

Original Investigation

Minority Faculty Development Programs and Underrepresented Minority Faculty Representation at US Medical Schools

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IMPORTANCE Diversity initiatives have increased at US medical schools to address underrepresentation of minority faculty.

OBJECTIVE To assess associations between minority faculty development programs at US medical schools and underrepresented minority faculty representation, recruitment, and promotion.

DESIGN Secondary analysis of the Association of American Medical Colleges Faculty Roster, a database of US medical school faculty.

PARTICIPANTS Full-time faculty at schools located in the 50 US states or District of Columbia and reporting data from 2000-2010.

EXPOSURE Availability of school-wide programs targeted to underrepresented minority faculty in 2010.

MAIN OUTCOMES AND MEASURES Percentage of underrepresented minority faculty, defined as self-reported black, Hispanic, Native American, Alaskan Native, Native Hawaiian, or Pacific Islander faculty. Percentage of underrepresented minority faculty was computed by school and year for all faculty, newly appointed faculty, and newly promoted faculty. Panel-level analyses that accounted for faculty clustering within schools were conducted and adjusted for faculty- and school-level variables.

RESULTS Across all schools, the percentage of underrepresented minority faculty increased from 6.8% (95% CI, 6.7%-7.0%) in 2000 to 8.0% (95% CI, 7.8%-8.2%) in 2010. Of 124 eligible schools, 36 (29%) were identified with a minority faculty development program in 2010. Minority faculty development programs were heterogeneous in composition, number of components, and duration. Schools with minority faculty development programs had a similar increase in percentage of underrepresented minority faculty as schools without minority faculty development programs (6.5%-7.4% vs 7.0%-8.3%; odds ratio [OR], 0.91 [95% CI, 0.72-1.13]). After adjustment for faculty and school characteristics, minority faculty development programs were not associated with greater representation of minority faculty (adjusted OR, 0.99 [95% CI, 0.81-1.22]), recruitment (adjusted OR, 0.97 [95% CI, 0.83-1.15]), or promotion (adjusted OR, 1.08 [95% CI, 0.91-1.30]). In subgroup analyses, schools with programs of greater intensity (present for ≥ 5 years and with more components) were associated with greater increases in underrepresented minority representation than schools with minority faculty development programs of less intensity.

CONCLUSIONS AND RELEVANCE The percentage of underrepresented minority faculty increased modestly from 2000 to 2010 at US medical schools. The presence of a minority faculty development program targeted to underrepresented minority faculty was not associated with greater underrepresented minority faculty representation, recruitment, or promotion. Minority faculty development programs that were of greater intensity were associated with greater increases in underrepresented minority faculty representation.

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Minority physicians and scientists have been inadequately represented among medical school faculty when compared with their representation in the US population.^{1,2} Although their representation has increased over time, underrepresented minority faculty are less likely to be promoted and spend a longer period in a probationary rank.^{3,4} In addition, underrepresented minority faculty have been less likely to hold senior faculty and administrative positions⁵ and less likely to receive National Institutes of Health research awards.⁶ Moreover, minority faculty report lower career satisfaction and higher social isolation and attrition than faculty who are not underrepresented minorities.⁷⁻⁹ As a result, the Institute of Medicine has advocated for institutional support to address the challenges that underrepresented minority faculty face in academic medicine.¹⁰

To increase the recruitment and retention of underrepresented minority faculty, a number of medical schools in recent years have developed minority faculty development programs.¹¹⁻¹⁵ These programs have been designed to improve academic skills, provide mentoring, and allow networking opportunities for underrepresented minority faculty members to improve their recruitment, retention, and promotion.¹¹⁻¹⁴ The minority faculty development programs described at these institutions are heterogeneous in scope, goals, duration, components, and funding sources.

Although it is clear that efforts to enhance diversity and inclusion are increasing,^{5,11,14} it is not clear whether minority faculty development programs are effective in general at enhancing the recruitment and retention of underrepresented minority faculty. There is limited evidence to show that targeted programs may be successful at improving underrepresented minority representation.¹⁴ For this reason, we sought to determine whether minority faculty development programs targeting underrepresented minority faculty at US medical schools are associated with increases in underrepresented minority faculty representation, recruitment, and promotion.

Methods

Setting

We identified 131 potentially eligible MD degree-granting medical schools in the United States using the Association of American Medical Colleges (AAMC) Faculty Roster, a database of faculty that is used to support national program studies.¹⁶ The faculty roster contains comprehensive information on the characteristics of full-time faculty members at accredited US allopathic medical schools. Institutional participation in the faculty roster is voluntary at each medical school and contains records on approximately 128 000 active faculty members. To preserve confidentiality, data from the faculty roster were de-identified and reported by year for each institution from 2000-2010. Separate datasets were assembled for all faculty, newly hired faculty, and newly promoted faculty. Newly hired faculty were defined as those reported as new faculty in a given calendar year by an institution, regardless of rank, whereas newly promoted faculty were defined as those reported as promoted to a higher faculty rank in a given calendar year by an

institution. To be eligible for the study, schools had to report faculty data for the years 2000 through 2010 and be located within 1 of the 50 states or the District of Columbia.

Measures

The main independent variable was the presence in 2010 of a minority faculty development program, defined as a school-wide program targeted to underrepresented minority faculty to enhance their recruitment, retention, and/or promotion. We excluded programs restricted to individual departments or centers because we did not have data at the department level. Minority faculty development programs were identified through surveys and website searches of eligible schools in 2011 (details are provided elsewhere).¹⁵ We identified minority faculty development programs at 35 schools through interviews and 1 school through website searches, while 49 responding schools reported no minority faculty development programs and the remaining 39 schools provided no evidence of a minority faculty development program on their websites. We received a waiver of consent for the interviews by the institutional review board at The Children's Hospital of Philadelphia.

The dependent variable was the percentage of underrepresented minority faculty. Underrepresented minority faculty status was derived from self-reported information of individual faculty members based on fixed categories obtained at the time of hire and reported by institutions to the AAMC. Faculty who self-reported using fixed categories as black, Hispanic, Native American, Alaskan Native, Native Hawaiian, or Pacific Islander were categorized as underrepresented minority faculty, while faculty who self-reported as white, Asian, multiple, or other were categorized as nonunderrepresented minority faculty. The percentage of underrepresented minority faculty was computed by school and year for all faculty, newly appointed faculty, and newly promoted faculty. Percentage of underrepresented minority faculty was determined for the years 2000 to 2010 for each eligible school contained in the faculty roster.

Additional faculty-level and school-level variables were obtained from the faculty roster and from public domain sources. Faculty-level data obtained from the faculty roster included sex, race and ethnicity, faculty rank (instructor, assistant professor, associate professor, professor), department (basic science, clinical), degree (MD, PhD, MD/PhD, other), and tenure status (tenure track, nontenure track). School-level variables included year established (divided into quartiles to protect confidentiality), public or private status, historically black college status, faculty size (divided into tertiles), region of the country (West, Northeast, Midwest, South), and reputation ranking. Reputation ranking was derived from the 2010 *US News & World Report* "Best Medical Schools" ranking based on a weighted average of 8 indicators and was divided into quartiles, with the lowest quartile representing unranked schools.^{17,18} The study received an exemption from review by the institutional review board at The Children's Hospital of Philadelphia.

Analysis

We collected and merged study data from the faculty roster, public domain sources, and interview data using Research Electronic Data Capture (REDCap, version 4.11.0), hosted at the Chil-

dren’s Hospital of Philadelphia. REDCap is a secure, web-based application designed to support data capture for research studies. Data were organized into yearly panels, with rows within a panel representing individual faculty and columns representing faculty- and school-level variables. The unit of analysis was the individual faculty member. Since faculty were deidentified and could not be tracked from year to year in the database, we computed person-years of exposure (number of faculty in each yearly panel added across all years) to convey cumulative exposure time by faculty over the study period. Thus, an institution with an average of 10 000 faculty over the 11-year study period would contribute 110 000 person-years of exposure.

We performed summary statistics on faculty and school characteristics by underrepresented minority faculty status for all faculty, newly hired faculty, and newly promoted faculty. Faculty with missing information on race/ethnicity were distributed fairly equally across all schools and were excluded from the analysis (8.8%).

Differences in overall characteristics were assessed using chi-square statistics; differences in characteristics by year were assessed using χ^2 test of trend statistics. To assess associations between faculty and school characteristics and percent underrepresented minority faculty, we developed marginal logistic regression models with robust variance estimates to control for clustering of faculty within schools.^{19,20} Models regressed the log odds of underrepresented minority representation on faculty- and school-level variables (Table 1 and Table 2) within each yearly panel. Panels were aggregated if the association of the main independent and dependent variables were consistent across panels.

Adjusting for school-level clustering allowed for independence of observations between schools but not necessarily within schools, in order to allow for the correct estimation of standard errors. Backward step-wise regression was used to create parsimonious multivariable models, but all models included the independent variables representing minority faculty development programs and year to adjust for secular trends. The Wald test was used to determine the significance of nested models compared with full models. In addition, minority faculty development program-by-year interaction terms were examined to assess for program effects over time. Separate models were fit for all faculty, newly hired faculty, and newly promoted faculty. To assess whether historically black medical schools influenced the overall results, we conducted the analysis after excluding these schools. To assess whether missing data may have influenced the results, we conducted a best case-worst case scenario in which individuals with missing data on race/ethnicity were assumed to be all underrepresented minority or nonunderrepresented minority.

We conducted stratified analyses among schools with minority faculty development programs to explore characteristics of minority faculty development programs that were associated with more favorable outcomes. We examined the change in the percentage of underrepresented minority faculty between 2000 and 2010 by the type of program components (mentoring, career development, social climate, pilot funding), number of program components (1-4), funding (federal vs nonfederal), duration of program (<5 years, ≥5 years), and program intensity (duration of pro-

Table 1. Characteristics of US Medical Schools by Individual Faculty Underrepresented Minority Status^a

Characteristics	No. (%)		P Value
	Underrepresented Minority Faculty, Person-Years (n=91 091)	Nonunderrepresented Minority Faculty, Person-Years (n=1 114 932)	
Year established			
1765-1859	27 027 (6.8)	373 525 (93.2)	<.001
1860-1909	27 098 (7.1)	354 370 (92.9)	
1910-1959	20 853 (9.1)	209 656 (90.9)	
1960-2000	16 113 (8.3)	177 381 (91.7)	
Public/private status			
Public	43 623 (7.0)	576 774 (93.0)	<.001
Private	47 468 (8.1)	538 158 (91.9)	
Historically black			
Yes	5044 (67.9)	2389 (32.1)	<.001
No	86 047 (7.2)	1 112 543 (92.8)	
Rank quartile ^b			
First	38 686 (6.8)	533 935 (93.2)	<.001
Second	25 047 (7.4)	313 731 (92.6)	
Third	11 505 (7.4)	143 226 (92.6)	
Fourth	4907 (13.1)	32 670 (86.9)	
School size ^c			
Small	15 053 (10.8)	125 037 (89.2)	<.001
Medium	24 496 (7.2)	315 553 (92.8)	
Large	51 383 (7.1)	672 291 (92.9)	
US region			
Northeast	25 603 (6.8)	350 869 (93.2)	<.001
Midwest	15 602 (5.7)	256 240 (94.3)	
South	38 491 (9.9)	352 220 (90.1)	
West	11 395 (6.8)	155 603 (93.2)	
Minority faculty development programs			
Yes	30 217 (7.1)	394 663 (92.9)	<.001
No	60 874 (7.8)	720 269 (92.2)	

^a Data are derived from the 2000-2010 faculty roster, a database of all full-time US medical school faculty. Individual faculty were deidentified, reported in yearly panels, and represented as person-years over the 11-year period. All P values were calculated using the χ^2 test.

^b Rank quartiles were derived from the 2010 *US News & World Report* Best Medical Schools ranking and divided into quartiles with the last quartile representing unranked schools.

^c School size was derived from the average number of faculty at a school 2000-2010 and was divided into tertiles.

gram × number of components). Inclusion of baseline underrepresented minority percentage did not change the estimates and was dropped. All analyses were conducted using Stata version 11.²¹ Two-sided P values <.05 were considered statistically significant.

Results

Of 131 schools contained in the 2010 Faculty Roster, we excluded 4 schools not located in the 50 US states or District of Columbia and 3 schools with absent faculty data for some of the years. The remaining 124 eligible schools contributed faculty data for all

Table 2. Characteristics of Full-time Faculty by Individual Faculty Underrepresented Minority Status^a

Characteristic	No. (%)		P Value
	Underrepresented Minority Faculty, Person-Years (n=91 091)	Nonunderrepresented Minority Faculty, Person-Years (n=1 114 932)	
Sex^b			
Men	54 214 (6.6)	763 734 (93.4)	
Women	36 808 (9.5)	350 777 (90.5)	
Rank^b			
Instructor	12 030 (10.0)	108 323 (90.0)	<.001
Assistant professor	48 309 (10.0)	436 544 (90.0)	
Associate professor	16 714 (6.3)	250 743 (93.7)	
Professor	12 113 (4.0)	294 444 (96.0)	
Department^b			
Basic science	8075 (4.9)	157 654 (95.1)	<.001
Clinical	82 291 (8.0)	947 327 (92.0)	
Degree^b			
MD	67 473 (9.0)	682 036 (91.0)	<.001
PhD	13 281 (4.5)	282 298 (95.5)	
MD, PhD	5232 (5.6)	87 788 (94.4)	
Other	2810 (7.2)	36 502 (92.8)	
Tenure status^b			
On tenure track	26 002 (5.6)	431 327 (94.4)	<.001
Not on tenure track	58 045 (8.7)	606 650 (91.3)	

^a Data are derived from the 2000-2010 faculty roster, a database of all full-time US medical school faculty. Individual faculty are deidentified, reported in yearly panels, and represented as person-years over the 11-year period. All P values were calculated using the χ^2 test.

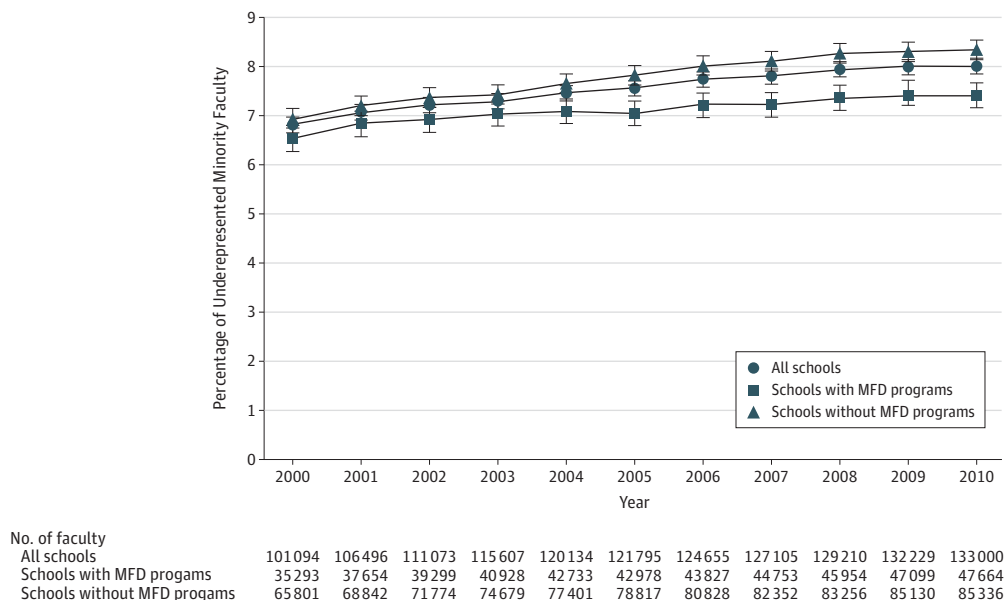
^b Indicates categorical data were missing (sex 0.1%, rank 2.7%, department 1.0%, degree 2.8%, tenure status 7.4%).

study years. The number of faculty at eligible schools increased by year from a low of 96 399 in 2000 to a high of 114 925 in 2006, then declined to 112 512 in 2010 ($P < .001$), providing 1 206 023 person-years. Overall, 7.5% of faculty across all years self-reported as an underrepresented minority, corresponding with 91 091 person-years. The number of underrepresented minority faculty increased from 6565 (6.8%; 95% CI, 6.7%-7.0%) in 2000, to 9009 (8.0%; 95% CI, 7.8%-8.2%) in 2010 (**Figure**, $P < .001$; **Table 3**). This was accompanied by similar increases in the percentage of newly hired faculty self-reporting underrepresented minority status from 888 (9.4%; 95% CI, 8.8%-10.0%) in 2000 to 678 (12.1%; 95% CI, 11.3%-13.05%) in 2010, and newly promoted faculty from 156 (6.3%; 95% CI, 5.3%-7.3%) in 2000 to 241 (7.9%; 95% CI, 6.9%-8.9%) in 2010. Hispanic faculty members increased from 3415 (3.6%; 95% CI, 3.4%-3.7%) in 2000 to 4798 (4.3%; 95% CI, 4.2%-4.4%) in 2010 ($P < .001$), while black faculty members increased from 3045 (3.2%; 95% CI, 3.1%-3.3%) in 2000 to 3846 (3.4%; 95% CI, 3.3%-3.5%) in 2010 ($P = .03$; **Table 3**). There were few faculty members reporting Native American, Alaskan, Hawaiian, and Pacific Islander status during this period.

The characteristics of schools by underrepresented minority and nonunderrepresented minority faculty status are shown in **Table 1** and the components of the minority faculty development programs in **Table 4**. Underrepresented minority faculty during this time period were more likely to reside at newer, private, historically black, and smaller institutions than nonunderrepresented minority faculty. In addition, they were more likely to reside at institutions located in the South or at institutions with lower reputational rankings.

Individual characteristics of underrepresented minority and nonunderrepresented minority faculty are shown in **Table 2**. Compared with nonunderrepresented minority

Figure. Percentage of Underrepresented Minority Faculty at US Medical Schools by Year, 2000-2010



MFD indicates minority faculty development. Error bars indicate 95% CIs.

Table 3. Race and Ethnicity Characteristics of Faculty in 2000 and 2010^a

Race/Ethnicity	Year	
	2000	2010
	No. (%) [95% CI]	No. (%) [95% CI]
White	77 413 (80.4) [80.1-80.6]	83 634 (74.6) [74.3-74.9]
Hispanic	3415 (3.6) [3.4-3.7]	4798 (4.3) [4.2-4.4]
Black	3045 (3.2) [3.1-3.3]	3846 (3.4) [3.3-3.5]
Asian	10 825 (11.2) [11.0-11.4]	16 821 (15.0) [14.8-15.2]
Native American/ Alaskan or Native Hawaiian/ Pacific Islander	105 (0.1) [0.1-0.1]	365 (0.3) [0.3-0.4]
Multiple race	1498 (1.6) [1.5-1.6]	2646 (2.4) [2.3-2.5]

^a Missing race/ethnicity data 8.8%.

faculty, underrepresented minority faculty were more likely to be women, to be physicians, and to work in clinical departments. Although 48.7% of all faculty during the study period were at the associate professor or full professor rank, underrepresented minority faculty were less likely to hold senior ranks (32.3% vs 50.0%; *P* < .001) or to be on a tenure track (28.6% vs 38.7%; *P* < .001) than nonunderrepresented minority faculty. Faculty with missing race/ethnicity data (8.8%) were more likely to have a PhD (41% vs 15% for underrepresented minority and 26% for nonunderrepresented minority); less likely to be on tenure track (26% vs 31% for underrepresented minority and 42% for nonunderrepresented minority); more likely to be at the instructor rank (23% vs 13% for underrepresented minority and 10% for nonunderrepresented minority); and more likely to be in a basic science department (20% vs 9% for underrepresented minority and 14% for nonunderrepresented minority).

Thirty-six (29%) of the 124 schools surveyed were identified as having a minority faculty development program. The programs were initiated between 1968 and 2010 (median, 2004), with 10 programs initiated before 2000, 10 initiated between 2000 and 2005, and the remainder initiated after 2005. This represented 30 217 person-years of exposure to minority faculty development programs by underrepresented minority faculty over the study period. The programs were heterogeneous: 20 (55.6%) schools had mentoring programs, 20 (55.6%) had career development programs, 17 (47.2%) had social climate programs, and 15 (41.7%) had financial programs.¹⁵ Thirteen (36.1%) schools offered 1 minority faculty development program component, 14 (38.9%) offered 2 components, 5 (13.9%) offered 3, and 4 (11.1%) offered all 4 components. Twelve (33.3%) schools had programs that were federally funded and the rest were funded by institutional support.

Underrepresented minority faculty representation increased at schools with minority faculty development programs from 2180 (6.5%; 95% CI, 6.3%-6.8%) in 2000 to 2976 (7.4%; 95% CI, 7.2%-7.7%) in 2010. Similarly, underrepresented minority faculty representation increased at schools without minority faculty development programs from 4385 (7.0%; 95% CI, 6.8%-7.2%) in 2000 to 6033 (8.3%; 95% CI, 8.1%-8.5%) in 2010, but the relative change was not different from

Table 4. Characteristics of Minority Faculty Development Programs at US Medical Schools

Characteristic	No. (%)	
	Schools (n=36)	Faculty, Person-Years (n=468 182)
Duration of program, y		
≥5	20 (56)	270 638 (57.8)
<5	16 (44)	197 544 (42.2)
Funding source of program		
Federal	12 (33)	128 507 (27.5)
Institutional	24 (67)	339 675 (72.5)
Components of program		
Mentoring	20 (56)	241 440 (18.3)
Career development	20 (56)	307 881 (23.3)
Social climate	17 (47)	269 496 (20.4)
Financial	15 (42)	204 517 (15.5)
Intensity of program		
1-4 Components and <5 y	16 (44)	197 544 (42.2)
1 Component and ≥5 y	7 (19)	43 835 (9.4)
2 Components and ≥5 y	8 (22)	168 976 (36.1)
3 Components and ≥5 y	3 (8)	27 922 (6.0)
4 Components and ≥5 y	2 (6)	29 905 (6.4)

schools with minority faculty development programs (odds ratio [OR], 0.91; 95% CI, 0.72-1.13) (Figure).

In a model adjusted for year, region, historically black college designation, faculty degree, rank, sex, and tenure status (Table 5), minority faculty development programs were not associated with increases in underrepresented minority representation (adjusted OR [aOR], 0.99; 95% CI, 0.81-1.22). Southern region, increase in year, and historically black college designation were associated with increased odds of underrepresented minority representation. Non-MD faculty degree, senior rank (associate or full professor), male sex, and tenure track status were associated with decreased odds of underrepresented minority representation. A time-by-program interaction term was not significant in the model, suggesting that minority faculty development programs did not have secular associations with faculty representation over the study period. When the model was restricted to new faculty hires (132 703 person-years), minority faculty development programs were not associated with increases in underrepresented minority recruitment (aOR 0.97; 95% CI, 0.83-1.15). Similarly, when the model was restricted to newly promoted faculty (44 914 person-years), minority faculty development programs were not associated with increases in underrepresented minority promotion (aOR 1.08; 95% CI, 0.91-1.30). Exclusion of historically black colleges resulted in little overall modification of the association of minority faculty development programs and underrepresented minority representation (aOR 0.99; 95% CI, 0.80-1.22). In addition, there was little effect on estimates when it was assumed that individuals with missing data on race and ethnicity were all underrepresented minorities (aOR 0.97; 95% CI, 0.71-1.32) or all nonunderrepresented minorities (aOR 1.00; 95% CI, 0.82-1.23).

Among the 36 schools with minority faculty development programs, there was variability in changes in underrepresented minority percentages over the study period, ranging

Table 5. Underrepresented Minority Representation by Minority Faculty Development Program Availability, School Characteristics, and Faculty Characteristics for All Faculty, Newly Hired Faculty, and Newly Promoted Faculty^a

Characteristic	Faculty					
	All		Newly Hired		Newly Promoted	
	Person-Years (n=1 206 023)	OR (95% CI)	Person-Years (n=132 703)	OR (95% CI)	Person-Years (n=44 914)	OR (95% CI)
Minority faculty development program						
Yes	424 880	0.99 (0.81-1.22)	45 026	0.97 (0.83-1.15)	16 555	1.08 (0.91-1.30)
No	781 143	1 [Reference]	87 677	1 [Reference]	28 359	1 [Reference]
Year ^b	1 206 023	1.01 (1.01-1.02)	132 703	1.01 (0.99-1.02)	44 914	1.01 (.099-1.03)
Region						
Northeast	376 472	1 [Reference]	41 384	1 [Reference]	13 648	1 [Reference]
Midwest	271 842	0.86 (0.69-1.08)	27 483	0.89 (0.74-1.07)	10 886	0.96 (0.77-1.19)
South	390 711	1.41 (1.09-1.83)	44 759	1.37 (1.13-1.67)	13 505	1.54 (1.25-1.90)
West	166 998	1.11 (0.78-1.58)	19 077	0.97 (0.75-1.24)	6875	1.17 (0.88-1.54)
Historically black						
Yes	7433	27.69 (20.99-36.52)	627	17.20 (13.20-22.30)	191	26.1 (21.7-31.5)
No	1 198 590	1 [Reference]	132 691	1 [Reference]	44 723	1 [Reference]
Degree						
MD	749 509	1 [Reference]	83 544	1 [Reference]	26 809	1 [Reference]
PhD	295 579	0.48 (0.42-0.54)	30 485	0.53 (0.46-0.61)	11 724	0.53 (0.46-0.61)
MD, PhD	93 020	0.68 (0.60-0.77)	9389	0.63 (0.50-0.73)	4135	0.72 (0.61-0.87)
Other	39 312	0.51 (0.42-0.63)	5582	0.48 (0.40-0.59)	912	0.62 (0.44-0.85)
Rank						
Instructor	120 353	1 [Reference]	32 768	1 [Reference]	224	1 [Reference]
Assistant professor	484 853	0.97 (0.85-1.10)	71 733	0.67 (0.61-0.73)	11 072	0.73 (0.63-0.84)
Associate professor	267 457	0.61 (0.52-0.71)	11 927	0.48 (0.42-0.56)	19 064	0.54 (0.47-0.63)
Professor	306 557	0.41 (0.35-0.49)	8791	0.95 (0.86-1.04)	14 553	0.51 (0.31-0.86)
Sex						
Men	817 948	0.77 (0.73-0.82)	79 063	0.79 (0.74-0.84)	29 531	0.81 (0.73-0.88)
Women	387 585	1 [Reference]	53 751	1 [Reference]	15 364	1 [Reference]
On tenure track						
Yes	457 329	0.86 (0.75-0.99)	30 659	0.90 (0.81-1.01)	18 503	0.85 (0.75-0.97)
No	664 695	1 [Reference]	85 800	1 [Reference]	23 672	1 [Reference]

Abbreviation: OR, odds ratio.

^a Data are derived from the 2000-2010 faculty roster, a database of all full-time US medical school faculty. Individual faculty are deidentified, reported in yearly panels, and represented as person-years over the 11-year period.

Separate models for all faculty, newly hired faculty, and newly promoted faculty were developed and clustering of faculty within schools was accounted for using variance-covariance matrix.

^b Reference year indicates the previous year back to 2000.

from -3.2% to 4.3% (mean, 0.90%; 95% CI, 0.89-0.91%). Ten schools had decreases in underrepresented minority representation. Ten schools had increases in underrepresented minority representation that were less than the overall average increase of 1.2% among all schools, while 16 schools had increases in underrepresented minority representation above the average. A single historically black college with a minority faculty development program was an outlier institution with regards to baseline underrepresented minority representation and had a greater increase in underrepresented minority representation over the study period (3.0%) than the average increase among other institutions with minority faculty development programs.

When minority faculty development programs were examined by type of component, schools with mentoring (change difference, 0.06%; 95% CI, -0.89% to 1.01%), career development (change difference, -0.76%; 95% CI, -1.64% to 0.12%),

social climate (change difference, -0.06%; 95% CI, -1.12% to 1.00%), and pilot funding (change difference, 0.85%; 95% CI, -0.03% to 1.74%) targeted to underrepresented minority faculty were not different in increases in underrepresented minority representation compared with schools without these types of components (Table 4). Schools with all 4 types of components had the greatest increase in underrepresented minority representation of 1.25% (95% CI, 1.24%-1.26%), but the increase was not significantly different from schools with only a single type of component (change difference, 0.59%; 95% CI, -0.88% to 2.01%).

When examined by minority faculty development program duration (Table 4), schools with minority faculty development programs for 5 or more years had a higher mean increase in underrepresented minority representation compared with schools with minority faculty development programs of shorter duration (1.38% [95% CI, 1.37%-1.38%] vs 0.25% [95%

CI, 0.25%-0.26%]; change difference, 1.13% [95% CI, 0.17%-2.08%]). Schools with more intensive programs (>5 years' duration and greater number of component types) were associated with a 0.44% increase in underrepresented minority representation (95% CI, 0.08%-0.79%) for each level of increase in intensity.

When examined by funding type (Table 4), schools with federal funding were not different in mean increases in underrepresented minority representation from schools with private or endowment funding (change difference, -0.04%; 95% CI, -1.53% to 1.44%). However, schools with programs that were federally funded and of longer duration were associated with a greater increase in underrepresented minority representation compared with schools with privately funded programs of shorter duration (change difference, 3.08%; 95% CI, 1.60%-4.56%). There was no association between funding type, number of components, or types of components and changes in underrepresented minority representation. A single model minority faculty development program that was federally funded, had comprehensive program components, and had been run for 8 years had an increase in underrepresented minority representation of 2.45% over the study period.

Discussion

This study attempted to fill a gap in knowledge concerning the associations of minority faculty development programs with underrepresented minority faculty representation, recruitment, and promotion. Previous studies have catalogued minority faculty development programs and described their characteristics. Bickel²² conducted a survey of medical school deans in 1989 and found that 62 of 113 responding schools (55%) reported having affirmative action programs but few details of the programs were provided. In 2008, Palermo et al¹⁴ and Daley et al¹¹ described the characteristics of minority faculty development programs at 4 minority-serving institutions and 6 Health Resources Services Administration-funded centers of excellence. They reported on formal education and training programs, personal positioning and planning strategies, resources and support, and mentoring available through these programs. More recently in 2012, we reported on the availability and characteristics of minority faculty development programs.¹⁵ We found that few schools (29%) have such programs and that program availability is likely a reflection of resources and a preference to establish stand-alone programs targeted to underrepresented minority faculty. To our knowledge, no previous study has examined the relationship between minority faculty development programs and underrepresented minority faculty representation, recruitment, and promotion.

Although the definition of underrepresented minority is evolving to reflect local and regional perspectives,^{1,2} findings from this study demonstrate that faculty who are underrepresented in medicine, relative to the general population, have seen little increase in absolute or percentage representation across all schools during this time period, while the prevalence of individuals of underrepresented minority status in the general population had increased to greater than 30% by 2010.²³ Southern

schools and historically black colleges were most likely to be associated with underrepresented minority representation, recruitment, and promotion. This relatively small increase may have been the result of an increase in the percentage of faculty hires that involve underrepresented minority faculty and efforts to increase the pipeline of medical school faculty. Our results suggest that current minority faculty development programs on average were not associated with these changes in underrepresented minority representation, recruitment, or promotion.

Although the findings may appear to suggest that stand-alone programs for underrepresented minority faculty are not effective, the heterogeneity of available programs makes firm conclusions difficult. In addition, schools with the greatest barriers to advancement of underrepresented minority faculty may have chosen to initiate minority faculty development programs. Indeed, we found that schools with programs in existence for 5 or more years were associated with greater improvements in percent of underrepresented minority faculty than schools with minority faculty development programs of shorter duration. This suggests that minority faculty development programs may have needed a number of years of support to mature and achieve favorable results. In addition, we found that schools with programs of greater intensity were associated with greater increases in percent of underrepresented minority faculty than schools with less comprehensive programs. This suggests that schools with more comprehensive and longer lasting minority faculty development programs may have been able to achieve better results.

There are limitations to these findings that should be kept in mind. First, the findings are observational, thus causality concerning the effectiveness of minority faculty development programs cannot be inferred. Experimental studies may better determine the effects of minority faculty development programs on underrepresented minority faculty representation. Second, the dataset precluded an understanding of the longitudinal nature of underrepresented minority faculty retention. To maintain confidentiality, individual faculty members within schools were deidentified. Thus, the ability to track faculty within institutions from year to year and monitor promotion and retention was not possible. Third, identification of minority faculty development programs was based on a survey of senior administrative staff and web site searches at eligible institutions, which may not have been accurate and may have misclassified some institutions. Fourth, individual quantitative measures of academic success such as publications and grants awarded were not available for this analysis. This limits the ability to control for varying recruitment and promotion standards at different institutions. Finally, the dataset precluded an analysis of departmental or center-specific minority faculty development programs.

Our results have implications for future research. First, since minority faculty development programs may require time to mature and affect underrepresented minority representation, studies evaluating the effects of minority faculty development programs should incorporate a sufficiently long time horizon. Second, since the minority faculty development programs identified in this study were heterogeneous in composition, duration, and funding, studies should attempt to measure the complexity and quality of programs offered. Third, studies should

be directed to model minority faculty development programs that have been in existence longer and have more comprehensive programs.^{11,14,24} Model programs may provide important clues as to which components are most effective. Fourth, evaluations of minority faculty development programs should critically assess outcomes using quantitative measures of academic success.²⁵ Quantitative measures can help control for varying recruitment and promotion standards across institutions. Ries et al²⁵ have identified a number of quantitative measures that encompass leadership and professional activities, honors and awards, research grants, teaching and mentoring activities, and publications that could be considered.

Conclusions

The percentage of underrepresented minority faculty increased modestly from 2000 to 2010 at US medical schools. The presence of a minority faculty development program targeted to underrepresented minority faculty was not associated with greater underrepresented minority faculty representation, recruitment, or promotion. Minority faculty development programs that were of longer duration and greater intensity were associated with greater increases in underrepresented minority faculty representation.

ARTICLE INFORMATION

Author Contributions: Dr Guevara had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Guevara.

Acquisition of data: Adanga, Avakame, Guevara.

Analysis and interpretation of data: Adanga, Carthon.

Drafting of the manuscript: Avakame, Carthon, Guevara.

Critical revision of the manuscript for important intellectual content: Adanga, Avakame, Guevara.

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REFERENCES

- Association of American Medical Colleges. *Diversity Research Forum: The Importance and Benefits of Diverse Faculty in Academic Medicine: Implications for Recruitment, Retention, and Promotion*. Washington, DC: Association of American Medical Colleges; 2008.
- Association of American Medical Colleges. *Striving Toward Excellence: Faculty Diversity in Medical Education*. Washington, DC: Association of American Medical Colleges; 2009.
- Anderson H, Lang J. *The Long-Term Retention and Attrition of U. Medical School Faculty*. Washington, DC: Association of American Medical Colleges; 2008.
- Liu CQ, Alexander H. *Promotion Rates for First-time Assistant and Associate Professors Appointed from 1967 to 1997*. Washington, DC: Association of American Medical Colleges; 2010.
- Nivet MA, Taylor VS, Butts GC, et al. Diversity in academic medicine no. 1 case for minority faculty development today. *Mt Sinai J Med*. 2008;75(6):491-498.
- Ginther DK, Schaffer WT, Schnell J, et al. Race, ethnicity, and NIH research awards. *Science*. 2011;333(6045):1015-1019.
- Cropsey KL, Masho SW, Shiang R, et al. Why do faculty leave? *J Womens Health (Larchmt)*. 2008;17(7):1111-1118.
- Mahoney MR, Wilson E, Odom KL, Flowers L, Adler SR. Minority faculty voices on diversity in academic medicine: perspectives from one school. *Acad Med*. 2008;83(8):781-786.
- Peterson NB, Friedman RH, Ash AS, Franco S, Carr PL. Faculty self-reported experience with racial and ethnic discrimination in academic medicine. *J Gen Intern Med*. 2004;19(3):259-265.
- Smedley B, Butler AS, Bristow L. *In the Nation's Compelling Interest: Ensuring Diversity in the Health Care Workforce*. Washington, DC: National Academies Press; 2004.
- Daley SP, Palermo A-G, Nivet M, et al. Diversity in academic medicine no. 6 successful programs in minority faculty development: ingredients of success. *Mt Sinai J Med*. 2008;75(6):533-551.
- Lewellen-Williams C, Johnson VA, Deloney LA, Thomas BR, Goyol A, Henry-Tillman R. The POD: a new model for mentoring underrepresented minority faculty. *Acad Med*. 2006;81(3):275-279.
- Kosoko-Lasaki O, Sonnino RE, Voytko ML. Mentoring for women and underrepresented minority faculty and students. *J Natl Med Assoc*. 2006;98(9):1449-1459.
- Palermo A-G, Soto-Greene ML, Taylor VS, et al. Diversity in academic medicine no. 5 successful programs in minority faculty development: overview. *Mt Sinai J Med*. 2008;75(6):523-532.
- Adanga E, Avakame E, Brooks-Carthon M, Guevara J. An environmental scan of faculty diversity programs at US medical schools. *Acad Med*. 2012;87:1540-1547.
- Association of American Medical Colleges. Faculty roster: 2010.; <http://www.aamc.org/data/facultyroster/>. Accessed November 16, 2013.
- Flanigan S, Morse R. Methodology: Best medical schools rankings. <http://www.usnews.com/education/best-graduate-schools/top-medical-schools/articles/2013/03/11/methodology-best-medical-schools-rankings>. Accessed September 13, 2013.
- Bastedo MN, Bowman NA. US News & World Report college rankings: modeling institutional effects on organizational reputation. *Am J Educ*. 2010;116:163-183. doi:10.1086/649437.
- Diggle P, Heagerty P, Liang K-Y, Zeger SL. *The Analysis of Longitudinal Data*. 2nd ed. New York, NY: Oxford University Press; 2002.
- Rabe-Hesketh S, Skrondal A. *A Multilevel and Longitudinal Modeling Using Stata*. 2nd ed. College Station, TX: Stata Press; 2008.
- Stata Corporation. *Stata Statistical Software, Release Version 11*. College Station, TX: Stata Corp; 2011.
- Bickel J. The changing faces of promotion and tenure at US medical schools. *Acad Med*. 1991;66(5):249-256.
- Castillo-Page L. *Diversity in the Physician Workforce: Facts and Figures 2010*. Washington, DC: Association of American Medical Colleges; 2010.
- Smith LH, Bridges K. *1995 Evaluation of MMFDP, Publication ID #027395*. Princeton, NJ: Robert Wood Johnson Foundation; 1995.
- Ries A, Wingard D, Gamst A, Larsen C, Farrell E, Reznik V. Measuring faculty retention and success in academic medicine. *Acad Med*. 2012;87(8):1046-1051.