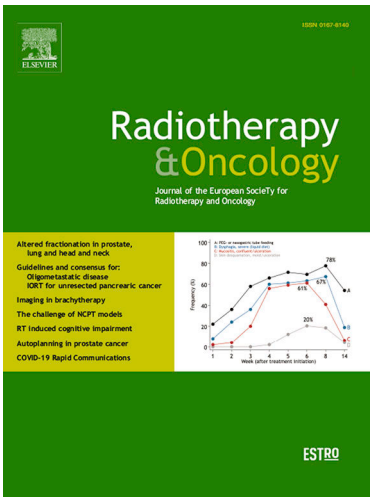
Journal Pre-proofs



Original Article

Establishing a benchmark of diversity, equity, inclusion and workforce engagement in radiation oncology in Europe – an ESTRO collaborative project

Anne Gasnier, Barbara Alicja Jereczek-Fossa, Matteo Pepa, Vincenzo Bagnardi, Samuele Frassoni, Sophie Perryck, Mateusz Spalek, Steven F. Petit, Jenny Bertholet, Ludwig J. Dubois, Pierfrancesco Franco

PII: S0167-8140(22)00190-6
DOI: https://doi.org/10.1016/j.radonc.2022.04.011
Reference: RADION 9213

To appear in: *Radiotherapy and Oncology*

Received Date: 30 November 2021
Revised Date: 1 April 2022
Accepted Date: 10 April 2022

Please cite this article as: Gasnier, A., Alicja Jereczek-Fossa, B., Pepa, M., Bagnardi, V., Frassoni, S., Perryck, S., Spalek, M., Petit, S.F., Bertholet, J., Dubois, L.J., Franco, P., Establishing a benchmark of diversity, equity, inclusion and workforce engagement in radiation oncology in Europe – an ESTRO collaborative project, *Radiotherapy and Oncology* (2022), doi: https://doi.org/10.1016/j.radonc.2022.04.011

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2022 Elsevier B.V. All rights reserved.

source: https://doi.org/10.48350/169523 | downloaded: 12.10.2024

Establishing a benchmark of diversity, equity, inclusion and workforce engagement in radiation oncology in Europe – an ESTRO collaborative project

Anne Gasnier[1,2], Barbara Alicja Jereczek-Fossa[3,4,5], Matteo Pepa[4], Vincenzo Bagnardi[6], Samuele Frassoni[6], Sophie Perryck[7,8], Mateusz Spalek[8,9], Steven F. Petit[8,10], Jenny Bertholet[8,11], Ludwig J. Dubois[8,12], Pierfrancesco Franco[8,13]

1 Radiotherapy Department, Gustave Roussy Cancer Campus, Villejuif, France
2 U1030 Molecular Radiotherapy and Innovative Therapeutics, Paris-Sud University - Gustave Roussy - Inserm - Paris-Saclay University, Villejuif, France
3 Department of Oncology and Hemato-oncology, University of Milan, Milan, Italy
4 Division of Radiotherapy, IEO European Institute of Oncology, IRCCS, Milan, Italy
5 European Society for Radiotherapy & Oncology (ESTRO) National Societies Committee, Brussels, Belgium
6 Department of Statistics and Quantitative Methods, University of Milan-Bicocca, Milan, Italy
7 Department of Radiation Oncology, University Hospital Zürich and University of Zurich, Zurich, Switzerland
8 European Society for Radiotherapy & Oncology (ESTRO) Young Committee, Brussels, Belgium
9 Department of Soft Tissue/Bone Sarcoma and Melanoma
Maria Sklodowska-Curie National Research Institute of Oncology, Warsaw, Poland
10 Department of Radiotherapy, Erasmus MC Cancer Institute, Rotterdam, The Netherlands
11 Division of Medical Radiation Physics and Department of Radiation Oncology, Inselspital, Bern University Hospital and University of Bern, Switzerland.
12 The M-Lab, Department of Precision Medicine, GROW – School for Oncology, Maastricht University, Maastricht, The Netherlands
13 Department of Translational Medicine, University of Eastern Piedmont, Novara, Italy

Corresponding author: Anne Gasnier. Radiotherapy Department, Gustave Roussy Cancer Campus, 114 Rue Edouard Vaillant, 94805 Villejuif, France ; tel : +33 1 42 11 24 94 ; anne.gasnier@gustaveroussy.fr

Establishing a benchmark of diversity, equity, inclusion and workforce engagement in radiation oncology in Europe – an ESTRO collaborative project

Journal Pre-proofs

Highlights

- ✓ Diversity, Equity & Inclusion is linked to improved care, research & staff engagement
- ✓ A survey among radiation oncology professionals was conducted in Europe
- ✓ The questionnaire was adapted from the Diversity Engagement Survey
- ✓ Inclusion scores were lower than American benchmark data for most factors
- ✓ Inclusion scores were lower for respondents who felt they belonged to minority groups

Journal Pre-proofs

A b s t r a c t

Background and purpose: Diversity, Equity and Inclusion (DEI) in the medical workforce is linked to improved patient care and innovation, as well as employee retention and engagement. The European Society for Radiotherapy and Oncology launched a survey to provide a benchmark of DEI and engagement among radiation oncology (RO) professionals in Europe.

Methods: An anonymous survey was disseminated among RO professionals in Europe. The survey collected demographics and professional information, and participants were asked if they felt they belonged to a minority group. A DEI and workforce engagement questionnaire by Person et al. evaluated 8 inclusion factors. A favourable score was calculated by adding the percentage of "strongly agreed" or "agreed" answers.

Results: A total of 812 complete responses were received from 35 European countries. 21% of respondents felt they belonged to a minority group, mostly based on race/ethnicity (5.9%), nationality (4.8%) and age (4.3%). Compared to benchmark data from the United States, scores were lower for most inclusion factors, and to a greater extent for minority groups. The overall favourable score was 58% for those belonging to a minority group, significantly lower than for other respondents (71%, $p<0.001$). Those belonging to a minority group because of their gender or age had the lowest overall favourable score (47% and 51% respectively).

Conclusions: Our work indicates that actions to improve DEI and workforce engagement among RO professionals in Europe are urgently needed, in particular among minority groups. This would potentially improve employee wellbeing and retention, promoting high quality care and innovation.

Keywords*:* Diversity, Equity, Inclusion, Engagement, Minority groups

Introduction

Several studies suggest that Diversity, Equity and Inclusion (DEI) in the medical workforce may improve patient care and innovation [1–3]. Diversity involves being mindful of differences such as age, gender identity, ethnicity, religion, sexual orientation, or disability status [4]. Equity means that everyone receives fair treatment and has equal access to opportunities, while inclusion of diverse individuals in the workplace is achieved by providing support, access to information, a sense of belonging and job security [4,5]. In the United States (US), it was shown that the oncology workforce did not reflect the diversity of the population served and that, when it occurs, patient outcomes are generally worse among underrepresented populations [6,7]. Hence, a diverse workforce would improve patient care [8,9]. For example, unconscious bias, which impacts one's judgment and behaviour despite an effort to behave in an egalitarian way [10,11], is less present in a diverse workforce, leading to less racial disparities in care [12].

It has also been demonstrated that diversity in academia leads to higher quality of science and education [13]. For example, more innovative research emerges from collaboration between people with different background [12]. Furthermore, diversity in the workforce has been linked to a better representation of diverse groups in clinical trials [9].

Finally, promoting DEI in the workplace improves employee retention and engagement at work, as individuals thrive in a professional environment where they feel valued and recognised [9]. Workforce engagement is a measure of how employees show enthusiasm for work and are connected

with the mission, vision and values of the organization [14]. Person et al. created a survey to measure the capacity of an institution to manage a diverse workforce by including and engaging all employees [4].

In the US, several individuals called for the promotion of diversity in radiation oncology [6,12] and professional bodies are now taking actions. For example, the American Society for Radiation Oncology (ASTRO) indicates diversity and inclusion as core values of the organization, on equal footing with excellence in patient care, improved outcomes, innovation and integrity [15]. The American Society of Clinical Oncology (ASCO) released an initiative to increase diversity in the oncology workforce [16].

While some European countries encourage data collection to promote equality [17], most only have limited data available regarding the current status of diversity within professional environments, and particularly within the radiation oncology workforce. Therefore, the Young and the National Society (NS) committees of the European Society for Radiotherapy and Oncology (ESTRO) launched a survey to assess DEI and workforce engagement in radiation oncology in Europe, and to compare the results with benchmark data from the US.

Materials and Methods

This survey was developed in collaboration with the ESTRO young and NS committees. This cross-sectional study included a first set of questions collecting demographics and professional information for stratification, including:

- Internal dimensions: age, gender, civil status, whether individuals felt they belonged to a minority group;
- Organizational dimensions: profession, seniority level, work location, professional setting, department size, ESTRO membership.

The second part comprised the DEI and workforce engagement questionnaire by Person et al. [4], rephrased with permission and used under a licensing agreement with the University of Massachusetts. This questionnaire is a validated instrument designed for academic medical centres to assess their capacity to promote DEI, resulting in workforce engagement. According to Person et al., employee engagement at work results from conditions that foster: 1) a shared sense of vision/purpose of the organization, 2) camaraderie, and 3) appreciation of the employee's contribution to the institution. The questionnaire comprises 22 items that evaluate 8 inclusion factors, which can be grouped under these 3 categories (Table 1). As a benchmark against which to assess our findings, we used the responses collected between 2011 and 2017 from more than 68,000 respondents working at 42 academic medical institutions (i.e. medical schools and their affiliated hospitals/clinics) across the US.

Vision/Purpose	**Meaning for individuals**
Common Purpose	They experience a connection to the mission and values of the organization
Access to Opportunity	They can find support for their professional development
Equitable Reward and Recognition	The organization has equitable compensation practices and non-financial incentives
Cultural Competence	They believe the institution can make use of its diverse workforce
Camaraderie	
Trust	They are confident that the practices and procedures of the organization will allow them to bring their best to work.
Sense of Belonging	They feel connected and accepted in the organization
Appreciation	

Appreciation of Individual Attributes	They are valued and can navigate the organizational structure
Respect	They experience a culture of respect

Table 1: 8 inclusion factors assessed by the questionnaire

In this study, the anonymous survey was disseminated online using the platform Survey Monkey (www.surveymonkey.com) and was compliant with the CHERRIES guidelines (Supplementary Table S1 [18]). Professionals working in the field of radiation oncology in Europe were invited to participate voluntarily via (a) email to ESTRO members, (b) social media (LinkedIn, Twitter, Facebook), (c) through the NS (ESTRO database) and (d) via personal networks. This survey was restricted to radiation oncology professionals working in one of the 53 European countries, as defined by the World Health Organization [19]; it was open to both members and non-members of ESTRO. Data were collected between 04/02 and 31/05/2021.

Analyses

Demographics and professional settings of the respondents were reported as percentages. To evaluate the representativeness of the studied sample, a Chi-square test was used to compare several demographic characteristics (age, gender, profession and country of work) between the respondents and the ESTRO distribution list (5,227 individuals).

For the DEI and workforce engagement questionnaire, the scores calculation was replicated from the work by Person et al. [4]. The 22 items were scored on a 5-point Likert scale (5=strongly agree to 1=strongly disagree). Respondents could indicate that they were unable to evaluate an item; this option was set to 3 (neither agree nor disagree) in this analysis. Eight inclusion factor scores and three cluster scores were created by summing the scores of related items. The favourable score for each question was calculated by adding the percent of people responding “strongly agreed” or “agreed”. The overall favourable score was calculated by averaging the favourable scores across all 22 items. The eight factors and three clusters scores were compared to previously described benchmark values [4]. The internal consistency of the questions measuring the same concept was evaluated by calculating Cronbach alphas with values of 0.7 and above deemed acceptable [4]. Comparisons of all scores, between professionals belonging to a minority group or not, were performed using Wilcoxon signed-rank test. All analyses were performed with the statistical software SAS 9.4 (SAS Institute, Cary, NC).

Results

A total of 987 answers was received; data were filtered to exclude respondents who did not complete all questions (143 answers), and those who did not agree to have their data presented (32 answers). This resulted in 812 complete answers from 35 European countries to be analysed.

Table 2 summarises demographic characteristics of the respondents and their professional setting. All age groups and professional categories were represented; the seniority level was equally distributed between group leaders, staff, and senior staff members. Most respondents were clinicians (57% either clinical, medical or radiation oncologists) while 27% were medical physicists, and 11% radiation therapy technologists (RTTs) or radiotherapy nurses. Other professional categories (such as radiobiologists or biomedical engineers) were also represented. As many as 23% (respectively 16%) of respondents were working in a country different from the one where they were born (respectively trained).

Gender identity	Female	54.7%
	Male	44.6%
	Non-binary	0.2%
	Prefer not to answer	0.5%
Civil status	Single / divorced / widowed	24.3%
	Married /in a civil union	69.3%

	Other	5.9%
	Prefer not to answer	0.5%
Age	<30 years old	11.1%
	31-40 years old	36.1%
	41-50 years old	25.1%
	51-60 years old	19.8%
	61-70 years old	7.3%
	>70 years old	0.5%
	Prefer not to answer	0.1%
City size	Small - medium town (population ≤ 100 000)	15.3%
	Medium city (population between 100 000 and 500 000)	45.7%
	Large (population ≥ 500 000)	39.0%
Workplace size	Small (e.g., less than 3 linacs)	21.8%
	Medium (e.g., 3 - 5 linacs)	43.8%
	Large (e.g., more than 5 linacs)	34.4%
Professional setting*	Clinical	87.7%
	Research	32.0%
	Academic	28.7%
	Other	3.0%
Seniority level	In-training	12.6%
	Staff	29.2%
	Senior staff	29.9%
	Head / group leader	26.5%
	Other	1.8%

** Respondents could select more than one answer*

Table 2: demographics and professional settings of the respondents

Seventy percent of the respondents were ESTRO members. The sample of respondents was representative of the ESTRO distribution list in terms of age, gender and profession when considering the relative proportion of clinicians, medical physicists, RTTs or radiotherapy nurses, and radiobiologists (Supplementary Table S2). However, other professions (such as physician assistants, quality & risk managers, researchers, and business employees) were more represented in the studied sample (7% of respondents compared to 2% in the mailing list). The respondents were not representative of the distribution list in terms of country of work, with certain countries being over-represented such as Italy (18% of respondents compared to 9% in the mailing list) and to a lesser extent France (7% vs 4%), Poland (6% vs 3%) and Romania (6% vs 3%), while other countries were underrepresented such as Germany (4% vs 10%), the Netherlands (11% vs 15%) or Spain (3% vs 6%).

Overall, 168 respondents (21%) felt they belonged to a minority group: 48 respondents (5.9%) for their race/ethnicity, 39 (4.8%) for their nationality, 35 (4.3%) for their age, 28 (3.4%) for their gender, 27 (3.3%) for their sexual orientation, 23 (2.8%) for their religion/belief or lack thereof, 5 (0.6%) for their disability status, 1 (0.1%) for their gender identity, and 29 (3.6%) for other reasons. Among those, 51 respondents (6.3%) felt they belonged to a minority group for more than one reason. While profession was not explicitly proposed as a minority criterion in the survey, 15 (1.8%) respondents also mentioned, in free text, their profession or specialisation as the reason they belonged to a minority group. Age, as a minority criterion, was more frequent among younger (under 40 years old) and older

respondents (above 60 years old) (Figure 1). Those who belonged to a minority group because of their gender were mostly female (89% female compared to 53% for other respondents), although some male individuals mentioned they were a minority within their department. Of note, the age, gender and profession statistics for subjects in the ESTRO mailing list are shown in Supplementary Table S2.

Responses to the DEI and workforce engagement questionnaire are shown in Supplementary Figure S1. Although 87% of respondents felt their work contributed to the mission of the workplace, 14% claimed their institution was not fair to all employees and that they did not receive recognition and praise for their good work, in a similar manner as others. Half of the respondents received support for working with diverse groups and in cross-cultural situations but 13% felt their institution did not manage diversity effectively.

Cronbach alphas, measuring the internal consistency of the 22 questions, ranged from 0.66 to 0.82 for the eight factors, and from 0.81 to 0.89 for the three clusters, with an overall value of 0.95 (Supplementary Table S3), demonstrating acceptable levels of internal consistency reliability except for the "sense of belonging" factor (0.66).

Scores for professionals belonging to a minority group or not were compared (Table 3). Figure 2 shows the comparison between the benchmark values and the 8 inclusion factors for the two groups, with scores and benchmark values expressed as a percentage of the maximum possible value. The overall favourable score for all respondents was 68.3%; it was 73% (33rd percentile) – 76% (66th percentile) for the benchmark value. The overall favourable score for minority groups was 58.1%, which was significantly lower than for other respondents (70.9%, p<0.001). When comparing the minority sub-groups, the lowest overall favourable score was obtained for those who selected "gender" as a minority criterion (47.4%) followed by those who selected "age" (50.9%).

	Range	**Belonging to a minority group**		
		No (N=644)	**Yes (N=168)**	**P-value**
Vision/Purpose	10-50	37.8	35.5	<0.001
Common Purpose	2-10	8.0	7.6	0.005
Access to Opportunity	2-10	7.7	7.3	0.012
Equitable Reward and Recognition	2-10	7.3	6.8	0.002
Cultural Competence	4-20	14.8	13.7	<0.001
Camaraderie	6-30	23.6	21.6	<0.001
Trust	3-15	11.5	10.2	<0.001
Sense of Belonging	3-15	12.1	11.4	<0.001
Appreciation	6-30	23.6	21.7	<0.001
Appreciation of Individual Attributes	3-15	11.6	10.8	<0.001
Respect	3-15	11.9	11.0	<0.001
Overall favourable score	0% – 100%	70.9%	58.1%	<0.001
		68.3%		

Table 3: comparison of the scores for professionals belonging to a minority group or not (Wilcoxon signed rank test). Scores for single questions ranged from 1 to 5; if multiple questions referred to the same factor, scores were added (as indicated by the range in the second column).

Discussion

This is the first study assessing DEI in the workplace and the level of workforce engagement amongst radiation oncology professionals in Europe. It reports on data from 812 radiation oncology professionals in 35 European countries. Compared to benchmark data from medical institutions in the US, favourable scores were lower for most inclusion factors as defined by Person et al. (Table 1), and to a greater extent for respondents who felt they belonged to a minority group. This calls for urgent action from institutions and professional bodies to promote DEI and increase the engagement at work of all radiation oncology professionals in Europe. This would improve employee wellbeing and retention [20], leading to high quality care and innovation, and is therefore an essential element of the ESTRO vision for 2030 promoting "Optimal Health for All, together", with an emphasis on inclusiveness [21].

The overall favourable score assessed whether respondents "agreed" or "strongly agreed" with all items related to the three clusters of "vision/purpose", "camaraderie" and "appreciation" in the workplace. This overall favourable score was 58% for respondents belonging to a minority group, significantly lower than for other respondents (71%). Both scores were lower than the 33rd percentile of the benchmark values (73%): the average score for European respondents was below the threshold of the lowest 33% scores in the US. This may indicate that respondents in Europe feel less connected to the vision/purpose of their organization and less valued compared to professionals in the US [4]. Compared to the 33rd percentile of the American benchmark value, European scores were lower for 6 out of 8 inclusion factors for respondents belonging to a minority group, and for 3 inclusion factors for other respondents: access to opportunity, cultural competence and respect factors. The largest difference between respondents belonging to a minority group or not was observed for the "trust" factor. Those belonging to a minority group felt that institutions could make better use of their diverse workforce ("cultural competence" factor), and that the culture of civility and positive regard for diverse perspectives could be improved ("respect" factor). When comparing minority sub-groups, those belonging to a minority group due to gender or age had the worst overall favourable score (47.4% and 50.9% respectively), with both sub-groups scoring particularly low for the "access to opportunity" factor.

These results show that DEI and workforce engagement must be encouraged in Europe. Institutions should develop a strong inclusive culture and encourage leaders to foster civility. They should set policies to support individuals subject to discrimination and to encourage diversity best practices, for example by organising unconscious bias workshops for leaders [22–24]. Hiring practices should be transparent, for example by setting criteria to standardize applicants' evaluations and mitigate bias during the hiring process [11]. Chapman et al. reported a bias during the recruitment of applicants from ethnic backgrounds that were underrepresented in medicine [10]. The access to opportunity could also be improved by setting up mentoring systems, organising outreach events or advertising jobs to a wide audience [12,25]. Organizations could also develop metrics to assess DEI and workforce engagement [4]. This survey could serve as an audit and be repeated after the implementation of new measures.

This study could also help target actions to specific sub-groups. For example, those who belonged to a minority group because of their gender had the lowest favourable score (47%), with gender being the 4th most cited minority criterion (3.4%). Respondents in this minority group were mostly female. Those who belonged to a minority due to their age had the second lowest favourable

score (51%), with age being the 3rd most cited minority criterion (4.3%). Respondents in this minority sub-group were more frequently under 40 or above 60 years of age. Profession or specialisation was also mentioned by 1.8% of respondents as a minority criterion in free text response. Promotion and recognition of all professions in radiation oncology is therefore an important factor. In particular, there is a lack of recognised RTT professional roles in some countries which may lead to poorer engagement. In Europe, ESTRO is working with RTT national societies to recommend and develop an education framework [26].

This work specifically focused on diversity in the work environment and we acknowledge several limitations. Our study may be affected by a selection bias: those belonging to a minority group or concerned by DEI might be more inclined to complete the survey. We showed that the sample of respondents was representative of the ESTRO distribution list in term of age, gender and profession regarding the relative proportion of clinicians, medical physicists, RTTs or radiotherapy nurses, and radiobiologists. However, other professions (such as physician assistants, quality and risk managers, researchers, or business employees) were more represented in this survey (6% in the sample compared to 2% in the ESTRO distribution list). This could indicate that respondents who felt they belonged to a minority because of their profession might be more inclined to complete this survey. In addition, the respondents were not representative of the distribution list in terms of country of work, with Italy, France and Poland being over-represented in this survey. One explanation could be that some of the co-authors are working in the aforementioned countries and may have shared the survey with their colleagues to a higher degree. In addition, the survey was opened to all radiation oncology professionals in Europe but the studied sample was compared to the ESTRO members, potentially lowering the generalizability of results; this was due to the availability of statistics for ESTRO members only.

Several respondents observed a lack of cultural difference in their department or institution. Lightfoote et al. previously showed that the workforce in radiation oncology did not reflect the diverse population in the US [8]. Unfortunately, we could not assess whether the sample for this survey was representative of the general population in Europe in terms of cultural diversity. In this study, 5.9% of respondents felt they belonged to a minority group due to their race/ethnicity and 4.8% due to their nationality. Also of interest is that 23% (respectively 16%) of respondents were working in a country different from the one where they were born (respectively trained).

Finally, benchmark values for the DEI and workforce engagement questionnaire [4] were obtained from answers by professionals working at medical academic institutions in the US, while this study focused at professionals working in radiation oncology in Europe. Differences seen in this study might indicate that the management of DEI is of secondary importance in institutions in Europe compared to the US. This cultural difference might have historical roots, with the US emphasising the need to address racial issues due to its past impacted by slavery and discrimination, while many countries in Europe are reluctant to collect data on ethnicity following the trauma of ethnic group genocide during World War II [27]. The lower scores compared to US benchmark data could also reflect on the specificities of radiation oncology compared to other medical specialties. For example, Odei et al. found that the proportion of female physicians working in radiation oncology was lower than in other medical specialties [25].

The COVID-19 pandemic has recently emphasised the need to encourage DEI in the medical workforce, with women caring for children and older adults being more impacted by the pandemic [29,30]. It also amplified existing issues such as a stretched healthcare system, in which professionals are at risk of burnout [20]. This has been shown across all professionals working in radiation oncology [31–34]. By integrating DEI in their core missions, institutions would help recruit and retain

experienced professionals in an understaffed workforce, improve care and promote ethical standards [12,20,35,36].

In conclusion, this work was an initial assessment of DEI and engagement at work of radiation oncology professionals in Europe, necessary to inform future projects and to develop recommendations. A follow-up qualitative study has been launched to deepen the understanding on how the organizational culture within a department could help improve work engagement and inclusiveness. We believe that DEI should be promoted and workforce engagement increased: it would help improve the quality of both treatments and research in radiation oncology by better representing and addressing the diversity among patients, helping to move towards personalized care, by encouraging heterogeneous perspectives to guide innovation, and by improving the well-being of professionals.

Acknowledgements

We would like to thank Pierfrancesco Franco and Ludwig Dubois for sharing the cost of the licence, ESTRO for logistic support and the dissemination of the survey, the NS committee for circulation within its network, and all the respondents for taking the time to fill out the survey.

Journal Pre-proofs

References

[1] Gomez LE, Bernet P. Diversity improves performance and outcomes. J Natl Med Assoc 2019;111:383–92. https://doi.org/10.1016/j.jnma.2019.01.006.

[2] Hofstra B, Kulkarni V v, Munoz-Najar Galvez S, He B, Jurafsky D, Mcfarland DA. The Diversity-Innovation Paradox in Science n.d. https://doi.org/10.1073/pnas.1915378117/-/DCSupplemental.

[3] Nielsen MW, Alegria S, Börjeson L, Etzkowitz H, Falk-Krzesinski HJ, Joshi A, et al. Gender diversity leads to better science. Proc Natl Acad Sci U S A 2017;114:1740–2. https://doi.org/10.1073/pnas.1700616114.

[4] Person SD, Jordan CG, Allison JJ, Fink Ogawa LM, Castillo-Page L, Conrad S, et al. Measuring Diversity and Inclusion in Academic Medicine: The Diversity Engagement Survey. Academic Medicine 2015;90:1675–83. https://doi.org/10.1097/ACM.0000000000000921.

[5] Bates C, Gordon L, Travis E, Chatterjee A, Chaudron L, Fivush B, et al. Striving for gender equity in academic medicine careers: A call to action. Academic Medicine 2016;91:1050–2. https://doi.org/10.1097/ACM.0000000000001283.

[6] Nead KT, Linos E, Vapiwala N. Increasing Diversity in Radiation Oncology: A Call to Action. Advances in Radiation Oncology 2019;4:226–8. https://doi.org/10.1016/j.adro.2018.11.009.

[7] Winkfield KM, Gabeau D. Why workforce diversity in oncology matters. International Journal of Radiation Oncology Biology Physics 2013;85:900–1. https://doi.org/10.1016/j.ijrobp.2012.11.004.

[8] Lightfoote JB, Fielding JR, Deville C, Gunderman RB, Morgan GN, Pandharipande P v., et al. Improving diversity, inclusion, and representation in radiology and radiation oncology part 1: Why these matter. Journal of the American College of Radiology 2014;11:673–80. https://doi.org/10.1016/j.jacr.2014.03.007.

[9] Rosenkranz KM, Arora TK, Termuhlen PM, Stain SC, Misra S, Dent D, et al. Diversity, Equity and Inclusion in Medicine: Why It Matters and How do We Achieve It? Journal of Surgical Education 2021;78:1058–65. https://doi.org/10.1016/j.jsurg.2020.11.013.

[10] Chapman B v, Rooney MK, Ludmir EB, De D, Cruz L, Salcedo A, et al. Linguistic Biases in Letters of Recommendation for Radiation Oncology Residency Applicants from 2015 to 2019. Journal of Cancer Education 2020. https://doi.org/10.1007/s13187-020.

[11] Diaz DA, Suneja G, Jagsi R, Barry P, Thomas CR, Deville C, et al. Mitigating Implicit Bias in Radiation Oncology. Advances in Radiation Oncology 2021;6. https://doi.org/10.1016/j.adro.2021.100738.

[12] Chapman CH, Jagsi R. The Ethical Imperative and Evidence-Based Strategies to Ensure Equity and Diversity in Radiation Oncology. International Journal of Radiation Oncology Biology Physics 2017;99:269–74. https://doi.org/10.1016/j.ijrobp.2017.04.015.

[13] Campbell LG, Mehtani S, Dozier ME, Rinehart J. Gender-heterogeneous working groups produce higher quality science. PLoS ONE 2013;8. https://doi.org/10.1371/journal.pone.0079147.

Journal Pre-proofs

[14] Owens K, Eggers J, Keller S, McDonald A. The imperative of culture: A quantitative analysis of the impact of culture on workforce engagement, patient experience, physician engagement, value-based purchasing, and turnover. Journal of Healthcare Leadership 2017;9:25–31. https://doi.org/10.2147/JHL.S126381.

[15] Strategic Plan n.d. https://www.astro.org/About-ASTRO/Strategic_Plan (accessed November 24, 2021).

[16] Diversity in Oncology Initiative n.d. https://www.asco.org/news-initiatives/current-initiatives/cancer-care-initiatives/diversity-oncology-initiative (accessed November 24, 2021).

[17] Farkas L. Data collection in the field of ethnicity 2017. https://ec.europa.eu/info/sites/default/files/data_collection_in_the_field_of_ethnicity.pdf (accessed November 25, 2021).

[18] Eysenbach G. Improving the quality of web surveys: The Checklist for Reporting Results of Internet E-Surveys (CHERRIES). Journal of Medical Internet Research 2004;6. https://doi.org/10.2196/jmir.6.3.e34.

[19] Countries n.d. https://www.euro.who.int/en/countries (accessed November 24, 2021).

[20] The Lancet. Medical professionalism and physician wellbeing. The Lancet 2021;398:817. https://doi.org/10.1016/S0140-6736(21)01966-8.

[21] Lievens Y, Ricardi U, Poortmans P, Verellen D, Gasparotto C, Verfaillie C, et al. Radiation Oncology. Optimal Health for All, Together. ESTRO vision, 2030. Radiotherapy and Oncology 2019;136:86–97. https://doi.org/10.1016/j.radonc.2019.03.031.

[22] Aysola J, Harris Di, Huo H, Wright CS, Higginbotham E. Measuring Organizational Cultural Competence to Promote Diversity in Academic Healthcare Organizations. Health Equity 2018;2:316–20. https://doi.org/10.1089/heq.2018.0007.

[23] Aysola J, Barg FK, Martinez AB, Kearney M, Agesa K, Carmona C, et al. Perceptions of Factors Associated With Inclusive Work and Learning Environments in Health Care Organizations: A Qualitative Narrative Analysis. JAMA Netw Open 2018;1:e181003. https://doi.org/10.1001/jamanetworkopen.2018.1003.

[24] Jones RD, Chapman CH, Holliday EB, Lalani N, Wilson E, Bonner JA, et al. Qualitative Assessment of Academic Radiation Oncology Department Chairs' Insights on Diversity, Equity, and Inclusion: Progress, Challenges, and Future Aspirations. International Journal of Radiation Oncology Biology Physics 2018;101:30–45. https://doi.org/10.1016/j.ijrobp.2018.01.012.

[25] Derck J, Yates E, Kuo M, Hwang C, Sturdavant W, Ross P, et al. Exploring the Impact Factor: Medical Students Mentoring High School Students and Cultivating Cultural Humility. Health Equity 2018;2:15–21. https://doi.org/10.1089/heq.2017.0025.

[26] Coffey M, Leech M. The European Society of Radiotherapy and Oncology (ESTRO) European Higher Education Area levels 7 and 8 postgraduate benchmarking document for Radiation TherapisTs (RTTs). Technical Innovations and Patient Support in Radiation Oncology 2018;8:22–40. https://doi.org/10.1016/j.tipsro.2018.09.009.

[27] Docteur E, Berenson RA. In Pursuit of Health Equity: Comparing U.S. and EU Approaches to Eliminating Disparities 2014. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2462922 (accessed November 24, 2021).

[28] Odei B, Kahn J, Holliday EB, Diaz DA, Bello-Pardo E, Odei J, et al. Where Are the Women in Radiation Oncology? A Cross-Sectional Multi-Specialty Comparative Analysis. Advances in Radiation Oncology 2021;6. https://doi.org/10.1016/j.adro.2021.100735.

[29] Paradis KC, Ryan KA, Schmid S, Moran JM, Laucis AM, Chapman CH, et al. Gender Differences in Work–Life Integration Among Medical Physicists. Advances in Radiation Oncology 2021;6. https://doi.org/10.1016/j.adro.2021.100724.

[30] Salles A, Jagsi R. Institutional imperatives for the advancement of women in medicine and science through the COVID-19 pandemic. The Lancet 2021;398:937–9. https://doi.org/10.1016/S0140-6736(21)01912-7.

[31] di Tella M, Tesio V, Bertholet J, Gasnier A, Gonzalez del Portillo E, Spalek M, et al. Professional quality of life and burnout among medical physicists working in radiation oncology: The role of alexithymia and empathy. Physics and Imaging in Radiation Oncology 2020;15:38–43. https://doi.org/10.1016/j.phro.2020.07.001.

[32] Franco P, Tesio V, Bertholet J, Gasnier A, Gonzalez del Portillo E, Spalek M, et al. Professional quality of life and burnout amongst radiation oncologists: The impact of alexithymia and empathy. Radiotherapy and Oncology 2020;147:162–8. https://doi.org/10.1016/j.radonc.2020.05.017.

[33] Franco P, di Tella M, Tesio V, Gasnier A, Petit S, Spalek M, et al. Alexithymia and professional quality of life in radiation oncology: The moderator effect of the professional profile. Radiotherapy and Oncology 2021;158:48–54. https://doi.org/10.1016/j.radonc.2021.01.033.

[34] Franco P, Tesio V, Bertholet J, Gasnier A, Gonzalez del Portillo E, Spalek M, et al. The role of alexithymia and empathy on radiation therapists' professional quality of life. Technical Innovations and Patient Support in Radiation Oncology 2020;15:29–36. https://doi.org/10.1016/j.tipsro.2020.07.001.

[35] Kamran SC, Yerramilli D, Vapiwala N. No Talent Left Behind: A Silver Lining for Diversity in Radiation Oncology in the Post–Coronavirus Disease 2019 (COVID-19) Era. International Journal of Radiation Oncology Biology Physics 2020;108:472–4. https://doi.org/10.1016/j.ijrobp.2020.05.055.

[36] Skourou C, Sherouse GW, Bahar N, Bauer LA, Fairobent L, Freedman DJ, et al. Code of ethics for the American Association of Physicists in Medicine (Revised): Report of Task Group 109. Medical Physics 2019;46:e79–93. https://doi.org/10.1002/mp.13351.

Journal Pre-proofs

Conflict of interest : none

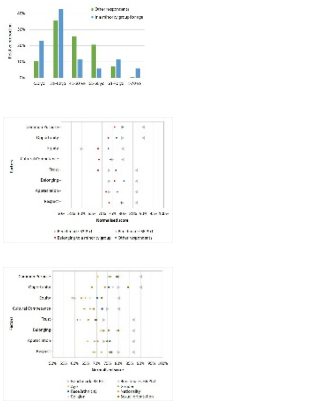
The authors disclose no conflict of interest.

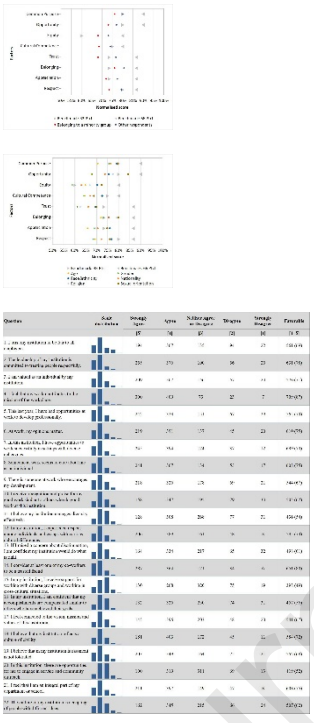
Figure 1: age of those in a minority group due to their age, compared to other respondents

Figure 2: normalized inclusion factor scores compared to normalized benchmark values
The upper figure summarises the scores for professionals belonging to a minority group (red dots) or not, and the lower figure details scores for each minority subgroup

==========
Supplementary files:

Figure S1: DEI and workforce engagement questionnaire: distribution of the answers to the 22 questions (N=812)





Journal Pre-proofs