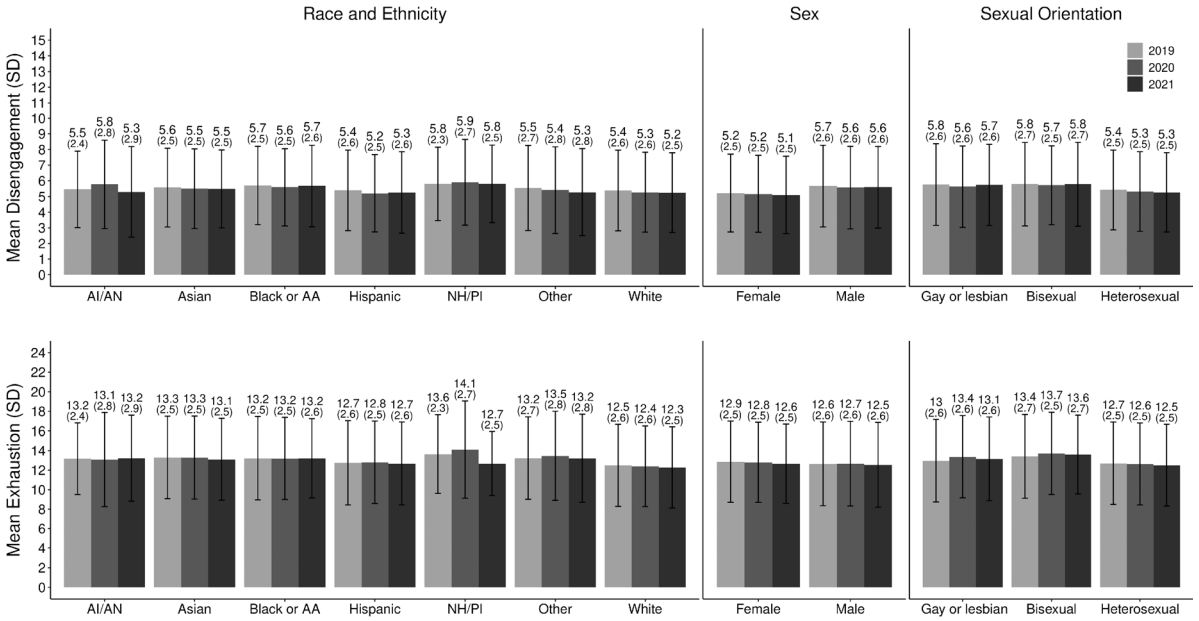


**Figure 1** Mean exhaustion and disengagement scores among responders to the 2019–2021 Association of American Medical Colleges Graduation Questionnaires by sex, race and ethnicity, and sexual orientation. The exhaustion subscale has a range of 0–24, and the disengagement subscale has a range of 0–15, with higher scores indicating higher exhaustion or disengagement. Within each graduating cohort, mean exhaustion and disengagement scores varied by sex, race and ethnicity, and sexual orientation. Abbreviations: SD, standard deviation; AI/AN, American Indian or Alaska Native; AA, African American; Hispanic, Hispanic, Latino, or of Spanish origin; NH/PI, Native Hawaiian or other Pacific Islander; Other, other race (response option on the Graduation Questionnaire that individuals could select either alone or in combination with other response options); Heterosexual, heterosexual or straight.

### Burnout

The GQ includes a modified OBI to measure burnout.[18] Originally developed in 2002 based on the job demands-resources model,[19] the OBI contains 2 subscales: exhaustion (physical, cognitive, and affective) and disengagement (negative attitudes toward work). Conceptually, high job demands (e.g., workload) are thought to contribute to exhaustion, whereas low job resources (e.g., social support at work, relational leadership practices) contribute to disengagement.[18] To date, the OBI has less construct validity evidence in U.S. medical students and health care workers than the Maslach Burnout Inventory but offers the advantage of not being proprietary.[20]

We included 8 items in the exhaustion subscale (Cronbach $\alpha = 0.83$) and 5 items in the disengagement subscale (Cronbach $\alpha = 0.72$) identified in our previous exploratory and confirmatory factor analysis to provide the best fit.[21] The resulting OBI exhaustion subscale had a score range of 0–24, and the disengagement subscale had a score range of 0–15, with higher scores indicating higher exhaustion or disengagement. A prior study has shown that these exhaustion and disengagement subscale scores relate to previous experiences of mistreatment, perceptions of the emotional climate, and levels of empathy or perceived stress, and vary by medical student gender and age.[21] Minimally important differences in exhaustion or disengagement scores, however, have not been formally established.[18]

### Statistical analysis

We calculated descriptive summary statistics and examined relationships between demographics and burnout (exhaustion and disengagement) over time using Kruskal-Wallis tests. As respondents were able to select multiple race and ethnicity categories, *P* values for these categories reflect comparison with all other race and ethnicity categories. For example, the *P* value for Asian medical students reflects comparison with non-Asian (e.g., all other race and ethnicity categories combined) medical students. All tests were 2-sided with a type I error of .05. We pooled all responders to obtain larger groups of historically marginalized participants and performed multivariable linear regression analysis to evaluate independent associations between demographics and burnout. All comparisons were performed using SAS version 9.4 (SAS Institute Inc., Cary, North Carolina).

## Results

Overall, 16,427 of 19,935 (82.4%), 16,253 of 20,390 (79.7%), and 16,217 of 20,296 (79.9%) medical students completed the 2019, 2020, and 2021 GQs, respectively (overall response rate, 80.7%). Demographics of the responders are shown in Table 1 and mirrored U.S. medical students nationally in the same graduating cohorts.[22] Of the 48,897 responders, 45,687 (93.4%) answered enough OBI items to calculate at least one of the subscale (exhaustion or disengagement) scores.

Within each cohort, mean exhaustion and disengagement scores varied by sex, race and ethnicity, and sexual orientation (Figure 1; see Supplemental Digital Appendixes 1 and 2 at http://links.lww.com/ACADMED/B612). Effect sizes for these differences were generally modest. Female medical students had statistically lower mean disengagement scores than male medical students in each cohort, and statistically higher mean exhaustion

Table 2

**Mean Exhaustion and Disengagement Scores by Sex and Race and Ethnicity Among Responders to the 2019–2021 Association of American Medical Colleges Graduation Questionnaires (GQs)**

| Characteristic | 2019 GQ | | 2020 GQ | | 2021 GQ | |
|---|---|---|---|---|---|---|
| | No. | Mean (SD) | No. | Mean (SD) | No. | Mean (SD) |
| **Exhaustion**[a] | | | | | | |
| Overall[b] | 15,277 | 12.75 (4.21) | 14,955 | 12.72 (4.20) | 14,998 | 12.59 (4.18) |
| Female | | | | | | |
| *AI/AN* | 59 | 12.97 (3.69) | 68 | 13.57 (4.60) | 56 | 13.36 (3.92) |
| *Asian* | 2,010 | 13.29 (4.09) | 2,039 | 13.24 (4.10) | 2,148 | 13.10 (4.04) |
| *Black or AA* | 635 | 13.46 (4.12) | 668 | 13.34 (4.11) | 657 | 13.59 (4.04) |
| *Hispanic*[c] | 568 | 12.83 (4.16) | 642 | 12.86 (3.84) | 703 | 12.68 (4.05) |
| *NH/PI* | 27 | 13.48 (4.12) | 24 | 14.79 (5.23) | 25 | 12.00 (3.18) |
| *White* | 4,665 | 12.58 (4.14) | 4,848 | 12.43 (4.02) | 4,730 | 12.26 (4.00) |
| *Other race*[d] | 222 | 13.18 (4.21) | 262 | 13.51 (4.46) | 293 | 12.89 (4.28) |
| Male | | | | | | |
| *AI/AN* | 66 | 13.35 (3.65) | 44 | 12.30 (5.07) | 54 | 13.07 (4.86) |
| *Asian* | 1,792 | 13.30 (4.35) | 1,668 | 13.32 (4.41) | 1,740 | 13.10 (4.34) |
| *Black or AA* | 398 | 12.80 (4.45) | 371 | 12.92 (4.33) | 377 | 12.54 (3.98) |
| *Hispanic*[c] | 575 | 12.66 (4.42) | 572 | 12.72 (4.59) | 616 | 12.66 (4.45) |
| *NH/PI* | 25 | 13.80 (3.98) | 19 | 13.21 (4.61) | 25 | 13.32 (3.29) |
| *White* | 5,203 | 12.40 (4.23) | 4,768 | 12.34 (4.21) | 4,682 | 12.28 (4.28) |
| *Other race*[d] | 244 | 13.26 (4.22) | 246 | 13.40 (4.65) | 283 | 13.54 (4.71) |
| **Disengagement**[e] | | | | | | |
| Overall[f] | 15,317 | 5.45 (2.55) | 14,985 | 5.36 (2.55) | 15,061 | 5.33 (2.55) |
| Female | | | | | | |
| *AI/AN* | 59 | 5.05 (2.19) | 66 | 5.55 (2.48) | 56 | 5.45 (2.47) |
| *Asian* | 2,014 | 5.43 (2.39) | 2,035 | 5.38 (2.41) | 2,157 | 5.31 (2.42) |
| *Black or AA* | 640 | 5.80 (2.43) | 666 | 5.57 (2.43) | 664 | 5.78 (2.62) |
| *Hispanic*[c] | 568 | 5.14 (2.43) | 641 | 5.13 (2.26) | 708 | 5.00 (2.48) |
| *NH/PI* | 26 | 5.58 (2.55) | 23 | 6.13 (2.75) | 25 | 4.80 (1.94) |
| *White* | 4,688 | 5.06 (2.51) | 4,865 | 5.01 (2.46) | 4,745 | 4.92 (2.43) |
| *Other race*[d] | 225 | 5.07 (2.49) | 263 | 5.21 (2.68) | 289 | 5.02 (2.61) |
| Male | | | | | | |
| *AI/AN* | 67 | 5.81 (2.60) | 44 | 6.11 (3.28) | 54 | 5.13 (3.29) |
| *Asian* | 1,788 | 5.72 (2.64) | 1,672 | 5.63 (2.69) | 1,753 | 5.69 (2.56) |
| *Black or AA* | 395 | 5.53 (2.60) | 373 | 5.60 (2.51) | 381 | 5.49 (2.56) |
| *Hispanic*[c] | 575 | 5.63 (2.68) | 578 | 5.29 (2.67) | 618 | 5.54 (2.70) |
| *NH/PI* | 25 | 6.04 (2.13) | 19 | 5.63 (2.75) | 26 | 6.77 (2.58) |
| *White* | 5,215 | 5.67 (2.59) | 4,782 | 5.54 (2.61) | 4,692 | 5.57 (2.60) |
| *Other race*[d] | 244 | 5.98 (2.85) | 246 | 5.61 (2.85) | 284 | 5.53 (2.92) |

Abbreviations: SD, standard deviation; AI/AN, American Indian or Alaska Native; AA, African American; NH/PI, Native Hawaiian or other Pacific Islander.

[a]Exhaustion subscale had a range of 0–24, with higher scores indicating higher exhaustion.

[b]Overall exhaustion subscale Kruskal-Wallis *P* value = .004.

[c]Hispanic includes Hispanic, Latino, or of Spanish origin.

[d]Other race was a response option on the GQ that individuals could select either alone or in combination with other response options.

[e]Disengagement subscale had a range of 0–15, with higher scores indicating higher disengagement.

[f]Overall disengagement subscale Kruskal-Wallis *P* value < .001.

scores in 2 of the 3 cohorts. Students in non-White racial groups or of Hispanic, Latino, or Spanish origin had higher mean exhaustion and disengagement scores than White medical students, with some reaching statistical significance. Similarly, students identifying as bisexual or gay or lesbian had statistically higher mean exhaustion and disengagement scores than students identifying as heterosexual or straight. Across the 2019, 2020, and 2021 time periods, mean exhaustion and disengagement scores did not worsen within any of these demographic groups that had a sample size larger than 1. In contrast, some minor, though statistically significant, improvements were seen.

### Intersectional analysis

Mean exhaustion and disengagement scores in each cohort across sex and racial and ethnic groups (Table 2) and sexual orientation and racial and ethnic groups (Table 3) are shown. Mean disengagement scores were lower among female medical students than male medical students in most racial and ethnic groups in each cohort (not true for Black or African American medical students in 2019, Native Hawaiian or Pacific Islander medical students in 2020, or American Indian or Alaska Native or Black or African American medical students in 2021). Mean exhaustion and disengagement scores tended to be lower among White and Hispanic medical students for both females and males. Mean exhaustion scores were lower among heterosexual or straight students than bisexual or gay or lesbian students in each racial and ethnic group in each cohort with few exceptions. Mean disengagement scores were generally lower among heterosexual students than bisexual or gay or lesbian students in each racial and ethnic group in each cohort, although this pattern did not consistently hold among groups with smaller sample sizes (i.e., American Indian or Alaska Native or Native Hawaiian or Pacific Islander medical students), where scores ranged widely across years. Mean exhaustion and disengagement scores were relatively stable or improved across nearly all intersectional groups across the 3 graduating cohorts.

### Multivariable analysis

On multivariable linear regression pooling of responders from all 3 graduating cohorts and adjusting for age at graduation, sex, race and ethnicity, sexual orientation, marital status, premedical school debt, medical school debt, noneducation debt, number of dependents, and year of GQ completion,

Table 3

**Mean Exhaustion and Disengagement Scores by Sexual Orientation and Race and Ethnicity Among Responders to the 2019–2021 Association of American Medical Colleges Graduation Questionnaires (GQs)**

| Characteristic | 2019 GQ | | 2020 GQ | | 2021 GQ | |
|---|---|---|---|---|---|---|
| | No. | Mean (SD) | No. | Mean (SD) | No. | Mean (SD) |
| **Exhaustion[a]** | | | | | | |
| Heterosexual or straight | | | | | | |
| *AI/AN* | 109 | 13.10 (3.69) | 97 | 13.06 (4.76) | 98 | 12.90 (4.37) |
| *Asian* | 3,466 | 13.24 (4.24) | 3,380 | 13.21 (4.24) | 3,504 | 13.02 (4.15) |
| *Black or AA* | 942 | 13.10 (4.19) | 927 | 13.09 (4.15) | 893 | 13.09 (4.09) |
| *Hispanic*[b] | 1,009 | 12.66 (4.30) | 1,049 | 12.68 (4.20) | 1,117 | 12.55 (4.26) |
| *NH/PI* | 45 | 13.49 (4.07) | 37 | 13.35 (4.66) | 38 | 12.13 (3.33) |
| *White* | 8,995 | 12.43 (4.17) | 8,641 | 12.28 (4.10) | 8,281 | 12.17 (4.13) |
| *Other race*[c] | 426 | 13.06 (4.19) | 471 | 13.37 (4.53) | 517 | 13.17 (4.53) |
| Bisexual | | | | | | |
| *AI/AN* | 8 | 14.38 (3.66) | 10 | 14.00 (4.64) | 4 | 15.75 (2.87) |
| *Asian* | 115 | 14.01 (3.66) | 105 | 13.62 (3.95) | 169 | 13.96 (4.26) |
| *Black or AA* | 36 | 14.47 (4.83) | 41 | 14.10 (4.41) | 66 | 14.36 (3.67) |
| *Hispanic*[b] | 41 | 13.80 (4.31) | 63 | 13.37 (4.33) | 78 | 13.74 (3.86) |
| *NH/PI* | 1 | 17.00 (0) | 0 | NA | 3 | 13.67 (0.58) |
| *White* | 312 | 13.11 (4.45) | 382 | 13.65 (4.25) | 481 | 13.36 (3.98) |
| *Other race*[c] | 16 | 14.81 (4.20) | 11 | 14.73 (5.06) | 17 | 13.47 (3.71) |
| Gay or lesbian | | | | | | |
| *AI/AN* | 7 | 13.29 (3.45) | 2 | 9.00 (2.83) | 1 | 14.00 (0) |
| *Asian* | 136 | 13.60 (4.10) | 120 | 14.13 (4.44) | 107 | 13.67 (4.71) |
| *Black or AA* | 24 | 12.58 (5.72) | 41 | 13.49 (4.53) | 37 | 13.46 (3.62) |
| *Hispanic*[b] | 65 | 12.68 (4.12) | 71 | 13.45 (4.25) | 74 | 12.82 (4.10) |
| *NH/PI* | 5 | 14.00 (4.42) | 4 | 16.75 (4.72) | 3 | 13.33 (2.89) |
| *White* | 414 | 12.79 (4.14) | 415 | 13.05 (4.08) | 441 | 12.91 (4.26) |
| *Other race*[c] | 12 | 14.25 (4.25) | 11 | 14.55 (4.16) | 23 | 14.09 (4.63) |
| **Disengagement[d]** | | | | | | |
| Heterosexual or straight | | | | | | |
| *AI/AN* | 109 | 5.42 (2.42) | 96 | 5.75 (2.76) | 98 | 5.15 (2.79) |
| *Asian* | 3,466 | 5.53 (2.52) | 3,377 | 5.46 (2.53) | 3,526 | 5.43 (2.46) |
| *Black or AA* | 943 | 5.65 (2.43) | 927 | 5.52 (2.42) | 905 | 5.64 (2.59) |
| *Hispanic*[b] | 1,008 | 5.34 (2.55) | 1,053 | 5.18 (2.48) | 1,120 | 5.13 (2.55) |
| *NH/PI* | 44 | 5.61 (2.41) | 36 | 5.92 (2.75) | 39 | 5.79 (2.33) |
| *White* | 9,030 | 5.35 (2.56) | 8,668 | 5.23 (2.54) | 8,309 | 5.19 (2.53) |
| *Other race*[c] | 427 | 5.45 (2.72) | 472 | 5.37 (2.76) | 514 | 5.20 (2.74) |
| Bisexual | | | | | | |
| *AI/AN* | 8 | 4.13 (2.75) | 10 | 6.20 (2.10) | 4 | 7.00 (3.56) |
| *Asian* | 117 | 6.23 (2.28) | 105 | 5.78 (2.42) | 169 | 5.92 (2.75) |
| *Black or AA* | 35 | 6.43 (3.09) | 40 | 6.23 (2.72) | 65 | 6.02 (3.06) |
| *Hispanic*[b] | 42 | 5.81 (2.53) | 63 | 5.14 (2.51) | 78 | 5.97 (3.01) |
| *NH/PI* | 1 | 7.00 (0) | 0 | NA | 3 | 6.67 (0.58) |
| *White* | 317 | 5.62 (2.77) | 385 | 5.70 (2.57) | 483 | 5.65 (2.54) |
| *Other race*[c] | 17 | 5.18 (2.48) | 11 | 6.73 (2.20) | 17 | 6.12 (3.02) |
| Gay or lesbian | | | | | | |
| *AI/AN* | 8 | 7.13 (1.73) | 2 | 3.00 (0.00) | 1 | 4.00 (0.00) |
| *Asian* | 135 | 6.01 (2.34) | 121 | 5.89 (2.81) | 108 | 5.86 (2.85) |
| *Black or AA* | 25 | 5.76 (4.01) | 42 | 6.02 (2.64) | 37 | 6.14 (2.18) |
| *Hispanic*[b] | 65 | 5.38 (2.64) | 72 | 5.32 (2.32) | 77 | 6.01 (2.51) |

*(Table continues)*

mean exhaustion and disengagement score differences persisted by sex, race and ethnicity, and sexual orientation (Table 4). After controlling for other factors, mean disengagement scores were lower among female than male students (parameter estimate [PE] −0.47, 95% confidence interval [CI] −0.52, −0.42), while mean exhaustion scores did not differ between female and male students. Further, mean disengagement scores were lower among Hispanic (PE −0.11, 95% CI −0.22, −0.01) and White (PE −0.10, 95% CI −0.19, 0.00) students and higher among Asian (PE 0.17, 95% CI 0.07, 0.27), Black or African American (PE 0.31, 95% CI 0.18, 0.44), bisexual (PE 0.54, 95% CI 0.41, 0.66), and gay or lesbian (PE 0.23, 95% CI 0.11, 0.35) students than those who did not identify with each of those respective groups. Mean exhaustion scores were lower among White (PE −0.53, 95% CI −0.68, −0.37) students and higher among Asian (PE 0.38, 95% CI 0.21, 0.54), bisexual (PE 0.97, 95% CI 0.76, 1.17), and gay or lesbian (PE 0.55, 95% CI 0.35, 0.75) students than those who did not identify with each of those respective groups. Both mean exhaustion (PE -0.17, 95% CI −0.26, −0.07) and disengagement (PE −0.13, 95% CI −0.19, −0.07) scores were lower in 2021 than 2019. Medical students who had a partner (i.e., legally married or common law or civil union), who were divorced or separated, or who had dependents had lower exhaustion and/or disengagement scores, while those who had premedical or medical school debt above $200,000 or noneducational debt over $300,000 had higher exhaustion and/or disengagement scores (see Table 4).

## Discussion

This study examines graduating medical student reports of burnout for 3 national samples during the COVID-19 pandemic (2019–2021). In these national samples of over 45,000 medical students, mean exhaustion and disengagement scores statistically varied by sex, race and ethnicity, and sexual orientation, after controlling for other factors, including age at graduation, premedical school debt, medical school debt, noneducation debt, marital status, number of dependents, and year of GQ completion. Disengagement scores were lower for female than male medical students, a finding that persisted across most racial

Table 3
(Continued)

| Characteristic | 2019 GQ | | 2020 GQ | | 2021 GQ | |
|---|---|---|---|---|---|---|
| | No. | Mean (SD) | No. | Mean (SD) | No. | Mean (SD) |
| *NH/PI* | 5 | 7.00 (1.73) | 4 | 4.75 (2.87) | 3 | 3.67 (2.08) |
| *White* | 410 | 5.68 (2.59) | 419 | 5.49 (2.61) | 437 | 5.62 (2.60) |
| *Other race*[c] | 13 | 6.46 (2.40) | 11 | 5.82 (2.71) | 23 | 5.78 (2.97) |

Abbreviations: SD, standard deviation; AI/AN, American Indian or Alaska Native; AA, African American; NH/PI, Native Hawaiian or other Pacific Islander; NA, not applicable.

[a]Exhaustion subscale had a range of 0–24, with higher scores indicating higher exhaustion. See Table 2 for information on the overall data for the overall exhaustion subscale.

[b]Hispanic includes Hispanic, Latino, or of Spanish origin.

[c]Other race was a response option on the GQ that individuals could select either alone or in combination with other response options.

[d]Disengagement subscale had a range of 0–15, with higher scores indicating higher disengagement. See Table 2 for information on the overall data for the overall disengagement subscale.

and ethnic groups and after controlling for other factors, while exhaustion scores did not differ between female and male medical students after controlling for other factors. White students had lower exhaustion and disengagement scores than non-White students. Asian and Black or African American students had higher exhaustion and/or disengagement scores after controlling for other factors. Differences in exhaustion and disengagement scores were also notable by sexual orientation, with bisexual and gay or lesbian students having higher sores than heterosexual or straight students after controlling for other factors.

Other studies have also found differences in how burnout manifests by sex.[1,6] In a previous national study of U.S. medical students, female medical students had higher exhaustion scores and lower disengagement scores than male medical students.[3] In a study of U.S. residents, female residents had higher emotional exhaustion scores than male residents, while there were no differences in depersonalization score by sex.[23] In a study of Dutch residents, depersonalization scores varied by sex with male residents having significantly higher depersonalization scores than female residents.[24] Large national studies of residents have reported a higher prevalence of overall burnout among female residents.[25,26] In several studies of trainees, the inequity in burnout by sex is attenuated after controlling for harassment experienced at work.[3,25,26] Several studies of practicing physicians have reported higher odds of burnout among female physicians; a finding that has been attributed to greater difficulties managing work and family needs, different patient demands and expectations, and sex-based discrimination and harassment.[27] Other studies, however, have not found evidence of gender-based differences in the odds of burnout among physicians after controlling for practice type, specialty, and other factors.[28]

The larger national sample size, ability to analyze most racial and ethnic groups separately, more contemporary cohorts, and/or use of a different measurement tool for burnout may explain the higher risk of burnout (suggested by higher exhaustion and/or disengagement scores) seen in most traditionally underrepresented racial groups in our study compared to findings of no relationship or lower risk of burnout among non-White medical students reported in some previous studies.[2,7,8] Our findings are similar to a previous study that reported higher exhaustion and disengagement scores in non-White medical studies.[3] Racial and ethnic minority medical students and physicians are more likely to be subjugated to discrimination and harassment in the health care setting than White students and physicians, and this increases their risk for burnout.[2,3,29] They may also have less social support and experience more demands (e.g., minority tax) than their peers.[30,31] Additional studies are needed to elucidate possible contributing factors, so that a more supportive and lower-stress learning environment can be built.

The finding of lower risk of burnout (suggested by lower disengagement scores after controlling for other factors) among Hispanic-, Latino-, or of Spanish-origin medical students than individuals not identifying with this group in our cohort has not, to our knowledge, been previously reported in medical students and is similar to other studies of physicians.[32] Whether this finding reflects a better medical school experience for Hispanic-, Latino-, or Spanish-origin students in comparison to students belonging to other minority groups or the presence of other factors that cannot be determined from this study is unclear and should be explored further.

The higher risk of burnout (suggested by higher exhaustion and disengagement scores) among sexual minority medical students in this cohort resonates with findings from a previous study using 2016 and 2017 AAMC GQ responses that found that students who identified as bisexual or gay or lesbian were more likely to have higher exhaustion or disengagement scores than their heterosexual peers, a result that persisted after controlling for mistreatment and perceptions of the learning environment.[1,3,11] We build on that work by examining the dose-response relationship between severity of exhaustion and disengagement (e.g., how high the scores are on a continuous scale) and disaggregated sexual minority and race and ethnic groups, while controlling for additional personal factors (i.e., number of dependents and amount of educational and noneducational debt). Our multivariable analysis suggests higher exhaustion and disengagement scores among individuals identifying either as bisexual or gay or lesbian. Aligned with population-based studies demonstrating that individuals belonging to sexual minority groups may be at higher risk for mental health disorders,[33] a previous multi-institutional longitudinal study of medical students moving into residency reported that sexual minority trainees were at higher risk for depression and anxiety.[10] Strategies that address factors contributing to a higher risk of burnout and mental health disorders among sexual minority medical students are warranted. Approaches that promote belonging and inclusion for sexual minority medical students may help to reduce burnout and improve mental

Table 4

**Multivariable Analysis of Factors Associated With Mean Exhaustion and Disengagement Scores Among Responders to the 2019–2021 Association of American Medical Colleges Graduation Questionnaires (GQs)**

| Characteristic | Exhaustion | | Disengagement | |
|---|---|---|---|---|
| | PE (95% CI) | *P* value | PE (95% CI) | *P* value |
| **Sex** | | | | |
| Male | *Referent* | | *Referent* | |
| Female | 0.07 (–0.01 to 0.15) | .11 | -0.47 (–0.52 to –0.42) | < .001 |
| Missing | –0.65 (–4.72 to 3.41) | .75 | –0.44 (–2.91 to 2.03) | .73 |
| **Age at graduation (for each additional year)** | –0.07 (–0.08 to –0.05) | < .001 | 0.04 (0.03 to 0.05) | < .001 |
| **Race and ethnicity[a]** | | | | |
| AI/AN | 0.42 (–0.04 to 0.89) | .072 | 0.13 (–0.15 to 0.41) | .37 |
| Asian | 0.38 (0.21 to 0.54) | < .001 | 0.17 (0.07 to 0.27) | .001 |
| Black or AA | 0.12 (–0.10 to 0.33) | .28 | 0.31 (0.18 to 0.44) | < .001 |
| Hispanic[b] | –0.08 (–0.25 to 0.09) | .35 | –0.11 (–0.22 to –0.01) | .03 |
| NH/PI | 0.44 (–0.28 to 1.16) | .24 | 0.34 (–0.10 to 0.78) | .13 |
| White | –0.53 (–0.68 to –0.37) | < .001 | –0.10 (–0.19 to 0.00) | .04 |
| Other race[c] | 0.51 (0.27 to 0.75) | < .001 | 0.00 (–0.14 to 0.15) | .97 |
| **Sexual orientation** | | | | |
| Heterosexual or straight | *Referent* | | *Referent* | |
| Bisexual | 0.97 (0.76 to 1.17) | < .001 | 0.54 (0.41 to 0.66) | < .001 |
| Gay or lesbian | 0.55 (0.35 to 0.75) | < .001 | 0.23 (0.11 to 0.35) | < .001 |
| **Marital status** | | | | |
| Single (never legally married) | *Referent* | | *Referent* | |
| Legally married or common law or civil union | –0.29 (–0.40 to –0.18) | < .001 | –0.06 (–0.13 to 0.01) | .07 |
| Divorced or separated, but still legally married | –0.06 (–0.49 to 0.37) | .79 | –0.36 (–0.62 to –0.10) | .01 |
| Widowed | –1.31 (–4.02 to 1.40) | .34 | –1.16 (–2.81 to 0.49) | .17 |
| **No. of dependents** | | | | |
| 0 | *Referent* | | *Referent* | |
| 1 | –0.25 (–0.46 to –0.04) | .02 | –0.13 (–0.26 to 0.00) | .04 |
| ≥ 2 | –0.31 (–0.58 to –0.05) | .02 | –0.29 (–0.45 to –0.13) | < .001 |
| **Premedical education debt (in US $)** | | | | |
| 0 | *Referent* | | *Referent* | |
| 1–99,999 | –0.01 (–0.11 to 0.09) | .81 | –0.09 (–0.15 to –0.04) | .002 |
| 100,000–199,999 | 0.17 (–0.08 to 0.42) | .17 | –0.18 (–0.34 to –0.03) | .02 |
| 200,000–299,999 | 0.73 (0.33 to 1.12) | < .001 | –0.03 (–0.27 to 0.21) | .79 |
| Over 300,000 | 0.88 (0.28 to 1.48) | < .001 | 0.03 (–0.33 to 0.39) | .87 |
| **Medical school debt (in US $)** | | | | |
| 0 | *Referent* | | *Referent* | |
| 1–99,999 | –0.10 (–0.24 to 0.04) | .18 | 0.07 (–0.02 to 0.15) | .14 |
| 100,000–199,999 | –0.05 (–0.16 to 0.06) | .35 | 0.03 (–0.04 to 0.10) | .41 |
| 200,000–299,999 | 0.31 (0.19 to 0.42) | < .001 | 0.11 (0.04 to 0.18) | .001 |
| Over 300,000 | 0.48 (0.33 to 0.63) | < .001 | 0.11 (0.02 to 0.21) | .02 |
| **Noneducation debt (in US $)[d]** | | | | |
| 0 | *Referent* | | *Referent* | |
| 1–99,999 | 0.31 (0.20 to 0.43) | < .001 | 0.01 (–0.06 to 0.09) | .68 |
| 100,000–199,999 | 0.23 (–0.09 to 0.54) | .15 | 0.09 (–0.11 to 0.28) | .38 |
| 200,000–299,999 | 0.12 (–0.30 to 0.54) | .58 | 0.01 (–0.25 to 0.26) | .95 |
| Over 300,000 | 0.48 (0.01 to 0.95) | .048 | 0.35 (0.07 to 0.64) | .02 |
| **Year of GQ completion** | | | | |
| 2019 | *Referent* | | *Referent* | |
| 2020 | –0.04 (–0.14 to 0.06) | .43 | –0.09 (–0.15 to –0.03) | .004 |

*(Table continues)*

Table 4
(Continued)

| Characteristic | Exhaustion | | Disengagement | |
|---|---|---|---|---|
| | PE (95% CI) | *P* value | PE (95% CI) | *P* value |
| 2021 | –0.17 (–0.26 to –0.07) | < .001 | –0.13 (–0.19 to –0.07) | < .001 |

Abbreviations: PE, parameter estimate; CI, confidence interval; AI/AN, American Indian or Alaska Native; AA, African American; NH/PI, Native Hawaiian or other Pacific Islander.

[a]As respondents were able to select multiple race and ethnicity categories, *P* values for these categories reflect comparison with all other race and ethnicity categories. For example, the *P* value for Asian medical students reflects comparison with non-Asian (e.g., all other race and ethnicity categories combined) medical students.

[b]Hispanic includes Hispanic, Latino, or of Spanish origin.

[c]Other race was a response option on the GQ that individuals could select either alone or in combination with other response options.

[d]Noneducation debt includes mortgages.

health,[34] while creating a culture that also reduces bias against bisexual, gay, and lesbian patients.[35]

Mean exhaustion and disengagement scores among medical students were relatively stable overall from 2019 to 2021 for both female and male responders and across each racial and ethnic and sexual orientation group. Similarly, through an intersectional lens, differences in exhaustion and disengagement scores from 2019 to 2021 across sex and racial and ethnic groups and sexual orientation and racial and ethnic groups were mostly small and unlikely to be clinically significant. Whether this finding is a result of steps medical schools took in response to the pandemic[14] or other factors is difficult to determine. For example, remote learning may increase flexibility and control (job resource increase) for some medical students and decrease social support (job resource reduction) for other medical students.

After controlling for race and ethnicity, sex, and other factors, medical students who were married or had dependents had lower exhaustion and disengagement scores, whereas those with higher debt had higher exhaustion and disengagement scores. Being married and having dependents may provide individuals with some social support, which buffers against the risk of burnout. On the other hand, students with more debt report higher financial stress and worse academic performance.[36] Debt has been similarly associated with higher odds of burnout in a national study of residents.[37] Greater debt may also prompt students to seek employment during medical school. A previous longitudinal multi-institutional study found that U.S. medical students who work for income are less likely to recover from burnout relative to those who do not work for income during medical school.[7]

This study has several limitations. First, the AAMC GQ contains a modified version of the OBI. We used a subset of the items from this modified version informed by our previous exploratory and confirmation analysis to improve internal validity.[21] The high Cronbach alphas for each subscale suggest acceptable reliability. Second, minimally important differences for the OBI exhaustion and disengagement scores have not been established. In this regard, it is noteworthy that many of the observed PEs in this study are similar in magnitude to differences identified as supporting the validity of the OBI during its development.[18] As noted above, the OBI has less construct validity evidence in U.S. medical students and health care workers than the Maslach Burnout Inventory to date but offers the advantage of not being proprietary.[20] Although a previous study mapped scores from commonly used burnout measures to the Maslach Burnout Inventory measure, the OBI was not included, limiting the ability to make comparisons between burnout scores across the OBI and other measures.[38] Third, we explored a limited number of demographics, including a binary definition of sex, and intersectional identities based on the available data. There are additional intersecting identities likely to influence medical students' experiences and risk of burnout. Despite pooling data from 3 consecutive cohorts of responders, some of our sample sizes remained small, limiting our ability to interpret the findings and threatening generalizability. Fourth, although the response rate in this study is quite high and nonresponder analyses in studies of burnout among practicing physicians have not identified substantial differences between responding and nonresponding participants, response bias remains possible.[39,40] Fifth, as this was a cross-sectional study, we are unable to determine direction of effect.

Among this national sample of graduating medical students, inequities in risk of burnout, as suggested by differences in mean exhaustion and disengagement scores, were found by sex, race and ethnicity, and sexual orientation, with Asian, Black or African American, and sexual minority medical students seemingly at highest risk. Given the potentially serious negative impact of burnout on professional identify formation, competency attainment, and retention in the workforce,[6] and the vital role medical students from historically underrepresented in medicine groups have in the nation's strategy to eliminate health inequities, urgent action is needed.[16] While many medical schools have implemented curricular and learning environment initiatives to reduce stress, build social support, and equip students to engage in self-care,[41,42] and while overall burnout among medical students was stable to improved between 2019 and 2021 across the demographic groups included here, these initial steps do not appear to have not been enough for all students. There is a need to create a more supportive environment for racial and ethnic and sexual minority medical students and reduce financial stress among all medical students. This could be achieved through more training on diversity, equity, and inclusion; tailored mentorship and support programs;

financial assistance through scholarships and loan forgiveness; and
a commitment to measuring and monitoring burnout rates to inform strategies and interventions.

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