

Challenges and advice for MD/PhD applicants who are underrepresented in medicine

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ABSTRACT The importance of diversity is self-evident in medicine and medical research. Not only does diversity result in more impactful scientific work, but diverse teams of researchers and clinicians are necessary to address health disparities and improve the health of underserved communities. MD/PhD programs serve an important role in training physician-scientists, so it is critical to ensure that MD/PhD students represent diverse backgrounds and experiences. Groups who are underrepresented in medicine and the biomedical sciences include individuals from certain racial and ethnic backgrounds, individuals with disabilities, individuals from disadvantaged backgrounds, and women. However, underrepresented students are routinely discouraged from applying to MD/PhD programs due to a range of factors. These factors include the significant cost of applying, which can be prohibitive for many students, the paucity of diverse mentors who share common experiences, as well as applicants' perceptions that there is inadequate support and inclusion from within MD/PhD programs. By providing advice to students who are underrepresented in medicine and describing steps programs can take to recruit and support minority applicants, we hope to encourage more students to consider the MD/PhD career path that will yield a more productive and equitable scientific and medical community.

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THE IMPORTANCE OF DIVERSITY IN MEDICINE AND BIOMEDICAL RESEARCH

The importance of diversity in the physician-scientist workforce cannot be overstated. Research has shown that diverse teams of physicians and scientists publish more often than less diverse teams, produce more impactful scientific discoveries, and are better equipped to address health disparities in the general population (Swartz *et al.*,

2019). Despite the many efforts to increase diversity in the biomedical workforce over the past few decades, several groups remain starkly underrepresented in MD/PhD programs across the country, and they face significant challenges on their journeys toward becoming physician-scientists. The Association of American Medical Colleges (AAMC) defines underrepresented minorities (URMs) as "racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population" (Association of American Medical Colleges, 2004), while the National Institutes of Health (2019) offers a broader definition that includes women, individuals with disabilities, and individuals from socioeconomically disadvantaged backgrounds. MD/PhD programs have been growing, yet URMs apply to MD/PhD programs at a significantly lower rate relative to other students, which has remained relatively stagnant for practically a decade (Milewicz *et al.*, 2015; Association of American Medical Colleges, 2019; Christophers and Gotian, 2020). In an effort to balance the representation of all groups within the medical field, we aim to provide URM applicants with

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Abbreviations used: AAMC, Association of American Medical Colleges; ER URMs, ethnic/racial underrepresented minorities; SE URMs, socioeconomic underrepresented minorities; SWDs, students with disabilities; URMs, underrepresented minorities.

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advice and clarity on the MD/PhD application process as well as to propose clear actions that program directors and academic institutions can take to increase URM enrollment in MD/PhD programs.

COMMON CHALLENGES AMONG URM GROUPS

URM students face many obstacles in academic medicine, including insufficient exposure or encouragement toward becoming physician-scientists. The scarcity of underrepresented physician-scientist mentors for students during or before their MD/PhD training naturally deters URM students from following this path (Andriole and Jeffe, 2016; Akabas and Brass, 2019). Additionally, URM students are frequently asked to self-identify throughout the application process as medical schools and funding programs aim to diversify the physician-scientist workforce. Consequently, however, many applicants are unsure how to best present various aspects of their identities during the application process, including validating a socioeconomic disadvantage, demonstrating a cultural identity, or addressing the impact of a disability. This can compound issues such as stereotype threat and imposter syndrome that many URMs face. Stereotype threat occurs when an individual feels at risk of conforming to preconceived notions about their identity (Van Laar *et al.*, 2008), whereas imposter syndrome is defined as the persistent inability to believe that one's success is deserved or has been legitimately achieved as a result of their own efforts or skills (Robinson *et al.*, 2016). These issues create significant obstacles for URM students and may affect various URM groups in different ways. In light of these distinctions, we will specifically address four underrepresented groups: racial/ethnic minorities, women, individuals with disabilities, and individuals who are socioeconomically disadvantaged. However, we acknowledge that there are other underrepresented groups that we have not addressed, including the LGBTQ+ community and that many students may identify as a member of multiple groups.

CHALLENGES AND ADVICE FOR ETHNIC/RACIAL URMS

Ethnic/racial URMs (ER URMs) are the most prominent category of minority applicants. They are the most studied URM group, as well as the group most widely recognized or referenced as URMs, as evidenced by the AAMC's interpretation of the term. Ethnic/racial minorities account for less than 15% of MD/PhD students in the United States (Christophers and Gotian, 2020), despite representing more than 33% of the population (United States Census Bureau, 2019). Representation of ER URMs is only slightly greater (around 20%) in the total medical school population (Association of American Medical Colleges, 2019). As a result of the visibility often imposed by their appearance and names, ER URMs are forced to confront concerns regarding how much of their merit and academic achievement may be overshadowed by their URM status and can affect how they are treated as applicants (Van Laar *et al.*, 2008). In addition, many ER URMs do not see themselves reflected in the faculty or students they meet during their MD/PhD interviews (Price *et al.*, 2005; Pololi *et al.*, 2010; Robinson *et al.*, 2016). Nevertheless, students who strongly identify as being part of an underrepresented ethnic or racial group should keep in mind that their identities can positively impact the outcome of their patient encounters and scientific discoveries (Green *et al.*, 2007; Alsan *et al.*, 2019; Swartz *et al.*, 2019). ER URMs are also in a unique position to address existing gaps in biomedical research that pertain to the needs of their specific communities. During the MD/PhD application process, we encourage ER URMs to seek out mentors to whom they can relate, including professors, older students, and physician-scientists, whenever possible. Furthermore, it is important to emphasize that most MD/PhD programs review applicants holistically, taking into

account applicants' experiences, identities, characters, and personal histories in addition to their academic qualifications. Therefore, ER URMs should feel confident discussing how their identity has played a role in their decision to apply to MD/PhD programs.

CHALLENGES AND ADVICE FOR WOMEN

As another highly visible minority in the physician-scientist workforce, women face many of the same hurdles as ER URM students. Women receive more than half of the doctoral degrees awarded to graduate students in the United States, both in total and in the biological sciences (Okahana and Zhou, 2018). However, in academic medicine, 41% of full-time faculty are women, and women comprise only 25% of tenured full-time professors, 18% of U.S. medical school deans, and 18% of department chairs as of 2019 (Lautenberger and Dandar, 2020). Therefore, since women are less likely to find a female mentor during or before their physician-scientist training, this may contribute to their underrepresentation among MD/PhD students. Optimistically, despite comprising only 41.6% of total U.S. MD/PhD students in 2020, 50.0% of MD/PhD matriculants for the 2019–2020 academic year were women (Association of American Medical Colleges, 2019).

It may be important for individuals who are considering starting a family during their MD/PhD training to choose a program that is dedicated to supporting them. Applicants are encouraged to ask about what accommodations will be available to them if they decide to have children within the next 8 years. Many program directors are very forthright about the flexibility that exists within their programs and encourage applicants to inquire about parental support and to learn about available health benefits, childcare availability, and parental leave policies. Applicants can often be connected with current students who are parents to hear directly about their experiences. However, there is no obligation to disclose family or personal plans, and interviewers and program directors should not ask applicants about family plans.

CHALLENGES AND ADVICE FOR STUDENTS WITH DISABILITIES

Physician-scientists with disabilities can provide a highly valuable perspective in furthering research and treatment for numerous conditions. Students with disabilities (SWDs) range from being highly visible to completely invisible as an underrepresented group in medicine, and this is reflected throughout the application process. However, the visibility of one's disability does not invalidate their URM status, as they are, perhaps, one of the most severely underrepresented minorities in the applicant pool. While 26% of adults within the United States population have a disability (Okoro *et al.*, 2016), only 2.7% of medical students surveyed in the United States identified as having a disability in 2016, which rose to 4.6% of students in 2019 (Meeks *et al.*, 2019). This rise in representation is attributed to an increase in the number of students who disclosed a psychological disability or chronic health condition. It is important to note that these statistics include both MD and MD/PhD students as the data for MD/PhD students specifically have not yet been assessed.

Significantly, 93.3% of respondents received disability accommodations in 2019 (Meeks *et al.*, 2019). Accommodations provided by medical schools include, but are by no means limited to, extra time on examinations, testing breaks, note taking, living and housing accommodations such as priority parking, materials in alternative formats, alternative clinical placements, and use of assistive technologies (Meeks *et al.*, 2019). Furthermore, recent advances in medical education and practice often lead to improved learning experiences for students with disabilities. For example, some schools

have incorporated an ultrasound component into the physical examination to replace or augment the stethoscope, which may lead to an improved quality of education for students with hearing-related disabilities (Solomon and Saldana, 2014).

SWDs should also recognize that under the Americans with Disabilities Act, schools cannot require them to disclose their disability on their application or during their interviews (Americans with Disabilities Act 1990, 1990). Specifically, when asked whether an applicant can perform the duties required for training (known as the technical standards), SWDs should keep in mind that those tasks can be performed with reasonable accommodations if needed, and therefore, should not be seen as a barrier to entry. Although not guaranteed, providing evidence of having received an accommodation in the past is generally sufficient to receive an accommodation in an MD/PhD program. However, demonstrating a past accommodation is not a requirement to receive an accommodation in the future. Students who have had to take an extended leave of absence due to a health condition should prepare themselves for questions pertaining to the gaps in their academic records. They can assert that their previous leave was for medical reasons and will not affect their ability to do well in medical school, or they can simply state that they are not comfortable discussing the topic. Alternatively, they can frame such gaps as a challenge that they have successfully overcome and learned from, thereby demonstrating the highly positive attribute of resilience in the face of adversity. Finally, for students who will require accommodations during an interview or who would like to be informed about the accommodations that are available to them at a given program, many schools have an avenue to confidentially disclose their disability and inquire about what options are available at their institution.

CHALLENGES AND ADVICE FOR STUDENTS FROM LOW-SOCIOECONOMIC BACKGROUNDS

Socioeconomic status is a profoundly prohibitive factor for low-income/socioeconomically disadvantaged individuals interested in MD/PhD programs. Socioeconomic URMs (SE URMs) may be discouraged from enrolling in a dual-degree graduate program due to the length of time it takes to attain the combined degree as a result of delayed opportunity costs and pressure to begin a career. Most MD/PhD programs provide a full tuition scholarship in addition to a living stipend throughout the program. However, the hefty costs associated with applying and interviewing can deter many from even following through with the process. While many SE URMs are aware of the AAMC's Fee Assistance Program, they may not qualify for the financial support offered due to the AAMC's strict eligibility cutoffs, which are based solely on family income, thus causing them to either reduce the number of schools to which they apply or reconsider applying to more competitive programs.

Additionally, studies have continuously demonstrated that a lower-socioeconomic status is correlated with lower test scores on standardized tests, including the MCAT (Croizet and Dutrevis, 2008; Grbic *et al.*, 2015). This is most likely due to a lack of resources while studying for a test like the MCAT or a lack of educational resources leading up to the test (Croizet and Dutrevis, 2008). However, it is important to emphasize that MD/PhD programs review applicants holistically and strongly consider the challenges and adversity each applicant has overcome, so SE URMs should not be discouraged by a lower MCAT score. Finally, SE URMs are often the first in their families to attend or graduate from college (first-generation graduates) and do not have the same network as their peers from which to seek advice on their journey toward becoming physician-scientists (Mullen *et al.*, 2003).

Many schools are willing to provide financial assistance for the interviewing process to those who need it even if it is not explicitly offered in the interview invitation. Also, students who have had to take out loans during college should understand the options that they have regarding payment deferral throughout graduate school and waived interest fees for federally subsidized loans. SE URMs should be acutely aware of the costs associated with certain institutions and should feel comfortable asking current MD/PhD students about the manageability of their stipend given their school's location and requirements as well as asking program leadership and administrators for a detailed list of costs. This includes miscellaneous fees, United States Medical Licensing Examination costs, insurance, and transportation. Moreover, SE URMs are encouraged to inquire about additional sources of financial aid and emergency funds.

NEXT STEPS TO IMPROVE URM RECRUITMENT

Program directors and academic institutions play a vital role in closing the gap between underrepresented and overrepresented students. Primarily, it is critically important to develop more research-oriented programs for URMs before their graduation from college. Most URMs are not aware of their ability to have a career in research until they enter medical school, and by that time, many may consider it too late to redirect their paths (Blish, 2018). Creating MD/PhD-themed programs specifically tailored to URMs in high school and college can tremendously help minority students to learn about MD/PhD programs and careers as physician-scientists and network with current MD/PhD students and program directors, which will ultimately encourage more to apply (Gotian *et al.*, 2017). One of the first such programs, the Gateways to the Laboratory Program of the Tri-Institutional MD/PhD Program, has demonstrated its efficacy in preparing and recruiting URM students for MD/PhD programs. As of 2013, 74% of the program's alumni have completed or are pursuing MD, PhD, or MD/PhD degrees, and 17% have completed or are pursuing an MD/PhD degree (Gotian *et al.*, 2017). A list of MD/PhD-focused undergraduate summer programs can be found at www.aamc.org/professional-development/affinity-groups/great/mdphd-summer-programs.

Additionally, implicit bias training should be an integral part of the admissions process for all institutions of higher education, but especially for MD/PhD programs, as they are subject to intersecting and compounding biases present in both clinical medicine and many scientific disciplines. Therefore, it is very likely that many highly qualified applicants are rejected due to inappropriate preconceived notions about their ability, knowledge, and potential as MD/PhD students and physician-scientists (Capers *et al.*, 2017; Williams, 2019). Moreover, MD/PhD programs should continue to improve their holistic review process in order to best assess an applicant's potential as a physician and researcher through a range of experiences and attributes that go far beyond quantitative metrics such as standardized testing. While MCAT scores have been shown to moderately correlate with didactic medical school performance, they have only a weak correlation with clinical performance and patient-oriented skills in medical school and beyond, and many lower-scoring individuals are highly successful in their careers (Saguil *et al.*, 2015; Terregino *et al.*, 2020). Therefore, we would not expect standardized test scores to have any meaningful correlation with an applicant's potential as a physician-scientist, who can engage in many versatile aspects of both laboratory science and clinical medicine.

Finally, it is imperative for programs to increase the diversity of the interviewers presented to students during their interviewing process. By meeting with individuals who share similar backgrounds

and experiences, applicants will have the opportunity to make meaningful connections with faculty while applying, which will likely improve the application experience for URMs and foster enthusiasm and excitement for the MD/PhD path. Ultimately, academic institutions should commit to enforcing a culture of diversity and inclusion, which starts with making URM-specific mentors and resources widely available and readily accessible to applicants and incoming students.

CONCLUSION

Although we were not able to cover all the different aspects that affect URM students throughout the application process or every group that is underrepresented in medicine, we sincerely hope that we are able to make a difference in the application process for all individuals who feel out of place in the biomedical field. As diverse MD/PhD students ourselves, we can relate to feeling self-conscious after learning that a higher-income applicant shares the same vacation spot as their interviewer, feeling frustrated by an interviewer who doubts an applicant's ability to succeed, or simply feeling reluctant to commit to an 8-year program when no one in the program looks like you or shares your experiences and perspective. We were often made to think that the main reason why we were accepted into various programs is our URM status, but nothing can be farther from the truth. It is important to remember that you have so much more to contribute than just your race, gender, ethnicity, sexual orientation, ability, or any other factor that may cause you to feel like a token. We encourage you to share how your identity has impacted your journey toward becoming a physician-scientist to whatever extent you are comfortable, and we urge you to identify constructive ways to fight imposter syndrome, such as reflecting on the academic achievements that you feel most proud about, affirming your intellectual and scientific abilities with objective, quantitative measures of success, reaching out to mentors and advisors who inspire you and with whom you can relate, and seeking out peers who come from similar backgrounds and can validate your concerns. If you are passionate about research and direct patient care, please apply. We may not have all the mentors and advisors we need at the moment, but we can work with the next generation of physician-scientists to change the face of academic medicine.

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