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## **Disability, Program Access, Empathy and Burnout in US Medical Students: A National Study**

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## Abstract

**Objective:** To investigate whether self-disclosed disability and self-reported program access are associated with measures of empathy and burnout in a national sample of US medical students.

**Methods:** The authors obtained data from students who responded to the Association of Medical Colleges (AAMC) Year 2 Questionnaire (Y2Q) in 2019 and 2020. Data included demographic characteristics, personal variables, learning environment indicators, measures of burnout (Oldenburg Burnout Inventory for Medical Students) and empathy (Interpersonal Reactivity Index), and disability-related questions, including self-reported disability, disability category, and program access. Associations between disability status, program access, empathy, and burnout were assessed using multivariable logistic regression models accounting for YQ2 demographic, personal-related, and learning environment measures.

**Results:** Overall, 23,898 (54.2%) provided disability data and were included. Of those, 2,438 (10.2%) self-reported a disability. Most medical students with disabilities (SWD) self-reported having program access through accommodations (1,215 [49.8%] or that accommodations were not required for access (824 [33.8%]). Multivariable models identified that compared to students without disabilities, SWD with and without program access presented higher odds of high exhaustion (1.50 [95%CI, 1.34 – 1.69] and 2.59 [95%CI, 1.93 – 3.49], respectively) and lower odds of low empathy (.75 [95%CI, .67 – .85] and .68 [95%CI, .52 – .90], respectively). In contrast, multivariable models for disengagement identified that SWD reporting lack of program access presented higher odds of high disengagement compared to students without disabilities (1.43 [95%CI, 1.09 – 1.87], while SWD with program access did not (1.09 [95%CI, .97 – 1.22]).

**Conclusions:** Despite higher odds of high exhaustion, SWD were less likely to present low empathy regardless of program access, and SWD with program access did not differ from

students without disabilities in terms of disengagement. These findings add to our understanding of the characteristics and experiences of SWD including their contributions as empathic future physicians.

### **Keywords**

Empathy; Burnout; Disability; Medical Students, Access; Accommodations

### **Introduction**

The need for greater understanding of disability in medical education is evidenced by global health data on healthcare disparities encountered by people with disabilities worldwide<sup>1</sup> and by research showing that physicians from different countries report concerns about their ability to provide quality care for disabled patients.<sup>2-5</sup> One mechanism of addressing this need is through the inclusion and support of medical students with disabilities, who may better inform medicine, while reducing prevailing stereotypes of disability.<sup>6,7</sup> Indeed, a growing body of research suggests that a more diverse medical workforce can benefit all physicians, trainees and patients.<sup>8-10</sup> However, research on potential contributions and challenges faced by disabled trainees in medical education is still scarce.<sup>11</sup>

Patients with disabilities encounter high rates of mistreatment,<sup>1,12,13</sup> discrimination,<sup>14-19</sup> and communication difficulties<sup>17,20-24</sup> that point to diminished provider empathy as a potential

contributor to health inequities faced by this population. Conversely, anecdotal reports and qualitative research suggest that one of the valuable contributions that physicians and medical students with disabilities bring to the medical workforce is the highly empathic way they approach patient care.<sup>25-30</sup> Indeed, prior studies have found that patients with and without disabilities report believing that disabled physicians are more empathic.<sup>31,32</sup>

While the literature contains multiple definitions of physician empathy, it is most often defined as a predominately cognitive competency of understanding and respecting the patient perspective.<sup>33-36</sup> Physician empathy is highly valued by patients from different cultures,<sup>37</sup> and has been associated with decreased patient anxiety, increased patient satisfaction and adherence to treatment, and better patient outcomes<sup>33,35,38</sup> However, empathy may decline over the course of medical school,<sup>39-41</sup> while levels of burnout appear to increase.<sup>42</sup> While empathy is known to improve patient care, burnout is associated with lower professionalism,<sup>43</sup> diminished patient satisfaction,<sup>44,45</sup> and increased medical errors.<sup>46,47</sup> In addition, prior studies suggest that empathy and burnout are connected, with higher levels of burnout associated with lower empathy scores in medical students.<sup>48,49</sup>

For those who self-identify with a disability, substantial structural barriers during training<sup>26,29,50,51</sup> may contribute to increased burnout, which may, in turn, lead to decreased empathy. Indeed, prior research suggests that students with disabilities experience higher levels of distress during medical school,<sup>52</sup> and that disabled trainees are denied equal access to medical

education despite global endorsements about the benefits of a larger representation of physicians with lived experience of disability.<sup>1,26,53,54</sup> Given its associations with thoughts of dropping out of medical school,<sup>55</sup> burnout among medical students with disabilities may place them at higher risk for attrition, reducing the representation of this valuable and underrepresented group in medicine. Similarly, due to the inverse associations between burnout and empathy,<sup>48,49</sup> it is possible that the highly valued empathy demonstrated by disabled medical students could be threatened by increased levels of burnout in this population. To our knowledge, no studies have investigated potential factors associated with the development of burnout and erosion of empathy among medical students with disabilities. Lack of access to effective reasonable accommodations presents one such factor.

For learners with disability, program access, defined as access to accommodations or not needing accommodations due to an environment where access needs are already met,<sup>56</sup> has been positively associated with improved well-being and performance outcomes. Specifically, a study of first-year medical residents demonstrated that residents with self-reported disability and lack of program access were at a higher risk for developing depressive symptoms during internship than their peers without disabilities and were more likely to self-report medical errors than both residents without disabilities and disabled residents with program access. Conversely, residents who self-reported disability and program access did not differ from residents without self-

reported disabilities in terms of increase in depressive symptoms or reports of medical errors.<sup>56</sup>

In another study of healthcare professional students and trainees, higher satisfaction with accommodations was associated with lower likelihood of screening positive for the risk of depression and, for a subset, increased likelihood of obtaining employment.<sup>57</sup> Lack of access to needed reasonable accommodations has also been associated with lower scores in standardized exams and delayed student progression among medical students with disabilities.<sup>58,59</sup>

While physicians with disabilities may be a critical part of a multifaceted approach to advance health equity, there is a dearth of research that examines empathy and burnout measures for medical students with disabilities. Systematically assessing this data will allow for a more nuanced understanding of the experiences of students with disabilities and uncover potential need for additional support. In addition, given prior evidence that program access is closely linked with the wellbeing and performance of disabled trainees,<sup>56-59</sup> and the emphasis on disability access across international recommendations,<sup>1,26,53,54</sup> research on the associations between program access, burnout, empathy, and self-reported disabilities has the potential to identify possible targets of intervention to better support the wellbeing and performance of this diverse and valued population.

This study aimed to characterize indicators of burnout and empathy among medical students with self-disclosed disabilities, compared to those without disabilities, and to investigate whether self-

disclosed disability and reported lack of program access are associated with measures of empathy and burnout in two national cohorts of US medical students, addressing the gap in literature about the wellbeing and empathy among medical students with disabilities.

## **Methods**

### ***Study setting and participants***

We obtained de-identified data from two cohorts (2019 and 2020) of second-year medical students who replied to the Association of Medical Colleges (AAMC) Year 2 Questionnaires (Y2Q). The Y2Q is an anonymous online survey that is administered annually to all second-year medical students actively enrolled in US-allopathic medical schools. The complete dataset included 27,009 medical students from two yearly cohorts (13,967 from 151 medical schools for the 2019 cohort and 13,042 from 153 medical schools for the 2020 cohort; overall response rate of 61.3% based on the number of eligible second-year medical students in 2019 [21,917] and 2020 [22,138]). Of those, 23,898 (88.5%) provided a yes or no response to the question “Are you a person with a disability (e.g., ADHD, learning, psychological, chronic health, mobility, hearing, vision, etc.)?” and were included in the analyses (496 [1.8%] replied “I don’t know” and were excluded). The final sample represents 54.2% of second-year US medical students in 2019 and 2020. Obtained data included demographic characteristics (i.e., sex, age group, sexual orientation, race/ethnicity, cohort year), disability-related questions, along with measures of

personal-related variables, learning environment, burnout, and empathy. Given that all data were obtained on a population-level without any identifying information about medical students or their medical schools, the study was deemed exempt by the University of Colorado Medical School Institutional Review Board and followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

### *Measures*

#### Disability-related questions

##### *Disability status and type*

Medical students' disability status was assessed through their responses to the question "Are you a person with a disability (e.g., ADHD, learning, psychological, chronic health, mobility, hearing, vision, etc.)?" Possible responses to the disability-status question included "yes", "no", or "I don't know". Disability type was determined using the question "Which of the following best describes your disability? If you have more than one type, select all that apply". Available responses to this question included "attention deficit/hyperactivity disorder (ADHD)", "chronic health disability", "deaf or hard of hearing", "learning disability", "mobility disability", "psychological disability", "visual disability", or "other".

##### *Program access*



Students with disabilities were asked whether their medical school provided accommodations for their disabilities (yes/no). Those who replied “no” were further asked the question “Which of the following best describes why your medical school did not or has not provided accommodations?” (Responses included: “my request for accommodations was denied”, “my request for accommodations is under review”, “I have not requested accommodations because I feel I do not need accommodations”, and “I have not requested accommodations for other reasons”). In keeping with previous studies,<sup>56,60</sup> we coded program access to include students reporting receiving accommodations or not needing accommodations. All other responses were coded as lack of program access.

### Burnout

Burnout symptoms were measured using the Oldenburg Burnout Inventory for Medical Students (OLBI-MS),<sup>61,62</sup> which is a modified and shortened version of the Oldenburg Burnout Inventory (OLBI).<sup>61</sup> The OLBI-MS consists of 16 items measuring two dimensions of burnout – exhaustion (8 items, Cronbach’s alpha=0.8 in the present study sample) and disengagement (8 items, Cronbach’s alpha=0.8 in the present study sample). According to Demerouti and Bakker,<sup>61</sup> exhaustion is defined as *“a consequence of intense physical, affective and cognitive strain, i.e. as a long-term consequence of prolonged exposure to certain job demands”*, while the disengagement items from the OLBI concern the relationship of individuals with their work, *“particularly with respect to identification with work and willingness to continue in the same*

*occupation.*<sup>61</sup> In the medical student version (OLBI-MS) of the OLBI the word ‘work’ is substituted by ‘studies’ on every item.<sup>62</sup> Each subscale is calculated by summing across its items, which are measured on a 0–3 point scale. Higher scores indicate higher levels of burnout. Given the high levels of burnout among the overall population of medical students,<sup>42</sup> and that despite having good psychometric properties, the OLBI does not provide clinical cutoffs for burnout,<sup>63</sup> quartiles were used to provide clinical meaning to the ranges of specific subgroup scores relative to the total sample of medical students who took the Y2Q. Therefore, following the procedures of prior studies that used the OLBI and OLBI-MS to assess burnout among health professionals<sup>64</sup> and medical students,<sup>65</sup> students’ scores in each OLBI-MS subscale were categorized as high at the 75th percentile and above (i.e., high exhaustion  $\geq 14$  and high disengagement  $\geq 12$  in the complete Y2Q sample [N=27,009]).

### Empathy

Empathy was measured using eight items derived from the perspective taking and empathic concern subscales of the Interpersonal Reactivity Index (IRI).<sup>66,67</sup> The IRI scores are calculated by summing across the 8 items, which are measured on a 0–4 point scale. The possible range of scores is 0–32, with higher scores indicating higher levels of empathy. The Cronbach alpha for the IRI in the present study was 0.8. Given that reduced empathy is associated with poorer patient care outcomes, IRI scores at the 25th percentile or below in the complete Y2Q sample (IRI  $\leq 22$ ) were categorized as low empathy in order to assess whether self-reported disability

associates with a higher or lower risk of presenting low empathy in relation to the overall population of medical students.

#### Personal-related measures

Tolerance for ambiguity was measured using the 7-item Tolerance for Ambiguity Scale (TFA).<sup>68</sup> The TFA is designed to measure the individual's ability to cope with situations of uncertainty and includes seven items measured on a 1–6 point scale. TFA scores are calculated by summing scores across all seven items, with a possible total score range of 7–42. Higher scores on the TFA indicate higher tolerance for ambiguity. The Cronbach alpha for TFA in the present study sample was 0.8.

To control the results for current perceived quality of life, we included the 6-item Linear Analogue Self-Assessment Scale (LASA-6), which measures respondents' perceptions about the following six aspects of life: overall quality of life, mental, physical, emotional, social, and spiritual well-being. LASA-6 scores are calculated by summing across its items, which are rated on a 0–10 point scale (Cronbach alpha=0.9 in the present study sample). The possible range of the total score is 0–60, with higher scores indicating higher perceived quality of life.

#### Learning environment measures

Students' perceptions regarding their learning environment were measured through the Medical School Learning Environment Survey (MSLES).<sup>69</sup> The MSLES consists of 11 items measuring

three dimensions of the learning environment: emotional climate (3 items), faculty interactions (4 items), and student-student interactions (4 items). Each subscale is calculated by summing across the individual items, which are measured on a 0–5 point scale. Higher scores on MSLES subscales indicate a more positive perception of the learning environment. Cronbach alpha values for the MSLES subscales were 0.9 for emotional climate, 0.8 for faculty interactions, and 0.8 for student-student interactions.

### *Statistical analyses*

#### Associations between disability status, empathy, and burnout

We calculated descriptive summary statistics for the overall sample and stratified by disability status (i.e., students with and without disabilities). Differences in demographic characteristics among students with and without disabilities were assessed using  $\chi^2$  tests. We examined for the associations between the presence of disabilities and indicators of high exhaustion, high disengagement, and low empathy using unadjusted odds ratio (OR) and multivariable logistic regression models accounting for the following demographic, personal-related, and learning environment covariates: sex, sexual orientation, age group, race/ethnicity, cohort year, TFA score, LASA-6 score, and MSLES subscale scores. Because previous studies suggest that high burnout is detrimental to empathy,<sup>41,48,70,71</sup> multivariable models for low empathy also included high exhaustion and high disengagement as independent covariates. Additionally, in order to gain insight on the influence of specific types of disability in any observed associations between

disability status, empathy, and burnout, we performed sensitivity analyses by serially excluding each individual disability type from our multivariable models of high exhaustion, high disengagement, and low empathy.

#### Associations between program access, empathy, and burnout

To identify possible associations of program access with indicators of burnout and empathy among medical students, we performed a two-step secondary analysis: first, we examined for associations between lack of program access with the presence of indicators of high exhaustion, high disengagement, and low empathy within the subset of students with reported disabilities using unadjusted odds ratio. Subsequently, we performed multivariable logistic analyses examining whether indicators of high exhaustion, high disengagement, and low empathy associated with disability status and program access, while accounting for demographic, personal-related, learning environment, and burnout measures. Burnout measures were only included as independent covariates in multivariable models for empathy.

A 2-sided  $P < .05$  was considered statistically significant for all statistical analyses. All analyses were conducted using SPSS-21 (IBM Corp).

#### **Findings**

Of the 23,898 second-year medical students included in the present study (54.2% of second-year US medical students in 2019 and 2020), 2,438 (10.2%) self-identified as having a disability. Compared to students who did not report a disability, students with disabilities were more likely to be women ( $\chi^2=8.1$ ,  $df=1$ ,  $p=.004$ ), older ( $\chi^2=212.5$ ,  $df=1$ ,  $p<.0001$ ), lesbian, gay, or bisexual ( $\chi^2=353.9$ ,  $p<.0001$ ), from racial and ethnical groups underrepresented in medicine ( $\chi^2=31.9$ ,  $df=1$ ,  $p<.0001$ ), and from the 2020 cohort ( $\chi^2=12.8$ ,  $df=1$ ,  $p<.0001$ ) (Table 1).

### ***Burnout and empathy among students with and without reported disabilities***

Compared to students without disabilities, students who reported disabilities were significantly more likely to report high exhaustion (1,181 [49.3%] vs. 6,433 [30.6%], OR 2.21 [95% CI, 2.01–2.40]) and high disengagement (979 [40.7%] vs. 6,291 [29.9%], OR 2.21 [95% CI, 2.01–2.40]). With respect to empathy scores, SWD were significantly less likely to present low empathy than their colleagues without disabilities (608 [25.5%] vs. 6,531 [31.1%], OR .76, 95% CI [.69–.83]).

In multivariable models accounting for demographic, personal-related, and learning environment characteristics, the presence of a self-reported disability was significantly associated with increased odds of high exhaustion (OR 1.60 [95%CI, 1.43–1.79]) and high disengagement (OR 1.11 [95%CI, 1.001–1.24]), and lower odds of presenting low empathy (OR .74 [95% CI, .66–.82]) (Table 2). Sensitivity analyses serially excluding each individual disability type from multivariable models demonstrated that disabled students continued to present significantly higher odds for high exhaustion (from 1.42 [95%CI, 1.21–1.67] to 1.63 [95%CI, 1.44–1.83]) and

significantly lower odds for low empathy (from .65 [95%CI .55–.76] to .80 [95%CI, .71–.90]) regardless the removal of any single disability type. Differently, students with disability were no longer more likely to present higher odds for high disengagement when either students with chronic health, hearing, or psychological disabilities were removed from multivariable models (from 1.09 [95%CI, .97–1.23] to 1.19 [95%CI, 1.02–1.40]) (Supplemental figure).

### *Associations of program access with indicators of burnout and empathy*

Compared to SWD with program access, SWD who reported not having program access were significantly more likely to present high exhaustion (229 [67.4%] vs. 931 [46.4%], OR 2.39, 95% CI [1.87–3.04]) and high disengagement (193 [56.4%] vs. 771 [38.4%], OR 2.08, 95% CI [1.65–2.63]). In contrast, no significant associations were identified between low empathy and lack of program access among SWD (93 [27.5%] vs. 505 [25.3%], OR 1.12, 95% CI [.86–1.45]) (Figure 1).

In multivariable models accounting for demographic, personal-related, and learning environment covariates, disabled students were more likely to present indicators of high exhaustion than students without disabilities regardless of program access (access needs met, OR 1.50 [95%CI, 1.34–1.69]; lack of access OR 2.59 [95%CI, 1.93–3.49]). Further, SWD with program access were less likely to present high exhaustion than their counterparts reporting lack of program access (SWD with program access vs. without, OR .58 [95%CI, .42–.79]). In contrast, while students with disabilities reporting lack of program access were significantly more likely than

students without disabilities to present indicators of high disengagement (OR 1.43 [95%CI, 1.09–1.87]), SWD with program access were not (OR 1.09 [95%CI, .97–1.22]). While not significant, SWD with program access showed a tendency toward being less likely to present high disengagement than SWD without program access (OR .76 [95%CI, .57–1.01];  $p=.06$ ). With respect to empathy, both groups of SWD were less likely than their peers without disabilities to present indicators of low empathy (access needs met, OR .75 [95%CI, .67–.85]; lack of access, OR .68 [95%CI, .52–.90]). Program access did not seem to impact empathy as there was not a significant difference in low empathy odds between SWD with and without access (OR 1.10 [95%CI, .82–1.48]) (Table 3).

## Discussion

To our knowledge, this is the first study to systematically investigate the association between empathy, burnout, program access, and disability among medical students. Using data from a national sample of US medical students, we identified that despite the high frequency of burnout symptoms among disabled students, this population was significantly less likely to present low empathy than their peers without disabilities. Importantly, after accounting for program access, disabled students who had program access did not differ from students without disabilities in terms of high disengagement and did not report low empathy regardless of program access. These data highlight the relevance of this population to a more empathic workforce and



underscore the critical role of program access to the well-being and retention of medical students with disabilities.

Prior studies demonstrate that higher empathy scores are associated with demographic factors (e.g., female sex,<sup>39,72-74</sup> older age,<sup>72,73</sup> underrepresented race/ethnicity,<sup>75</sup> sexual minorities<sup>76</sup>), higher tolerance for ambiguity,<sup>77</sup> better quality of life,<sup>74</sup> more positive perceptions of the learning environment,<sup>72</sup> and lower disengagement.<sup>72,74,78,79</sup> Our study results add to the literature by demonstrating that the associations between disability and higher empathy persisted even after accounting for these well-established factors associated with empathy among medical students. Notably, multivariable models accounting for program access identified that both disabled students with and without program access were less likely to present low empathy than their peers without disabilities, suggesting that even in situations where program access is not provided, empathy remains preserved. Taken together, these results suggest that lived experience of disability<sup>25,26,28</sup> may be a robust protective factor, leading to increased empathy among medical students with disabilities.

Recent studies with training physicians suggest that program access is critical to the well-being and performance of learners with disabilities.<sup>56,58</sup> Our results endorse this body of knowledge by demonstrating that program access was associated with lower exhaustion and disengagement among medical students with disabilities, and that students self-reporting disabilities and program access did not differ from their colleagues without disabilities in terms of disengagement indicators. Given that exhaustion is understood as the stress component of

burnout and disengagement is associated with negative attitudes towards one's studies and unwillingness to continue in the same profession,<sup>61,80</sup> our findings suggest a critical role of program access to the well-being and retention of medical students with disabilities. This is particularly noteworthy as anecdotal reports suggest varying levels of expertise informing disability access across medical schools.<sup>26</sup> A 2021 study demonstrated that 35% of US medical schools did not maintain disability disclosure systems in alignment with AAMC considerations.<sup>50</sup> In parallel, multiple calls support the benefit of having a specialized disability personnel for the medical school to enhance effective accommodations and communicate support for the population of students with disabilities.<sup>26,51,81</sup> Our findings support the recommendations and the need to remove structural barriers to disability disclosure and accommodation request.<sup>50,82</sup> Commonly reported structural barriers include, but are not limited to, conflicts of interest in the disability disclosure process (e.g., when individuals who hold a role on students' assessment or promotion are involved in the review of students' requests for accommodations),<sup>25,29,50,81</sup> lack of expertise and knowledge about accommodations among disability resource professionals,<sup>26,50</sup> and disability disclosure systems that are not informed by best accommodation practices and relevant disability and case law.<sup>47</sup>

This study has limitations. First, its cross-sectional design does not allow definitive conclusions about causality or the direction of the identified associations. Second, despite the large sample size and high response rate, the data focuses on second-year medical students, reducing our ability to report on the stability of empathy across the medical education continuum. Third, while

the self-reported nature of our study measures is critical to reduce students' confidentiality concerns regarding disability and mental health disclosures, these measures may be limited by students' decision to disclose, which can be influenced by stigma, bias, and access to formal evaluation.<sup>26</sup> Fourth, despite its good psychometric properties,<sup>61</sup> the OLBI is a screening instrument and not a clinical assessment of burnout. Fifth, although our analyses included several demographic, personal-related, and learning environment factors that are likely relevant for burnout and empathy among medical students, the survey does not include other potentially relevant factors such as personal experiences with healthcare systems and with disability disclosure and program access in previous academic settings. Sixth, while our sensitivity analyses suggest that no single type of disability played a large impact on the overall outcomes related to the associations between self-disclosed disability and indicators of burnout and empathy, the small number of students reporting certain types of disabilities did not allow us to perform multivariable analyses specific to each disability type. Finally, although we aimed to capture lack of program access through self-reported lack of accommodations when needed, disability access is a multifactorial construct that extends beyond accommodation and includes additional barriers, including stigmatizing attitudes and biases that shape climate and inclusion. Despite these limitations, this study uses a large, national sample of students, strengthening our findings. Further research is needed to identify additional potential drivers of burnout and empathy among students with disabilities. Moreover, longitudinal studies investigating the associations between disability, empathy, and well-being among medical students are needed to

better understand the identified associations and to determine whether empathy is maintained throughout medical school for this population. This large national study of disability, program access, empathy, and burnout among US medical students suggests that, compared to students without disabilities, disabled students exhibit higher empathy regardless of program access or burnout and that program access may be a critical factor in reducing exhaustion and disengagement in this population. These findings also add to our understanding of the strengths of students with disabilities in medicine and have implications for recruiting and supporting this diverse population of students.

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***Note:*** In this article, we use both person-first language (e.g., "person with a disability") and identity-first language (e.g., "disabled person"). This approach recognizes and respects the variation in preferred language among persons with disabilities. We, and many who study disability, feel that it is important to include this preferred language as part of our work. Given that our work is informed, developed, analyzed and written by people with disabilities, the

language choice stays true to the community and to our authors. More information can be found in the following work: *Am Psychol.* 2015;70(3):255-64; *J Child Psychol.*

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***Conflicts of interest:*** none.

***Ethical approval:*** This study was deemed exempt by the University of Colorado Medical School Institutional Review Board.

**Table 1.** Characteristics of participants (N=23,898)

Characteristic	Students with disabilities (N= 2,438), N (%)	Students without disabilities (N=21,460), N (%)	P value
<i>Overall prevalence</i>	10.2%	89.8%	
<i>Demographic characteristics</i>			
Sex			.004
Women	1,438 (59.0)	12,010 (56.0)	
Men	999 (41.0)	9,442 (44.0)	
No. Missing	1 (0.0)	8 (0.0)	
Age			< .001
Up to/including 26 years old	1,804 (74.0)	18,318 (85.4)	
27 years or older	634 (26.0)	3,142 (14.6)	
Sexual orientation			<.001
Heterosexual or straight	1,887 (77.4)	19,360 (90.2)	
Lesbian, gay, or bisexual	488 (20.0)	1,797 (8.4)	
No. Missing	63 (2.6)	303 (1.4)	
Race/Ethnicity			< .001
Underrepresented in Medicine <sup>a</sup>	559 (22.9)	3,916 (18.2)	
Non-Underrepresented in Medicine	1,804 (75.7)	17,269 (80.5)	
No. Missing	34 (1.4)	275 (1.3)	
Cohort year			< .001
2019 cohort	1,190 (48.8)	11,293 (52.6)	
2020 cohort	1,248 (51.2)	10,167 (47.4)	
<i>Disability-related characteristics</i>			
Disability type			
ADHD	1401 (57.5)		
Chronic health disability	466 (19.1)		
Deaf or hard of hearing	75 (3.1)		
Learning disability	198 (8.1)		
Mobility disability	53 (2.2)		
Psychological disability	543 (22.3)		
Visual disability	94 (3.9)		
Other	128 (5.3)		
Program access: Accommodation or other			
Medical school provided accommodations	1215 (49.8)		
I have not requested accommodations because I feel I do not need accommodations	824 (33.8)		
Lack of program access			
My request for accommodations was denied	25 (1.0)		
My request for accommodations is under review	16 (0.65)		
I have not requested accommodations for other reasons	299 (12.3)		
Reason not provided	5 (0.2)		
No. missing	54 (2.2)		

a Underrepresented in Medicine includes any U.S. citizen or permanent resident who self-identified as one or more of the following race/ethnicity categories (alone or in combination with any other race/ethnicity category): American Indian or Alaska Native; Black or African American; Hispanic, Latino, or of Spanish Origin; or Native Hawaiian or Other Pacific Islander

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**Table 2.** Multivariable models of burnout and empathy among medical students with and without disabilities

Variable	High Exhaustion		High Disengagement		Low Empathy	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
<i>Presence of disabilities</i>						
Students without disabilities	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Students with disabilities	1.60 (1.43 – 1.79)	< .001	1.11 (1.00 – 1.24)	.047	.74 (.66 – .82)	< .001
<i>Demographic characteristics</i>						
Men	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Women	1.63 (1.52 – 1.75)	< .001	0.64 (0.59 – 0.68)	< .001	.48 (.45 – .51)	< .001
Heterosexual or straight	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Lesbian, gay, or bisexual	1.24 (1.11 – 1.38)	< .001	1.13 (1.01 – 1.16)	.03	.81 (.73 – .91)	< .001
Up to 26 years old	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
27 years or older	0.92 (0.83 – 1.01)	.09	0.77 (0.70 – 0.85)	< .001	.88 (.81 – .96)	.004
Non-Underrepresented in Medicine	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Underrepresented in Medicine <sup>a</sup>	1.23 (1.16 – 1.38)	< .001	0.89 (0.81 – 0.96)	< .001	.81 (.74 – .87)	< .001
2019 cohort	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
2020 cohort	0.77 (0.72 – 0.83)	< .001	0.97 (0.91 – 1.04)	.40	.92 (.86 – .98)	.01
<i>Personal-related measures (for each 1-point increase)</i>						
TFA tolerance for ambiguity	0.94 (0.94 – 0.95)	< .001	0.97 (0.96 – 0.97)	< .001	.98 (.98 – .99)	< .001
LASA-6 perceived quality of life	0.90 (0.89 – 0.90)	< .001	0.94 (0.93 – 0.94)	< .001	.99 (.99 – .994)	.002
<i>Learning environment measures (for each 1-point increase)</i>						
MSLES faculty interactions	1.00 (0.99 – 1.02)	.44	0.97 (0.95 – 0.98)	< .001	.94 (.93 – 0.95)	< .001
MSLES student interactions	1.01 (1.00 – 1.03)	.06	0.98 (0.97 – 0.996)	< .001	.98 (.97 – .99)	< .001
MSLES emotional climate	0.84 (0.83 – 0.86)	< .001	0.81 (0.79 – 0.82)	< .001	.97 (.95 – .98)	< .001



*Burnout*<sup>b</sup>

High exhaustion (No)	N.A.	N.A.	N.A.	N.A.	1 [Reference]	N.A.
High exhaustion (Yes)	N.A.	N.A.	N.A.	N.A.	.66 (.61 – .72)	< .001
High disengagement (No)	N.A.	N.A.	N.A.	N.A.	1 [Reference]	N.A.
High disengagement (Yes)	N.A.	N.A.	N.A.	N.A.	1.30 (1.20 – 1.40)	< .001

<sup>a</sup> Underrepresented in Medicine includes any U.S. citizen or permanent resident who self-identified as one or more of the following race/ethnicity categories (alone or in combination with any other race/ethnicity category): American Indian or Alaska Native; Black or African American; Hispanic, Latino, or of Spanish Origin; or Native Hawaiian or Other Pacific Islander

<sup>b</sup> Burnout measures were only included as independent covariates in multivariable models for low empathy

**Table 3.** Multivariable models of burnout and empathy among medical students without disability and with disability with and without program access

Variable	High Exhaustion		High Disengagement		Low Empathy	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
<i>Presence of disabilities</i>						
Students without disabilities	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Students with disabilities and program access	1.50 (1.34 – 1.69)	< .001	1.09 (.97 – 1.22)	.17	.74 (.67 – .85)	< .001
Students with disabilities lacking program access	2.59 (1.93 – 3.49)	< .001	1.43 (1.09 – 1.87)	.01	.68 (.52 – .90)	.006
<i>Demographic characteristics</i>						
Men	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Women	1.63 (1.52 – 1.75)	< .001	.64 (.60 – .68)	< .001	.48 (.45 – .51)	< .001
Heterosexual or straight	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Lesbian, gay, or bisexual	1.24 (1.11 – 1.39)	< .001	1.13 (1.01 – 1.25)	.03	.81 (.73 – .91)	< .001
Up to 26 years old	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
27 years or older	.92 (.83 – 1.01)	.08	.77 (.70 – .85)	< .001	.88 (.81 – .96)	.004
Non-Underrepresented in Medicine	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
Underrepresented in Medicine <sup>a</sup>	1.27 (1.16 – 1.39)	< .001	.88 (.81 – .96)	.005	.81 (.74 – .87)	< .001
2019 cohort	1 [Reference]	N.A.	1 [Reference]	N.A.	1 [Reference]	N.A.
2020 cohort	.77 (.72 – .83)	< .001	.97 (.91 – 1.04)	.40	.92 (.87 – .98)	.01
<i>Personal-related measures (for each 1-point increase)</i>						

TFA tolerance for ambiguity	.94 (.94 – .95)	< .001	.97 (.96 – .97)	< .001	.98 (.98 – .99)	< .001
LASA-6 perceived quality of life	.90 (.89 – .90)	< .001	.94 (.93 – .94)	< .001	.99 (.986 – .99)	< .001
<i>Learning environment measures</i> (for each 1-point increase)						
MSLES faculty interactions	1.01 (.99 – 1.02)	.41	.97 (.95 – .98)	< .001	.94 (.93 – .95)	< .001
MSLES student interactions	1.01 (.99 – 1.03)	.06	.98 (.97– .95)	.009	.98 (.97 – .99)	< .001
MSLES emotional climate	.84 (.83 – .86)	< .001	.81 (.79 – .82)	< .001	.97 (.95 – .98)	< .001
<i>Burnout</i> <sup>b</sup>						
High exhaustion (No)	N.A	N.A	N.A	N.A	1 [Reference]	N.A.
High exhaustion (Yes)	N.A	N.A	N.A	N.A	.66 (.61 – .72)	< .001
High disengagement (No)	N.A	N.A	N.A	N.A	1 [Reference]	N.A.
High disengagement (Yes)	N.A	N.A	N.A	N.A	1.30 (1.20 – 1.40)	< .001

<sup>a</sup> Underrepresented in Medicine includes any U.S. citizen or permanent resident who self-identified as one or more of the following race/ethnicity categories (alone or in combination with any other race/ethnicity category): American Indian or Alaska Native; Black or African American; Hispanic, Latino, or of Spanish Origin; or Native Hawaiian or Other Pacific Islander.

<sup>b</sup> Burnout measures were only included as independent covariates in multivariable models for low empathy

**Figures (submitted in separate files):**

**Figure 1.** Proportion of high burnout and low empathy among medical students with disability by program access (N=2,438)

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Figure 1. Proportion of high burnout and low empathy among medical students with disabilities by program access (N=2,438)

