Original Contribution

Diversity by Race, Hispanic Ethnicity, and Sex of the United States Medical Oncology Physician Workforce Over the Past Quarter Century

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Abstract

Purpose: To assess the medical oncology (MO) physician workforce diversity by race, Hispanic ethnicity, and sex, with attention to trainees.

Methods: Public registries were used to assess 2010 differences among MO practicing physicians, academic faculty, and fellows; internal medicine (IM) residents; and the US population, using binomial tests with $P < .001$ significance adjusting for multiple comparisons. Significant changes in fellow representation from 1986 to 2011 were assessed.

Results: Female representation as MO fellows (45.0%) was significantly increased compared with faculty (22.4%) and practicing physicians (27.4%); was no different than IM residents (44.7%, $P = .853$); and increased significantly, by 1.0% per year. Women were significantly underrepresented as practicing physicians, faculty, and fellows compared with the US population (50.8%). Traditionally underrepresented minorities in medicine (URM) were significantly underrepresented as practicing physicians (7.8%), faculty (5.7%), and fellows (10.9%), versus US population (30.0%). Hispanic MO fellows (7.5%) were increased compared with faculty (3.9%) and practicing physicians (4.1%); Black fellows (3.1%) were no different than faculty (1.8%, $P = .0283$) or practicing physicians (3.5%, $P = .443$). When comparing MO fellows versus IM residents, there were no differences for American Indians/Alaska Natives/Native Hawaiians/Pacific Islanders (0.3%, 0.6%, respectively, $P = .137$) and Hispanics (7.5%, 8.7%, $P = .139$), unlike Blacks (3.1%, 5.6%, $P < .001$). There has been no significant change in URM representation, with negligible changes every 5 years for American Indians/Alaska Natives/Native Hawaiians/Pacific Islanders (−0.1%), Blacks (−0.3%), and Hispanics (0.3%).

Conclusions: Female fellow representation increased 1% per year over the quarter century indicating historical gains, whereas URM diversity remains unchanged. For Blacks alone, representation as MO fellows is decreased compared with IM residents, suggesting greater disparity in MO training.

Introduction

Diversification of the physician workforce has been identified as a strategy to address health disparities, meet the health care needs of newly insured patients following the Affordable Care Act, and enrich physician cultural competence. Women are more likely to pursue careers in women's health with respect to clinical practice and research focus.[1] Racial and ethnic minority providers are more likely to practice in underserved communities[2-4] and pursue disparities research.[5] Students from medical schools with more diverse student bodies report more confidence managing patients from different cultural backgrounds.[6] Patients managed by a physician from the same culture report more satisfaction with their treatment and their ability to effectively communicate with their provider.[7]

With women constituting half and racial/ethnic minority groups accounting for more than one third of the US population in 2010, pressing issues highlight the need for a diverse oncology physician workforce. Cancer is the second leading cause of death in the United States, and well-documented disparities by race, ethnicity, and sex exist across a wide variety of malignancies.[8] ASCO set the objective of diversifying the clinical oncology workforce as a requisite to improving cancer care for underserved populations in their 2009 "Disparities in Cancer Care" policy statement[9] and most recently in "The State of Cancer Care in America, 2014," provided a Key Finding and Recommendation indicating the need for greater workforce diversity.[10]

Despite this recognition, there remains in the oncology literature no publication dedicated solely to analyzing physician workforce diversity. The limited existing literature consists primarily of organizational summary reports noting decreased representation of women and minority groups underrepresented in medicine (URM).[10-12] In ASCO's recent publication, "Key Trends in Tracking Supply of and Demand for Oncologists," absolute percentages from 2004 to 2011 by race, ethnicity, sex, age, and other demographics were described for medical oncology (MO) fellows relative to internal medicine (IM) subspecialties, without analyses for significant trends over time, acknowledging URM fellow trainee underrepresentation.[13] These findings were recently corroborated, noting a closing gender gap, yet fewer African American and Hispanic physicians currently in MO training compared with other specialties.[10] The purpose of this study was to assess the diversity of the US MO physician workforce by race, Hispanic ethnicity, and sex, with particular attention to the fellow trainee level over the past quarter century.

Methods

Data Sources

Institutional review board evaluation and exemption were granted for the study as primary data were obtained from public sources with no identifiable private or protected information. Population data were obtained from the US Census.[14,15] Data on academic faculty,[16,17] US medical school graduates,[18] numbers of female practicing physicians[19] from 2010 and for race and ethnicity[20] from 2008—the most recent year publicly available—were obtained from the American Association of Medical Colleges (AAMC). Data on oncology fellowships and hematology and oncology fellowships and other training programs were obtained from 1986 to 2011 *Journal of the American Medical Association* supplements.[21-46] Hematology and oncology fellows and oncology fellows were combined into a single category as MO fellows. Eleven of the remaining 14 Accreditation Council for Graduate Medical Education IM subspecialty training fellowship programs have more than 100 trainees and were included in this analysis: cardiovascular disease (2,437 trainees); gastroenterology (1,348); pulmonary disease and critical care medicine (1,339); nephrology (911); infectious disease (788); endocrinology, diabetes, and metabolism (586); rheumatology (423); interventional cardiology (239); geriatric medicine (237); critical care medicine (185); and clinical cardiac electrophysiology (171). Pulmonary disease alone (77), hematology alone (43), and transplant hepatology (16) were not included. Race and ethnicity measures were provided separately as unduplicated totals for US census, medical school graduates, and residents/fellows. For other data sources, Hispanics were included in the Other racial category because no breakdown by race among Hispanics was provided. All data sources represent the entire population in question.

Measures

Variables evaluated were race, ethnicity, and sex, defined as consistent with US Census Bureau.[14,15] Racial groups assessed were (1) White; (2) Black or African American, referred to as Black; (3) Asian or Asian American, referred to as Asian; (4) American Indian, Alaska Native, Native Hawaiian, and Pacific Islanders (AI/AN/NH/PI), grouped as one category; and (5) Other, defined in this study as any person with unknown racial information and/or not classifiable into one of the previous categories. Ethnic groups included Hispanic and non-Hispanic. The URM grouping was used as defined by the AAMC,[47] first addressed in 1970 and modified in 2004 to describe minorities underrepresented relative to their numbers in the general population, which currently includes Blacks, Hispanics, and AI/AN/NH/PI. Certain Asian subgroups (Vietnamese, Hmong, and Cambodian) have historically been included as URM but are not included in the URM group for the purposes of this analysis.

Statistical Analysis

Binomial tests were used to investigate significant differences in racial, ethnic, and sex distribution among MO practicing physicians and MO faculty separately, compared with the US population, and compared with each other. MO fellows were compared, by individual racial groupings, ethnicity, and sex, with (1) MO practicing physicians, (2) MO faculty, (3) medical school graduates, (4) IM residents, and (5) IM subspecialty trainees. Hematology and oncology fellows were similarly compared with oncology fellows. One-sample binomial test was used for comparison to the US population statistics, and two-sample tests were used for two distinct samples. Adjusting for multiple comparisons among different groups, P values $< .001$ were considered statistically significant. To assess changes in the percentages of MO fellows by sex, race, and ethnicity over the past 26 academic years with available data, the slope and the associated 95% CIs for each group were estimated using a simple linear regression model in which year was used as independent variable. With 26 years of data and the most conservative estimate of the percentage (ie, 50%), the minimum detectable slope is 4%, with 80% power and two-sided significance level of .01, for a total of alpha level of .05 over five regression analyses. Finally, MO was ranked descriptively among the IM subspecialty fellowship training programs with more than 100 fellows in descending order of size, in terms overall size and the percentages of women, URMs, and individual URM groups as MO fellows in 2010.

Results

Comparative Cohort Analysis

Figures 1A to 1D show the distribution of women, Hispanics, racial groups, and URMs, respectively, compared among the US population; MO academic faculty, practicing physicians, and fellows; and IM residents. Appendix Table A1 (online only) shows the raw data for all groups evaluated.

Female sex. Female representation as MO fellows (45.0%) was significantly increased compared with faculty (22.4%) and practicing physicians (27.4%; Ps $< .001$ for each comparison) There were no differences when comparing MO fellows (45.0%) with medical school graduates (48.3%, $P = .0142$) and IM residents (44.7%, $P = .853$), nor when comparing hematology and oncology (45.4%) and oncology (39.2%) fellows with each other ($P = .2576$), and with the combined MO group ($P = .8265$ and $P = .2604$, respectively). Women were significantly underrepresented as faculty and practicing physicians compared with their percentage of the US population (50.8%; Ps $< .001$). Representation as faculty was decreased compared with practicing physicians ($P < .001$).

With 1,564 fellows, MO ranked second in size compared with other IM fellowship training programs with more than 100 trainees (Table 1) and fifth for female representation at 45.0% (range, 8.8% to 66.9%). Representation of female fellows in MO was significantly less compared with endocrinology, diabetes, and metabolism (66.9%); rheumatology (65.7%); geriatrics (57.0%); and infectious disease (56.5%), and significantly higher compared with nephrology (37.0%), pulmonary disease and critical care (32.1%), gastroenterology (31.9%), critical care medicine (26.5%), cardiovascular disease (22.2%), clinical

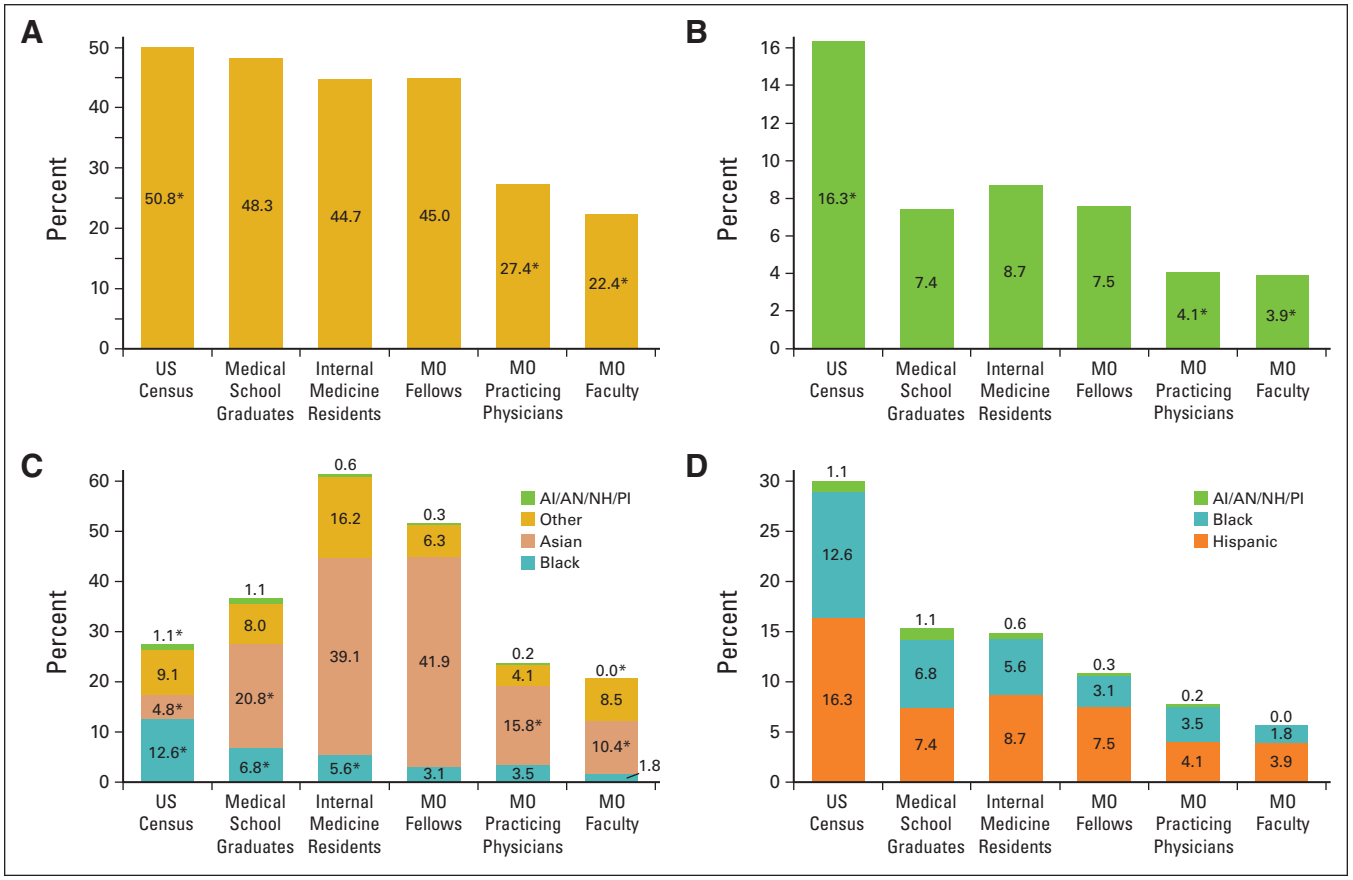

Figure 1. Distribution in the 2010 US population; medical school graduates; internal medicine residents; and medical oncology (MO) practicing physicians, academic faculty, and fellows. (A) Females; male category is not shown. (B) Hispanic ethnicity; the non-Hispanic category is not shown. (C) Race; analyses were not performed for the "Other" race category; the "White" category is not shown. (D) Underrepresented minorities (URM); non-URM category is not shown. AI/AN/NH/PI, American Indian/Alaska Native/Native Hawaiian/Pacific Islander. (*) Significantly different proportion ($P < .001$) in comparison with MO fellows analyses of significant differences not performed in panel D.

cardiac electrophysiology (13.5%), and interventional cardiology (8.8%; all Ps $< .001$).

Figure 2 shows the distribution of MO fellows by sex for the 1986 through 2011 academic years. Representation for men was lowest in 2011 (44.3%) and highest in 1986 (79.0%); representation for women was lowest in 1986 (21.0%) and highest in 2011 (45.7%). Female representation was found to be increasing 1.0% per year (95% CI, 0.867 to 1.137; $P < .001$).

Table 1. Medical Oncology Subspecialty Fellowship Trainee Demographic Characteristics Among the 12 Largest Internal Medicine Subspecialties* for 2010

Characteristic	Medical Oncology	Range for 12 Largest Specialties	Medical Oncology Ranking Amongst 12 Largest Specialties
Overall size, No.	1,564	171-2,437	2nd
Female, %	45.0	8.8-66.9	5th
Hispanic, %	7.5	6.3-14.3	8th
AI/AN/NH/PI, %	0.3	0.0-0.8	8th
Black, %	3.1	2.8-6.9	11th
URMs combined, %	10.9	10.8-19.5	11th

Abbreviations: AI/AN/NH/PI, American Indian, Alaska Native, Native Hawaiian, Pacific Islander; URM, underrepresented minority groups in medicine.
* Internal medicine subspecialty fellowship training programs with more than 100 fellows in descending order of size: cardiovascular disease, gastroenterology, pulmonary disease and critical care medicine, nephrology, infectious disease, endocrinology, diabetes, and metabolism, rheumatology, interventional cardiology, geriatric medicine, critical care medicine, and clinical cardiac electrophysiology.

URMs in medicine. URMs comprised 10.9% of fellows. For Hispanics (7.5%) representation was significantly increased as

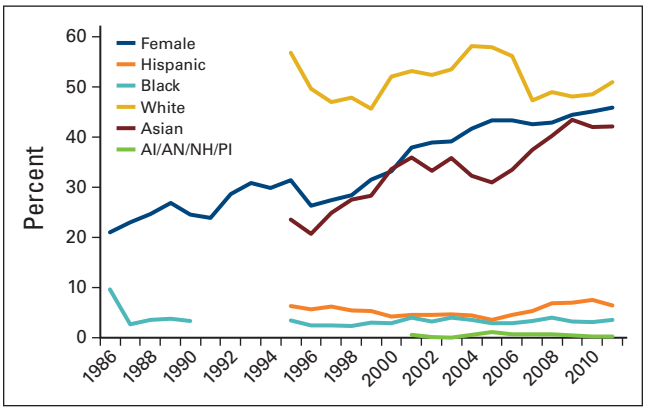

Figure 2. Medical oncology fellows by sex, ethnicity, and race from 1986 through 2011. Non-Hispanic ethnicity, male sex, and the "other" race category are not shown.

fellows compared with both faculty and practicing physicians (*P*s < .001), whereas for Blacks (3.1%) there were no differences (1.8%, *P* = .0283 and 3.5%, *P* = .443, respectively). Representation of AI/AN/NH/PI as fellows (0.3%) was greater than as faculty (0%), but no different from practicing physicians (0.2%; *P* = .9575). URMs comprised 14.8% of IM residents. When comparing MO fellows with IM residents by individual groups, there were no significant differences for AI/AN/NH/PI (0.3% *v* 0.6%; *P* = .137) and Hispanics (7.5% *v* 8.7%; *P* = .139), nor when comparing MO fellows with medical students (AI/AN/NH/PI: 1.1%, *P* = .003; Hispanics: 7.4%, *P* = .021). Blacks were significantly underrepresented as fellows (3.1%) compared with IM residents (5.6%) and medical students (6.8%; *P*s < .001). There were no significant differences in any individual URMs groups when comparing hematology and oncology fellows and oncology fellows with each other and with the combined MO group (*P*s > .001).

MO ranked 11th for URM (10.9%; range for 12 largest programs: 10.8% to 19.5%) and Blacks (3.1%; 2.8% to 6.9%) and eighth for Hispanics (7.5%; 6.3% to 14.3%) and AI/AN/NH/PI (0.3%; 0.0% to 0.8%; Table 1). Representation for Blacks as fellows in MO (3.1%) was significantly less compared with nephrology (5.9%) and infectious disease (6.9%), with no significant differences compared with the other training subspecialties (*P*s > .001). Representation for Hispanics as fellows in MO (7.5%) was significantly less compared with geriatric medicine (14.3%) and infectious disease (12.1%), with no significant differences compared with the other training subspecialties (*P*s > .001). There were no AI/AN/NH/PI fellows in critical care medicine, clinical cardiac electrophysiology, or interventional cardiology; otherwise, there were no significant differences in representation of AI/AN/NH/PI as fellows in MO (0.3%) compared with the other training subspecialties (*P*s > .001).

Figure 2 shows the distribution of MO fellows by race and ethnicity over time. The lowest and highest percentage representations (and associated year) were Whites 45.5% (1999) to 58.0% (2004), Asians 20.7% (1996) to 43.3% (2009), URMs overall 7.2% (2000) to 11.5% (2008), Hispanics 3.5% (2005) to 7.5% (2010), Blacks 2.3% (1998) to 4.0% (2008), and AI/AN/NH/PI 0.3% (2011) to 1.1% (2005). When analyzing differences over time, representation was found to be per year: increasing for Asians at 1.1% (95% CI, 0.897 to 1.500; *P* < .001); decreasing for the Other group at −1.3% (95% CI, −1.787 to −0.826; *P* < .001); and unchanged for all URM groups: AI/AN/NH/PI at −0.02% (95% CI, −0.132 to 0.096; *P* = .726), Blacks at −0.06% (95% CI, −0.153 to 0.028; *P* = .165), Hispanics 0.06% (95% CI, −0.032 to 0.158; *P* = .178).

Individually, Blacks, AI/AN/NH/PI, and Hispanics were significantly underrepresented among practicing physicians and faculty compared to the US population (*P*s < .001), confirming their URM status in MO. Collectively URMs comprised 30%, 7.8%, and 5.7% of the US population, practicing physicians, and faculty, respectively (Figure 1D). Blacks were decreased in representation as faculty compared with practicing physicians (*P*s < .001). AI/AN/NH/PI had no representation as faculty. There was no difference for Hispanics when comparing faculty with practicing physicians (*P* = .876).

Discussion

In this analysis of diversity based on sex, Hispanic ethnicity, and race in the US MO physician workforce, we found that women and URM are underrepresented relative to their percentages of the US population. Female representation as MO fellows has increased significantly over the past quarter century at approximately 1% per annum and is increased relative to practicing physicians and academic faculty, indicating historical gains that are projected to reach parity with medical school graduates and the US population over the next 5 years. Meanwhile, there were no significant increases in URM groups over the past 17 years of available data, suggesting that racial and ethnic diversity are not increasing. Furthermore, for Blacks alone, representation as fellows decreased compared with representation as IM residents, suggesting a greater disparity in Blacks entering MO training. Efforts have been made to increase the available pipeline of URM medical school graduates with the expectation that this increased representation will translate downstream across all specialties.[48] Our findings indicate that increased URM representation in IM residency has not translated to MO fellowship, as it has for other subspecialties.

Consistent increases in female representation as MO fellows, mirroring medical school and IM residency representation, is reassuring and has not been consistently seen in other oncologic specialties such as radiation oncology.[49] Positive influences of this increase should be explored as it may contribute to strategies for increasing female diversity in these other specialties. Still, our analysis suggests that there are gains to be made as academic faculty, where representation of women is decreased relative to practicing physicians, a trend also noted for Blacks and AI/AN/NH/PI. A hematology and oncology fellow survey found that 49% of respondents ranked an academic career as "very" or "extremely important," and those with high academic interest were more likely female.[50] In addition, having a mentor within the same field and of the same sex were both associated with having a high (*v* low or moderate) academic career interest. These data highlight a number of hypothesis-generating concepts and related initiatives: given significant interest in academic careers among female fellows and that same-sex mentorship has an important role in the choice to pursue academics, initiatives that increase female mentorship opportunities may increase the numbers of trainees opting to pursing academic careers.

Factors leading to disparities in URM representation in the MO physician workforce relative to IM and other subspecialties are unclear. The scarce literature examining the etiology of this disparity focuses mostly on the limited medical student pipeline.[12] Because MO fellowship training occurs after completion of IM residency, this may uniquely challenge attracting diverse populations and highlighted the need for initiatives at both the medical school and residency level. Potential strategies for medical students include (1) supporting student interests groups in oncology, (2) permitting rotations on inpatient oncology ser-

vices as part of IM core clerkship, and (3) allowing elective time in outpatient MO before the fourth year to allow factoring the experience into specialty selection. At the resident level, the recent change in fellowship match timeline from second to third year may provide the opportunity to gain more exposure to IM subspecialties.[51] Whether such initiatives, intentionally inclusive of diverse populations, result in increases in URM trainees should be assessed. A variety of training programs and grants exposing URM medical students and/or residents to oncology exist.[52-56] Evaluating the efficacy of these programs by race, ethnicity, and sex will be critical in discovering additional insights and highlighting successful interventions.

At the practicing level, given the lack of literature examining URM experiences in academic MO, extrapolating from the general URM experience may be useful to begin investigating the disparate URM representation in MO. A survey of URM faculty investigating specialty choices, compensation, and career satisfaction found that, compared with Whites, they were significantly less satisfied with their careers and more often considered leaving academic medicine within 5 years.[57] Price et al[58] similarly found that URM faculty were significantly less likely to report that they would be at their current institution in 5 years and three times less likely to believe networking opportunities included members of racial minority groups. These data underscore the importance of mentorship to academic faculty and may similarly speak to a lack of diverse role models and mentors to recruit medical students and residents.

Institutionally, there is a need for increased accountability. Holding health care leaders accountable for clinical operations is a necessary, industry-wide management tool. Commitment to increasing the diversity profile of highly competitive subspecialty programs by such authorities can yield positive results. In business, education, and other environments where cultural diversity is valued, cultural metacognition is often at work as a positive force.[59] Unless medical school deans and cancer center directors hold MO leaders accountable, the current situation with respect to diversification of the workforce will likely be left to progressive training programs to address as has occurred in other fields.[60] Future investigation should seek to identify whether such exemplary oncology programs currently exist.

This analysis is limited by comparing groups (practicing physicians, faculty, fellows, and residents), for the most part, across a single year, assuming that IM residents in 2010 would become fellows in 2012. Analysis of resident diversity annually from 1986 to 2011 was performed to attempt to assess such delayed trends. Other limitations include the delayed public reporting of demographics, which creates an inevitable time lag in assessing the most recent trends, and use of the AAMC faculty roster, which includes only full-time faculty with an MD or MD/PhD degree who have reported specialty information. In addition, this analysis does not seek to establish correct or sufficient levels of diversity by race, ethnicity, and sex; it simply seeks to assess current representation and trends. Finally, exploring the causative factors related to increasing female and unchanged URM representation in MO fellowship training is limited by a dearth of information characterizing fellowship applicants, successful matriculants, and program directors' selection criteria, as is made available for residency programs and applicants by the Electronic Residency Application Service, AAMC, and the National Resident Matching Program. In particular, no such information for fellowship applicants is publicly available by race, ethnicity, and sex. For example, prior analyses for residency applicants in orthopedic surgery, radiation oncology, and radiology have found that Blacks submit, on average, fewer residency applications, which may limit their likelihood of a successful match.[49,61,62] National Resident Matching Program survey data revealed that radiation oncology program directors ranked research and letters of recommendation higher than board scores and grades, yet Hispanics and Blacks are less likely to attend medical schools with affiliated radiation oncology residency programs, which may limit access to field-related research and mentorship opportunities.[49] Whether such patterns occur in MO is unknown. Addressing disparities in URM representation in MO fellowship training and identifying potential barriers and solutions will require the rudimentary reporting of similar statistics and survey data. Applying the fourth-generation model for addressing health disparities requires a foundation of descriptive studies to characterize the problem, which this report seeks to address, followed by exploration of explanative data; interventional solutions and approaches; and public health praxis, infrastructure, and policy.[63]

In conclusion, although women will reach parity in MO fellowship trainee representation, URMs remain underrepresented in the MO physician workforce despite an available pipeline of IM residents. Given prevalent health care disparities and an increasingly diverse society, future research and training efforts should address increasing fellow diversity.

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Appendix

Table A1. Demographic Distribution by Sex, Hispanic Ethnicity, and Race, of the US Population, Medical School Graduates, Internal Medicine Residents, and Medical Oncology Practicing Physicians, Academic Faculty, and Fellows, for 2010 (except where noted)

	Sex				Ethnicity				Race			
	Female		Male		Hispanic		Non-Hispanic		White		Asian	
Category	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
US Census	156,964,212	50.8	151,781,326	49.2	50,477,594	16.3	258,267,944	83.7	223,553,265	72.4	14,674,252	4.8
Medical school graduates	8,129	48.3	8,706	51.7	1,254	7.4	15,580	92.5	10,665	63.4	3,503	20.8
IM residents	10,028	44.7	12,387	55.3	1,942	8.7	20,473	91.3	8,635	38.5	8,767	39.1
MO practicing physicians	3,483	27.4	9,241	72.6								
MO practicing physicians (2008)	2,723	38.1	4,423	61.9	291	4.1	6,857	95.9	5,459	76.4	1,132	15.8
MO faculty	280	22.4	969	77.6	49	3.9	1,201	96.1	992	79.4	130	10.4
MO fellows*	704	45.0	860	55.0	118	7.5	1,446	92.5	757	48.4	656	41.9
HO fellows	664	45.4	798	54.6	110	7.5	1,352	92.5	709	48.5	612	41.9
Oncology fellows	40	39.2	62	60.8	8	7.8	94	92.2	48	47.1	44	43.1

NOTE. Percentages were calculated with total, unduplicated, for the category as the denominator. Percentages were rounded.
Abbreviations: IM, internal medicine; HO, hematology and oncology; MO, medical oncology; AI, American Indian; AN, Alaska Native; NH, Native Hawaiian; PI, Pacific Islander.
*MO Fellows represents Hematology and Oncology fellows and Oncology fellows combined into one group.

Table A1. Continued

Race						
Black		AI/AN/NH/PI		Other		
No.	%	No.	%	No.	%	Total
38,929,319	12.6	3,472,261	1.1	28,116,441	9.1	308,745,538
1,138	6.8	180	1.1	1,349	8.0	16,835
1,250	5.6	130	0.6	3,633	16.2	22,415
						12,724
251	3.5	15	0.2	291	4.1	7,148
22	1.8		0	106	8.5	1,250
48	3.1	4	0.3	99	6.3	1,564
47	3.2	3	0.2	91	6.2	1,462
1	1.0	1	1.0	8	7.8	102

NOTE. Percentages were calculated with total, unduplicated, for the category as the denominator. Percentages were rounded.
Abbreviations: IM, internal medicine; HO, hematology and oncology; MO, medical oncology; AI, American Indian; AN, Alaska Native; NH, Native Hawaiian; PI, Pacific Islander.
*MO Fellows represents Hematology and Oncology fellows and Oncology fellows combined into one group.