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Original research article

Analysis of pre-residency research productivity, dual degree status, and gender distribution of underrepresented minorities among a current United States radiation oncology junior resident class



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ABSTRACT

Background: Among the most competitive medical subspecialties, representation of underrepresented minorities (African–American race and/or Hispanic ethnicity) among resident trainees has historically been low compared to their United States Census general population representation. Research productivity and dual degree status may impact residency applicant competitiveness. To date, such an analysis has yet to be performed in Radiation Oncology.

Methods: A list of radiation oncology residents from the graduating class of 2022 was obtained through internet searches. Demographics included were gender and dual degree status. Research productivity was calculated using the number of pre-residency peer-reviewed publications (PRP). Fisher's exact test was used for statistical analysis.

Results: Of the 179 residents evaluated from the 2022 class, eleven (6.1%) were underrepresented minorities. Compared to the remainder of the class, underrepresented minorities had a lower proportion of men (63.6% versus 69.3%), a higher proportion of dual degrees (45.5% versus 28.6%), and a lower proportion of MD-PhD degrees (9.1% versus 17.2%). Underrepresented minorities had a higher proportion of residents with at least two PRP (72.7% versus 57.1%) and a lower proportion of residents with no PRP (18.2% versus 24.4%). None of these differences reached statistical significance ($p > 0.05$).

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Conclusion: Underrepresented minorities were comparable to the remainder of their Radiation Oncology resident class regarding gender distribution, dual degrees status, and likelihood of having at least two peer-reviewed publications cited in PubMed during the calendar year of residency application. Further studies will be needed to determine how these findings translate into future scholarly activity and post-graduate career choice.

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1. Background

In the United States (US) the physician workforce does not reflect the diversity of the population.^{1–4} Data has long shown that the number of medical students and practicing physicians from backgrounds that are traditionally underrepresented in medicine (URM) has not kept pace with the racial/ethnic composition of the US.^{1,2,4} The Association of American Medical Colleges defines URM as “those racial and ethnic populations that are underrepresented in the medical profession relative to their numbers in the general population” (<https://www.aamc.org/initiatives/urm/>). Due to the very low number of Native American/American Indians in the physician workforce, this manuscript will use the term underrepresented minorities to indicate African-American race and/or Hispanic ethnicity. Among the most competitive medical subspecialties (i.e. radiation oncology, neurosurgery, interventional radiology, etc.), representation of underrepresented minorities at both the trainee and attending physician levels has historically been low compared to their representation in the general population as defined by the US Census.^{1–5} To date, such an analysis of underrepresented minority demographics has rarely been performed in radiation oncology,¹ with no previous analysis of resident research productivity by race. This study utilizes a current radiation oncology residency class to examine research productivity by race and ethnicity.

2. Materials and methods

A list of radiation oncology residents from the graduating class of 2022 (PGY-2 academic year of 2018–2019) was obtained through internet searches, using methodology similar to previously published work^{6–8}; race/ethnicity was identified from interviews and self-described internet depictions. Demographics included were gender, dual degree status (MPH, MS, MBA, JD, PhD), and presence/absence of a PhD as previously described.^{6,7} Research productivity was calculated using the number of pre-residency peer-reviewed publications (PRP) as previously described; PRP was compiled as the number of publications a resident had listed in PubMed (pubmed.gov) as of the end of the calendar year of residency application (2016 for the class of 2022).^{6,7} PRP was stratified a priori as zero, one, or more than one per resident based on previous work demonstrating statistical significance between these benchmarks.^{6,7} Statistical analysis was conducted using Fisher’s exact test, with significance assigned at $p < 0.05$ (GraphPad Software, San Diego, CA).

3. Results

Of 179 residents examined from the 2022 class, eleven (6.1%) were underrepresented minorities. Compared to the remainder of the class, underrepresented minorities had a lower proportion of men (63.6% versus 69.3%), a higher proportion of dual degrees (45.5% versus 28.6%), and a lower proportion of MD-PhD degrees (9.1% versus 17.2%).

Regarding research productivity, underrepresented minorities had a higher proportion of residents with at least two PRP (72.7% versus 57.1%) and at least one PRP (81.8% versus 75.6%), with a lower proportion of residents with zero PRP (18.2% versus 24.4%).

Specific comparisons between underrepresented minorities and the remainder of the class revealed no statistically significant differences in gender distribution, dual degree status, presence of a PhD, absence of PRP, or having at least two PRP ($p > 0.05$) (Fig. 1).

4. Discussion

Despite the clinical and economic benefits of embracing a racially and ethnically diverse radiation oncology workforce (including the benefits of leveraging diversity and inclusion into innovation and contribution),⁹ Hispanic ethnicity and African-American race have remained significantly underrepresented in radiation oncology compared to their representation in the general population according to the most recent US Census.^{4,9} Unfortunately, such underrepresentation remains prevalent in this study, as the US composition of Hispanic-Americans (12.5%) and African-Americans (13.8%) in the general population remains significantly larger than their representation in radiation oncology, which is only 6.1% combined in the residency class of 2022.⁴

Encouraging findings from this study are that the pre-residency research productivity of underrepresented minorities is in no way inferior to that of their resident peers; in fact, although not statistically significant, underrepresented minorities had a higher percentage of residents having at least one PRP (82% versus 76%; Fig. 1), which has been previously demonstrated to be associated with citation-based scholarly activity as a resident as well as future choice of academic over private practice career.^{7,8} This may be an indication that underrepresented minorities have to work harder than their colleagues to successfully matriculate into radiation oncology. There was also no significant difference in dual degree and/or PhD status, and there was no significant difference in gender distribution among underrepresented minorities.

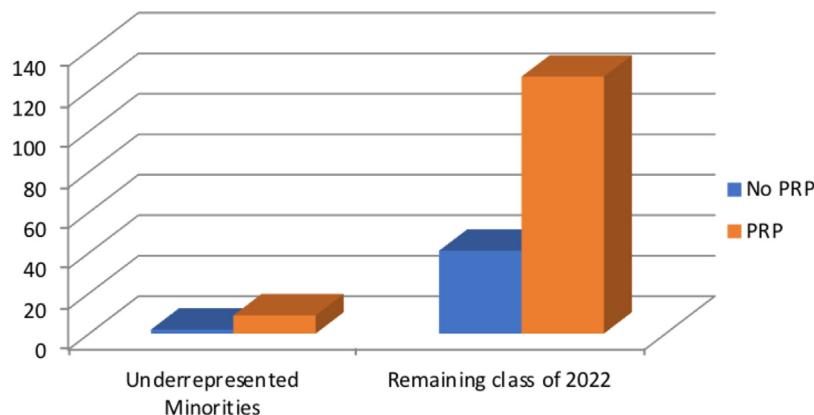


Fig. 1 – Depiction of research productivity comparing underrepresented minorities with the remaining radiation oncology resident class of 2022. Research productivity was measured by the presence/absence of at least one pre-residency peer-reviewed publications (PRP).

These results indicate that addressing the multitude of barriers hindering racial and ethnic diversity in radiation oncology (i.e. insufficient exposure in medical school, misperception of radiation oncology as non-patient care, delayed preparation of candidates to compete successfully for residency positions, etc.) can increase diversity without compromising present and future research productivity (defined from this analysis as PubMed publications) of the field.¹⁰

Limitations to this study include its inability to capture every radiation oncology resident from the class of 2022, reliance on interviews and internet depictions to identify underrepresented minorities, and its focus on US programs which may limit global applicability of these findings. A further limitation is the reliance of this work on PubMed to accurately reflect PRP; the increasing number of open-access journals (many of which are not listed in PubMed) increases the likelihood that applicants could have published in any of these journals and would have not had these publications counted in PRP analysis. Perhaps the largest limitation of this study is the extreme difference in sample size between the underrepresented minority cohort ($n=11$) versus the remainder of the class ($n=168$) which limits the ability of potentially important differences to reach statistical significance.

In conclusion, although a very small proportion of the recent Radiation Oncology resident population, underrepresented minorities were statistically comparable to the remainder of their junior resident class regarding gender distribution, dual degree status, and likelihood of having at least two peer-reviewed publications cited in PubMed during the calendar year of residency application. Further study will be needed to determine how these findings translate into citation-based scholarly activity and future academic versus private practice career choice following graduation.

Conflict of interest

None declared.

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None declared.

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REFERENCES

1. Chapman CH, Hwang WT, Deville C. Diversity based on race, ethnicity, and sex, of the US radiation oncology physician workforce. *Int J Radiat Oncol Biol Phys* 2013;**85**(4):912–8.
2. Higgins MC, Hwang WT, Richard C, et al. Underrepresentation of women and minorities in the United States IR academic physician workforce. *J Vasc Interv Radiol* 2016 Dec;**27**(12), 1837–1844e2.
3. Heron DE, Suntharalingam N, Winkfield KM, Regine WF. Obituary: Carl Mansfield, MD, ScD, FACR, FASTRO (1928–2018). *Int J Radiat Oncol Biol Phys* 2018;**101**(4):765–6.
4. Census Bureau U.S. Overview of Race and Hispanic Origin: 2010; 2011. p. 2018, vol. 2 Retrieved from <https://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf> on March.
5. McClelland 3rd S. The Montreal Neurological Institute: training of the first African–American neurosurgeons. *J Natl Med Assoc* 2007;**99**(9):1071–3.
6. McClelland 3rd S. Pre-residency peer-reviewed publications are associated with neurosurgery resident choice of academic compared to private practice careers. *J Clin Neurosci* 2010;**17**(3):287–9.
7. McClelland 3rd S, Thomas Jr CR, Wilson LD, et al. Association of pre-residency peer reviewed publications with radiation oncology resident choice of academic versus private practice career. *Pract Radiat Oncol* 2017;**7**(5):364–7.
8. McClelland 3rd S, Jaboin JJ. The relationship between pre-residency peer reviewed publications and subsequent citation-based scholarly activity of United States radiation oncology residents. *Int J Radiat Oncol Biol Phys* 2018;**102**(3):666–8.

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9. Lightfoote JB, Fielding JR, Deville C, et al. Improving diversity, inclusion, and representation in radiology and radiation oncology part 1: why these matter. *J Am Coll Radiol* 2014;**11**(7):673–80.
 10. Lightfoote JB, Deville C, Ma LD, et al. Diversity, inclusion, and representation: it is time to act. *J Am Coll Radiol* 2016;**13**(12 Pt A):1421–5.