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Perspective Physician-Scientist Development

The 2018 National MD-PhD Program Outcomes Study highlighted the critical need to increase MD-PhD trainee diversity and close the gender gap in MD-PhD enrollment. This Association of American Medical Colleges imperative prompted us to evaluate trends in female matriculation from our institutional MD-PhD program compared with national data. Based on a 10-year review of Harvard/MIT Medical Scientist Training Program admissions, we observed a sharp and sustained increase in female matriculants for the past 5 years that is well above the national average. We report our experience with achieving gender parity among matriculants of our MD-PhD program, identify the specific stage of the admissions process where the gender balance acutely shifted, and attribute the increase in female matriculation to concrete administrative changes that were put into place just prior to the observed gender balance shift. These changes included increasing the number of faculty participants in application screening and awardee selection and establishing gender balance among faculty decision makers. We believe that adopting basic administrative practices geared toward increasing the diversity of perspectives among admissions faculty has the potential to expedite gender parity of MD-PhD matriculants nationwide and could eventually help achieve gender balance in the national physician-scientist workforce.

Mind the gap: Expediting gender parity in MD-PhD admissions

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The 2018 National MD-PhD Program Outcomes Study highlighted the critical need to increase MD-PhD trainee diversity and close the gender gap in MD-PhD enrollment. This Association of American Medical Colleges imperative prompted us to evaluate trends in female matriculation from our institutional MD-PhD program compared with national data. Based on a 10-year review of Harvard/MIT Medical Scientist Training Program admissions, we observed a sharp and sustained increase in female matriculants for the past 5 years that is well above the national average. We report our experience with achieving gender parity among matriculants of our MD-PhD program, identify the specific stage of the admissions process where the gender balance acutely shifted, and attribute the increase in female matriculation to concrete administrative changes that were put into place just prior to the observed gender balance shift. These changes included increasing the number of faculty participants in application screening and awardee selection and establishing gender balance among faculty decision makers. We believe that adopting basic administrative practices geared toward increasing the diversity of perspectives among admissions faculty has the potential to expedite gender parity of MD-PhD matriculants nationwide and could eventually help achieve gender balance in the national physician-scientist workforce.

Introduction

MD-PhD training programs provide exceptionally qualified students with the opportunity to earn dual degrees in medicine (MD) and basic or social science research (PhD) through an integrated curriculum. The overarching goal of physician-scientist training is to produce a multidisciplinary workforce capable of engaging, integrating, and advancing clinical practice and biomedical innovation. In "speaking both languages," MD-PhDs are tasked with translating clinical insights into research-based inquiries and harnessing science to drive discoveries that will improve patient care and outcomes. Given the critical role of physician-scientists in society and the public investment in their training via the NIH-sponsored Medical Scientist Training Program (MSTP), ongoing assessment and optimization of educational programs are critically important.

In 2018, the Association of American Medical Colleges (AAMC) reported the results of their most recent National MD-PhD Program Outcomes Study. The main stated goal of the study was to "assess whether MD-PhD programs are collectively training a diverse cohort of men and women who can combine their clinical perspectives with high-quality research across a broad spectrum of disciplines"(1). A key finding from the report was that trainee diversity has increased over time but very slowly. For example, the most recent MD-PhD cohort examined in the study (2016–2017) was only approximately 35%–40% female (1). In contrast, both MD and biological science PhD programs achieved gender parity nationally in 2006 and 2014, respectively (2, 3). Recruitment of a diverse training cohort, especially in team-based professions, has been linked to increased work-group effectiveness (4). While gender is only one form of diversity, gender-heterogeneous work groups in academia produce higher quality science (e.g., publications) than those containing individuals of a single gender (5). On the clinical front, some studies suggest that female physicians bring unique benefits to patient care. For example, patients in a cross-sectional study treated by female physicians were found to have lower mortality and readmission rates when compared with those treated by male physicians in the same hospital (6). Other studies reported that female physicians generally provided more preventive care (7–9), psychosocial counseling, and patient-centered communication (10, 11) than male physicians. Although MD-PhD physician-scientists are thought to spend a minority of their

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professional time caring for patients, the AAMC MD-PhD Program Outcomes Study revealed that the split between research and clinical duties varies widely, with nearly one-quarter of respondents devoting the majority of their time to patient care (1). Given gender-based differences in specialty selection (12), the overall gender gap in MD-PhD physician-scientists compounds the imbalances observed in select clinical fields. Taken together, these data suggest that achieving gender parity across MD-PhD training cohorts is a worthy goal for academic medicine.

We conducted a 10-year comparative review of the Harvard/MIT MSTP and national trends and observed recent female matriculation rates of 46%–67% in the Harvard/MIT MSTP, well above the national average that has remained below 50%. Specifically, we found a striking difference in gender balance between the academic years 2015–2016 (AY2015–2016) and AY2019–2020 and the 5 years prior, prompting us to retrospectively assess factors that may have influenced this change. Specifically, we tracked the relative proportions of female and male applicants through each admissions step and identified a series of administrative changes that could explain the relative acceleration toward gender parity at Harvard/MIT. The lessons learned may have broad implications in expediting the achievement of gender balance in MD-PhD training programs nationwide and ultimately remedy the gender gap in the US physician-scientist workforce.

Methods

Data sources. Publicly available national matriculation and application data were obtained from the AAMC (13). Historical data were obtained by data request from the AAMC. National data included both MSTP and non-MSTP MD-PhD programs. Harvard/MIT MSTP admissions decisions, applicant gender, and application data were collected from the Harvard/MIT MD-PhD program database of Harvard Medical School. Applications were made available to the Harvard/MIT MD-PhD program through the American Medical College Application Service (AMCAS). AY designation corresponds to the AAMC data tables and represents the AY of matriculation (e.g., AY2010–2011) of each training cohort, with the application cycle starting in the prior year (e.g., 2009).

National and Harvard/MIT MSTP gender-based applicant rates. The percentage of female- and male-identifying MD-PhD applicants and matriculants nationwide was reported in publicly available AAMC documents (see *Data sources*). The Harvard/MIT MSTP applicant percentages were calculated based on the number of female- or male-identifying applicants at each admissions step divided by the total number of applicants at each admissions step per AY.

Harvard/MIT MSTP admissions tracking from application to matriculation. We stratified the applicant data by gender for each step of the Harvard/MIT MSTP admissions process, including (a) total applicants, (b) MD screened-in (invited for MD interview, which is a prerequisite for MD-PhD interview consideration), (c) MD-PhD screened-in (invited for an MD-PhD interview), (d) MD-PhD offered (MSTP award offered), (e) MD-PhD accepted (MSTP award accepted), and (f) MD-PhD matriculated (all matriculants for that admissions cycle, excluding deferrals).

Data smoothing and line comparisons. The national and Harvard/MIT MD-PhD program's percentage of female application and matriculation rates over time were plotted and compared (Figure 1 and Figure 2). A 3-year rolling mean was applied to the national and Harvard/MIT MSTP data sets to address variability in the Harvard/MIT data. The actual and smoothed data were fit using a linear regression to calculate line slopes (Figure 1, Figure 2, and Table 1). The slopes were used to examine the changes in female application and matriculation rates over the total period of evaluation (i.e., negative, positive, no change). The Harvard/MIT MD-PhD program's percentage of female representation across the different stages of the MSTP admissions process was examined for the 5-year periods before and after implementation of administrative changes. Three-year rolling means were applied to each of the data sets, and the actual and smoothed data were fit using a linear regression to calculate and compare the slopes and intercepts of each 5-year period across admissions steps (Figure 3 and Table 1).

Cumulative GPA and composite MCAT scores. Cumulative undergraduate grade point averages (GPAs) and composite Medical College Admission Test (MCAT) scores were stratified by gender, total applicants versus MD-PhD offered applicants, and 5-year increments before and after administrative changes and averaged from individual values (see *Data sources*). Average GPA and MCAT scores were then statistically compared both between genders for each 5-year increment and within genders between each 5-year increment, where applicable. For the approximately 6000 applicants examined, cumulative GPAs for 87 applicants were not

Table 1. Comparisons of slope and intercept values for the national and Harvard/MIT MD-PhD program percentage of female matriculant and applicant data

		Actual data			Smooth data		
	Line measurement	National average	Harvard/MIT program	*P* value	National average	Harvard/MIT program	*P* value
Figure 1, % female matriculants	Slope	1.328	4.656	**0.007**	0.966	3.754	**<0.001**
	Intercept	34.364	22.371	**0.04**	34.832	22.998	**0.003**
Figure 2, % female applicants	Slope	1.027	1.163	0.71	0.628	0.829	0.51
	Intercept	34.593	30.836	0.057	35.393	31.395	**0.016**

Data are shown for Figures 1 and 2. Differences in the reported slope and intercept were assessed for statistical significance using interaction term t-statistics from linear regression. *P* values <0.05 are considered significant and highlighted in bold.

included in the analysis for specific reasons (e.g., foreign applicants without a comparable GPA or AMCAS applications no longer accessible). For the AYs evaluated, the format and scoring scale of the MCAT was changed by the AAMC in 2015 (14). Therefore, scores for the two MCAT versions (designated "old" and "new") were averaged separately. For 85 of approximately 6000 applicants evaluated, MCAT scores (old or new) were not included, because the AMCAS applications were no longer accessible. For applicants who took the MCAT more than once, the highest composite score was included in the analysis.

Administrative changes in admissions process. A review of admissions policies and procedures in 2014 conducted by a new MD-PhD Faculty Program Director resulted in a series of administrative changes in the admissions process for AY2015–2016, including the following. (a) The number of faculty evaluators for the MD-PhD screen-in step was increased and gender balanced, with each written application assigned to one female and one male screener, followed by the Faculty Program Director. (b) The composition of the Executive Committee that renders decisions after interviews regarding the MD-PhD offered cohort was increased in size, gender balanced, and included the Harvard Medical School Dean for Academic Programs and Diversity. (c) A revised quantitative system was put into place, with final MD-PhD admissions decisions

Table 2. Average undergraduate GPA and composite MCAT scores for total and MD-PhD offered applicants to the Harvard/MIT MSTP by gender and 5-year interval

	AY2010–2011 to 2014–2015		AY2015–2016 to 2019–2020		Pre/post comparison
	Mean ± SD	*P* value	Mean ± SD	*P* value	*P* value
Undergraduate GPA					
Total applicants, female	3.75 ± 0.25	0.69	3.74 ± 0.26	0.09	0.68
Total applicants, male	3.74 ± 0.26		3.76 ± 0.26		0.06
MD-PhD offered, female	3.92 ± 0.10	0.59	3.90 ± 0.08	0.36	0.44
MD-PhD offered, male	3.91 ± 0.09		3.92 ± 0.09		0.51
MCAT score (old version)					
Total applicants, female	33 ± 4.7	**<0.001**	32 ± 5.7	**<0.001**	**<0.001**
Total applicants, male	35 ± 4.4		34 ± 4.4		**0.04**
MD-PhD offered, female	38 ± 2.7	0.89	38 ± 3.5	0.61	0.87
MD-PhD offered, male	38 ± 2.7		39 ± 1.9		0.51
MCAT score (new version)					
Total applicants, female	N/A	N/A	513 ± 8.3	**<0.001**	N/A
Total applicants, male	N/A		516 ± 7.2		N/A
MD-PhD offered, female	N/A	N/A	520 ± 4.5	0.14	N/A
MD-PhD offered, male	N/A		522 ± 4.2		N/A

N/A, not applicable, where data for these groups were not available for the indicated years. Pre/post comparison refers to data analysis of the 5-year intervals before and after administrative changes. Unpaired *t* tests were used to determine statistical significance between genders (*P* values in data columns 2 and 4) and between 5-year intervals (*P* values in data column 5). *P* values < 0.05 are considered significant and highlighted in bold.

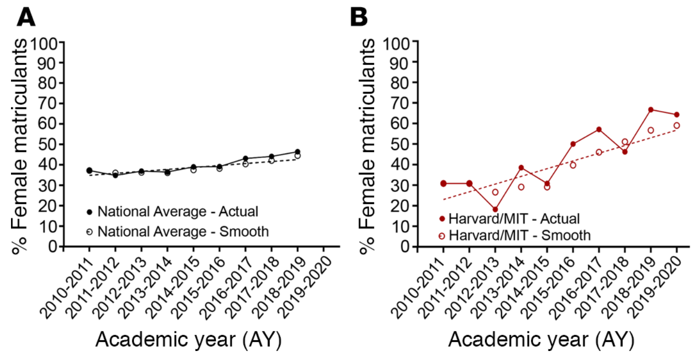

Figure 1. Percentage of female matriculants at Harvard/MIT outpaces national trend. (**A**) The national average for percentage of female MD-PhD matriculants from AY2010–2011 to AY2018–2019 (current AY not available) based on data from the AAMC was plotted (Actual, black circles connected by solid line). A 3-year rolling mean (Smooth) was applied for the 9-year data set to match the handling of the Harvard/MIT program data. The smoothed data were plotted (white circles) and fit using a linear regression to calculate a corresponding slope for comparison (dashed black line). (**B**) The percentage of female matriculants at the Harvard/MIT MSTP was plotted from AY2010–2011 to AY2019–2020 (Actual, crimson circles connected by solid line). A 3-year rolling mean was applied to the 10-year data set to smooth the yearly variation. The smoothed data were plotted (white circles) and fit using a linear regression to calculate the slope (dashed crimson line) for comparison to the national data. n = 609–672 matriculants (both genders) per AY nationally and n = 11–15 matriculants (both genders) per AY to the Harvard/MIT MSTP.

rendered by numerically averaged score and confirmatory democratic vote among members of the Executive Committee, which includes ex officio representation from the MD admissions committees that preapprove all candidates based on independent MD admissions criteria. Importantly, the above changes were made to increase diversity of opinion among faculty decision makers, rather than to specifically address gender balance among matriculants, as the ratio of female-to-male Harvard/MIT matriculants generally matched the national average at the time of leadership transition. Of note, the MD-PhD Executive Committee on Admissions works collaboratively with the Harvard Medical School (MD) admissions committee in screening and the ultimate selection of MSTP offered applicants. The MD admissions committee screens the MD-PhD applicant pool prior to the screening evaluation by the MD-PhD program committee for invitations to interview (Figure 3, B and C), regardless of PhD program interest.

Statistics. Undergraduate GPA and MCAT scores were summarized as means and standard deviations by gender and AY (5-year intervals). Differences in group means were tested with 2-tailed, unpaired t tests. Linear regressions were performed to assess the relationship of application and matriculation rates (actual and 3-year rolling averages) to year of application. Interaction terms were used to compare the slope and intercept coefficients before and after the change in admissions practices. Analyses were performed using R version 3.6.0 (2019-04-26).

Study approval. The study was reviewed by the Institutional Review Board of the Harvard Faculty of Medicine and deemed not to be human subjects research (IRB19-0318). All data were reported either in aggregate or deidentified.

Results

Comparative increase in female MD-PhD matriculation rates at Harvard/MIT. To determine the overall progress toward gender parity in MD-PhD programs, we plotted the percentage of female matriculants for the past decade from publicly available AAMC data sets (Figure 1A). Whereas national rates were consistently <50% and relatively flat (ranging from 35%–46%), except for a small increase over the AY2016–2017 to AY2018–2019 period (13), female matriculation rates at Harvard/MIT were more varied and appeared to increase more dramatically over time (Figure 1B). Specifically, AY2010–2011 to AY2014–2015 matriculants were 18%–40% female, followed by a sharp increase to 46%–67% during the AY2015–2016 to AY2019–2020 period. It is noteworthy that the observed increase in percentage of female matriculants of the Harvard/MIT program was that much more acute due to a more prominent gender gap than the national average during the AY2010–2011 to AY2012–2013 period and an inverted gender gap during the AY2018–2019 to AY2019–2020 period. To control for the increased variability of the Harvard/MIT MSTP data, a 3-year rolling mean was applied to the actual data for both the national and Harvard/MIT program values. A comparison of the

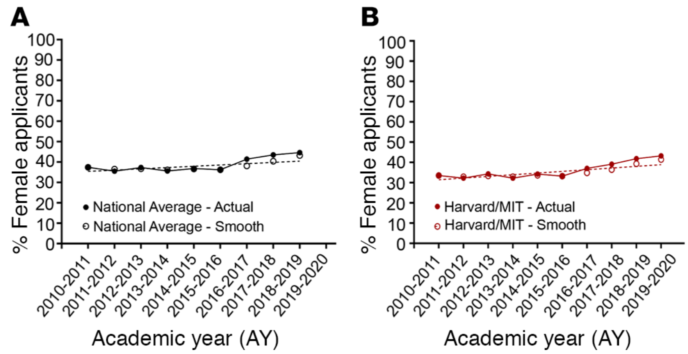

Figure 2. The gender disparity among applicants to the Harvard/MIT MSTP tracks the national data. (**A**) The national average for percentage of female MD-PhD applicants from AY2010–2011 to AY2018–2019 based on data from the AAMC was plotted (Actual, black circles connected by solid line). A 3-year rolling mean (Smooth) was applied to the 9-year data set to match the handling of the Harvard/MIT program data. The smoothed data were plotted (white circles) and fit using a linear regression to obtain the slope (black dashed line). (**B**) The percentage of female applicants to the Harvard/MIT MSTP was plotted from AY2010–2011 to AY2019–2020 (Actual, crimson circles connected by solid line). A 3-year rolling mean was used to smooth yearly variation in the Harvard/MIT data. Smoothed data were plotted (white circles) and fit using a linear regression to calculate the slope (dashed crimson line) for comparison to the national data. n = 1703–1937 applicants (both genders) per AY nationally and n = 609–714 applicants (both genders) per AY for the Harvard/MIT MSTP.

resulting smoothed linear regression results showed a statistically significant change only for the Harvard/MIT data, as reflected by a positive slope ($P < 0.001$; Table 1).

To examine whether a corresponding change in the proportion of female applicants could account for the observed increases in female matriculants at Harvard/MIT over time, we plotted both the national and Harvard/MIT MD-PhD application rates for the same period. Notably, both the national and Harvard/MIT data showed comparable levels of female application rates, which were consistently below 50% (Figure 2). Indeed, there was no statistical difference between the calculated slopes of the national and Harvard/MIT data (Figure 2 and Table 1).

Trends in applicant academic qualifications do not account for accelerated gender parity at Harvard/MIT. To determine whether the acceleration of female matriculants at Harvard/MIT corresponded to a change in exemplary academic qualifications, we compared female and male applicant undergraduate GPAs and composite MCAT scores over the past decade in 5-year increments before and after administrative changes (Table 2). We observed no statistical differences in undergraduate GPA between genders in either the group before or after administrative changes, whether analyzed by total or MD-PhD offered applicant pools. Similarly, we observed no differences in GPA for the total or MD-PhD offered groups within each gender for the periods before or after administrative changes. Of note, male applicants in the total pool scored statistically higher than female applicants for both versions of the MCAT, but such a difference was not observed among MD-PhD offered groups. Finally, both genders had statistically lower old version MCAT scores for the more recent 5-year period, during which the transition to the new MCAT test occurred (female, $P < 0.001$; male, $P < 0.04$).

Gender tracking across application stages linked accelerated female matriculation rates to increased percentage of female MD-PhD interviews, offers, and acceptances of admission. For the 5-year period before administrative changes were implemented at the Harvard/MIT MSTP, the percentage of female applicants at each step of the process was consistently below 50%, with no particular pattern observed across the stages of the admissions process (Figure 3; AY2010–2011 to AY2014–2015). However, a distinct pattern emerged for the 5-year period after the administrative changes were implemented (AY2015–2016 to AY2019–2020). Grouping the data by 5-year increments and evaluating the intercepts of the smoothed data from the periods before and after administrative changes, we found that the intercepts, which reflect the interval change between the two periods, were statistically different for all steps between the MD-PhD screened-in group and the MD-PhD matriculants (Figure 3 and Table 3). The most striking differences occurred for the MD-PhD offered through matriculation steps, with ≥50% female applicants represented in each of these cohorts after administrative change.

Association between acceleration of gender parity and administrative changes to the Harvard/MIT admissions process. Our review of admissions trends for the past decade revealed a rise in female MD-PhD matriculation

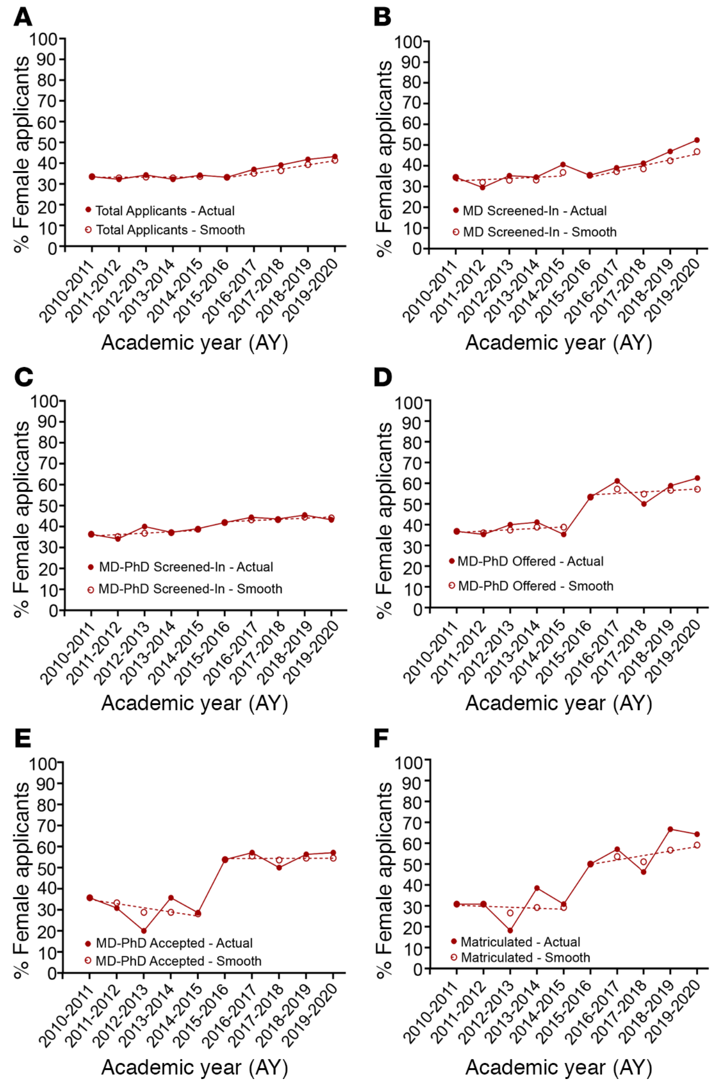

Figure 3. Accelerated female matriculation in the Harvard/MIT MSTP derives from an increased percentage of female MD-PhD interviews, offers, and acceptances since AY2015–2016. The percentage of female applicants was plotted at each stage of the Harvard/MIT MSTP admissions process over time from AY2010–2011 to AY2019–2020, with 3-year rolling means fit using linear regressions for the preadministrative (AY2010–2011 to AY2014–2015) and postadministrative (AY2015–2016 to AY2019–2020) change period. Actual data, crimson circles and solid connected line. Smoothed and fit data, white circles and dashed line. (**A**) The percentage of female applicants to the Harvard/MIT MSTP. (**B**) The percentage of female applicants after screening by Harvard Medical School (MD Screened-In). (**C**) The percentage of female applicants after the Harvard/MIT MSTP screen for granting interviews (MD-PhD Screened-In). (**D**) The percentage of female applicants who received an offer from the Harvard/MIT MSTP (MD-PhD Offered). (**E**) The percentage of female applicants who accepted an MD-PhD offer (MD-PhD Accepted). (**F**) The percentage of female applicants who matriculated into the Harvard/MIT MSTP. n = 609–714 per year (Total Applicants, both genders); n = 145–209 per year (MD Screened-In applicants, both genders); n = 66–91 per year (MD-PhD Screened-In applicants, both genders); n = 15–19 per year (MD-PhD Offered applicants, both genders); n = 10–16 per year (MD-PhD Accepted applicants, both genders); n = 11–15 per year (MD-PhD Matriculated applicants, both genders).

starting from AY2015–2016 to the present. After an initial upward shift at the MD-PhD screened-in step, a prominent change in gender balance occurred at the postinterview MD-PhD offered stage and was maintained through the subsequent MD-PhD accepted and matriculated steps (Figure 3). The timing of this shift toward gender parity coincided with a review of administrative policies and procedures by a new MD-PhD Faculty Program Director and implementation of admissions process changes that included establishing gender parity among faculty reviewers and increasing the size of the decision-making bodies, with the explicit goal of maximizing the diversity of opinion and experience (Figure 4). The change in gender balance since AY2015–2016 appears to be associated with these concrete administrative changes.

Table 3. Comparisons of slope and intercept values for the percentage of female representation data at each step of the Harvard/MIT MD-PhD admissions process for the periods before and after administrative changes

		Actual data			Smooth data		
Admissions Step	Line measurement	AY2010–2011 to 2014–2015	AY2015–2016 to 2019–2020	*P* value	AY2010–2011 to 2014–2015	AY2015–2016 to 2019–2020	*P* value
Total applicant	Slope	0.14	2.48	**0.002**	0.018	2.053	**<0.001**
	Intercept	33	33.9	0.43	33.193	32.973	0.64
MD screened-in	Slope	1.74	4.19	0.069	0.585	2.803	**0.02**
	Intercept	31.36	34.6	0.28	32.673	34.46	0.34
MD-PhD screened-in	Slope	0.85	0.37	0.58	0.677	0.575	0.75
	Intercept	35.62	42.98	**0.01**	35.473	42.24	**<0.001**
MD-PhD offered	Slope	0.29	1.61	0.53	0.685	0.703	0.97
	Intercept	37.14	53.92	**0.013**	36.207	54.4	**<0.001**
MD-PhD accepted	Slope	−0.93	0.58	0.57	-1.962	0.035	**0.009**
	Intercept	32.02	53.7	**0.013**	34.867	54.293	**<0.001**
MD-PhD matriculated	Slope	0.77	3.82	0.42	−0.49	2.125	**0.022**
	Intercept	28.28	49.22	0.052	30.287	49.827	**<0.001**

Data are shown for Figure 3. Differences in the reported slope and intercept were assessed for statistical significance using interaction term *t* statistics from linear regression. *P* values < 0.05 are considered significant and highlighted in bold.

Discussion

The 2018 National Study for MD-PhD Outcomes highlighted the persistent challenge of achieving diversity in both the physician-scientist workforce and MD-PhD training program enrollment nationwide (1). Here, we compared gender-specific trends in matriculation rates in the Harvard/MIT MSTP and US MD-PhD training programs. The national average demonstrated little overall variation and a slow but steady increase in female trainee representation from AY2010–2011 to AY2018–2019, yet the gender distribution nationwide ranged from 35% to 46% female matriculants. In contrast, the Harvard/MIT MSTP female matriculation rate rose from 31% in AY2014–2015 to 50% in AY2015–2016 and has remained above the national average since, with a range of 46%–67%. To determine the basis for this increase, we examined total application rates and academic qualifications among female and male MD-PhD applicants and observed no gender-specific changes that accounted for the observed increase in Harvard/MIT female matriculation rates. Instead, we identified an inflection point toward increased female representation starting at the MD-PhD screened-in step, becoming prominent at the MD-PhD offered step, and sustained thereafter. Just prior to AY2015–2016, a change in admissions practice was put into place whereby the composition of faculty tasked with screening and ultimately selecting MD-PhD offered applicants was increased in number and gender balanced. Thus, we conclude that an expansion in the diversity of perspectives, enabled both by increasing the number and equalizing the gender of faculty participants, may have contributed to the shift toward accelerated and sustained female representation for new admissions in the recent 5-year period at Harvard/MIT.

Although the percentage of female applicants to the Harvard/MIT MSTP (33%–43%) has gradually increased over the past decade, these figures are consistently below the national average for the same period (36%–45%). Interestingly, a disparity exists in the number of female applicants to MSTPs at higher-ranking medical schools compared with lower-ranking schools, despite an equivalent female success rate for gaining admission to MSTPs regardless of rank (15). Indeed, we observed no gender-specific differences in GPA or MCAT scores between female and male applicants offered acceptance to the Harvard/MIT MSTP, highlighting the equal academic qualifications of candidates from both genders in the narrowed admissions pool. The authors instead attributed the discrepancy in female application rates to the documented tendency of female applicants to underestimate their abilities compared with their male peers (16), a phenomenon that persists during medical school training and beyond (17, 18). Thus, by definition, achieving gender parity in MD-PhD programs will manifest as a disproportionate number of female MSTP offers compared with female applications, as observed at Harvard/MIT for the last 5 years since gender parity was established among faculty screeners and decision makers.

Our retrospective review suggests that simple administrative changes to the admissions process have the potential to improve gender balance in MD-PhD program enrollment. The first change involved

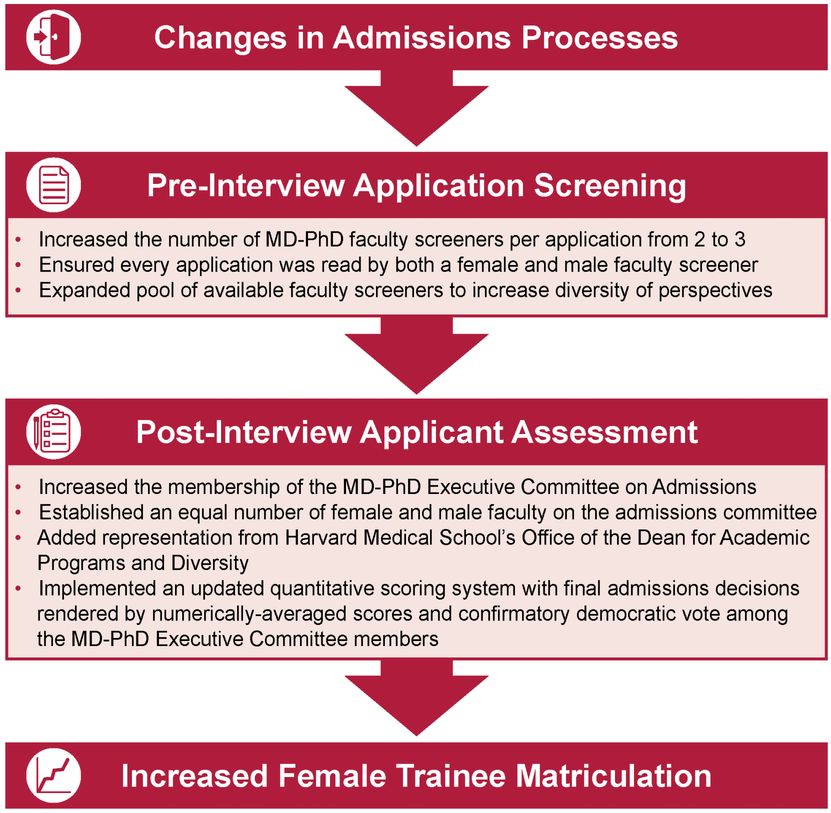

Figure 4. Administrative changes in MD-PhD admissions processes as of AY2015–2016. The faculty involved in preinterview application screening and postinterview application assessment was increased in number and gender balanced in advance of AY2015–2016, potentially contributing to the observed acceleration in female matriculation during the recent 5-year period.

establishing an expanded pool of female and male MD-PhD screeners, such that every application was assigned to at least one female and one male faculty member. The second change involved doubling the size of the MD-PhD Executive Committee on Admissions and establishing gender parity within this body. At the time, these administrative changes were not made to specifically address gender disparity in Harvard/MIT matriculation but instead to lessen the burden of admissions effort for faculty members and increase the diversity of perspectives. Indeed, 58% of respondents from a survey by the Council of Graduate Schools identified limited staff and faculty time as a barrier to performing holistic review (19), which is deemed best practice by both the Council of Graduate Schools (19) and the AAMC (20). In addition, a demographic survey of US medical school admissions committees found that representation from both female and underrepresented minority groups was lacking (21). Our findings suggest that the two process changes — increasing the size and gender representation of executive admissions committees — could potentially serve as administrative interventions to improve gender balance in MD-PhD enrollment.

Although establishing gender balance in admissions decision-making bodies is neither a prerequisite nor a guarantee of improving gender balance among admitted trainees, several studies document an influence of female representation in academia on gender parity outcomes. For example, economics departments with more female faculty have a higher percentage of female students (22). An analysis of the effect of transitioning from a male to a female department chair in sociology, economics, accounting, and political science departments correlated with an increase in female students joining the department (without affecting the number of male students) and a reduction in gender disparities in salary, publication volume, and assistant professor tenure success rates (23). Female faculty and peer role modeling in the STEM profession has also been associated with feed-forward benefits, including reduction in female drop-out rates during the first year of graduate school, increased likelihood of on-time degree completion, and selection of a career in a STEM field (24–26). Indeed, despite the fewer number of female trainees and graduates in MD-PhD programs compared with MD or PhD programs, the 2018 National MD-PhD Program Outcomes Study highlights similar professional aptitudes among female and male MD-PhD graduates. For example, female graduates were employed in full-time academic positions at similar rates to male graduates (62.9% female, 65.8% male) and had similar, though slightly lower, success rates in obtaining NIH research grants (72.0% female, 77.9% male) (1). Thus, we propose that careful attention to gender balance and the diversity of perspectives among faculty admissions decision makers could expedite gender parity of MD-PhD trainees and, ultimately, remedy gender disparity in the national MD-PhD workforce.

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