



# OPEN Demographic variations and temporal trends in hospice and palliative care fellowship matches in the United States

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This study examines trends in application and match rates for the United States Hospice and Palliative Care Fellowship Match, focusing on demographic variations, competitiveness, and match success across applicant types. This retrospective study analyzed data from the National Resident Matching Program for Hospice and Palliative Care fellowships from 2016 to 2024, including applicant demographics and match outcomes. Chi-square tests were used to assess differences and temporal trends were evaluated with Mann–Kendall tests, and statistical significance was set at  $p < 0.05$ . Our results were that the number of fellowship programs increased from 122 in 2016 to 185 in 2024 (51.6% increase), with positions rising from 280 to 451 (61.1% increase). Applicants grew by 75.2%, from 259 to 454. US MDs had significantly higher match rates than non-US MDs (86.1% vs. 79.8%,  $p < 0.001$ ). Female applicants were significantly overrepresented in Hospice and Palliative Care fellowships compared to all fellowships (64.9% vs. 47.0%,  $p < 0.001$ ), while males were underrepresented (33.4% vs. 51.4%,  $p < 0.001$ ). A higher proportion of matched applicants were from rural areas compared to all fellowships (16.0% vs. 13.1%,  $p = 0.040$ ). In conclusion, the number of Hospice and Palliative Care fellowship programs, positions, and applicants has increased. Female applicants, compared to males, and White applicants, relative to their representation in all fellowships, accounted for a larger proportion of applications and had higher match rates. Heterosexual applicants were less likely to pursue Hospice and Palliative Care fellowships compared to all specialties.

**Keywords** Trends, Hospice, Palliative care, Hospice, Fellowship, Epidemiology, NRMP, Disparities

## Abbreviations

ACGME	Accreditation council for graduate medical education
NRMP	National resident matching program
IMG	International medical graduate
MD	Doctor of medicine
DO	Doctor of osteopathic medicine

Hospice and Palliative Care fellowships are specialized training programs within the broader field of medicine, designed to equip physicians with advanced expertise in delivering compassionate care to patients with serious, life-limiting illnesses. These programs are accredited by the Accreditation Council for Graduate Medical Education (ACGME) and have gained prominence due to the increasing demand for skilled hospice and palliative care practitioners, driven by an aging population and evolving healthcare needs<sup>1</sup>.

The National Resident Matching Program (NRMP) provides annual data on match outcomes, offering insights into the competitiveness and trends within various medical specialties, including Hospice and Palliative Care<sup>2</sup>. Over the past decade, the Hospice and Palliative Care fellowship match has experienced fluctuations in

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both the number of available positions and the number of applicants. As the demand for hospice and palliative care specialists continues to grow, it is critical to examine how demographic factors, such as race, sex, and international medical graduate (IMG) status, impact applicants' chances of securing fellowship positions<sup>3</sup>.

This study seeks to address gaps in the literature by analyzing demographic variations and temporal trends in the United States Hospice and Palliative Care fellowship match from 2016 to 2024. The objectives are to evaluate the overall competitiveness of the fellowship, examine changes in applicant characteristics—including sex, race, ethnicity, and medical school location (US medical graduate versus IMG)—over time, and determine the association of these factors with match rates.

We hypothesize that while the total number of palliative care fellowship positions has increased, the number of applicants has fluctuated, likely influenced by demographic and geographical factors. By analyzing these trends in match outcomes, this study aims to inform strategies to improve recruitment efforts and enhance the inclusivity and accessibility of Hospice and Palliative Care training programs in the United States.

## Methodology

This retrospective study analyzed publicly accessible data from the NRMP database on Hospice and Palliative Care fellowship match outcomes for the years 2016 through 2024<sup>4,5</sup>. Previous studies have leveraged similar data to explore match results across various specialties<sup>6–8</sup>. As the data was anonymized and publicly available, no institutional review board (IRB) approval was necessary.

To examine trends over an 8-year period, we collected yearly data on Hospice and Palliative Care applicants, matches, ranked positions, and filled positions. The dataset provided figures for U.S. allopathic (MD) graduates, which allowed us to estimate match rates for non-U.S. allopathic (MD) graduates. Non-U.S. MD graduates include U.S. osteopathic (DO) graduates, U.S. IMGs, non-U.S. IMGs, 5th pathway graduates, and Canadian medical graduates. In addition to examining trends, we used a two-tailed Chi-square test to determine the association between IMG status and successful match throughout the study period.

The data also included percentages of matched allopathic, osteopathic, U.S. IMGs, and non-U.S. IMGs, expressed as a proportion of all Hospice and Palliative Care fellows. We investigated how applicants matched their first, second, third, or subsequent choice of Hospice and Palliative Care program. Temporal changes were analyzed using the Mann–Kendall trend test, with Kendall's Tau used to quantify the strength and direction of the trends, and *p*-values < 0.05 determining statistical significance.

Demographic data for the 2023 and 2024 application years were also available, as the NRMP began publicly reporting demographic information in 2023. Key demographic variables included sex, race, ethnicity, urban versus rural status, and first-generation status for college or medical school. These demographics were analyzed for both Hospice and Palliative Care applicants and those who matched, and were also compared to applicants and those who matched across all fellowships combined. Match rates were calculated and analyzed by these demographic categories. Potential disparities between applicants and matched individuals were evaluated using a two-tailed Chi-square test. Statistical significance was defined by a *p*-value of less than 0.05. All statistical analyses were conducted using XLSTAT software (RRID:SCR\_016299).

## Results

### Number of programs, positions, applicants, and percentage of positions filled

The total number of training programs rose from 122 in 2016 to 185 in 2024, a 51.6% increase ( $\tau = 0.944$ ,  $p < 0.001$ ), with available fellowship positions also increasing from 280 to 451 a 61.07% increase, ( $\tau = 0.944$ ,  $p < 0.001$ ). The number of fellowship applicants also increased from 259 in 2016 to 454 in 2024, a 75.2% increase, ( $\tau = 0.944$ ,  $p < 0.001$ ). There was no significant difference in the percentage of filled positions, 80.7% in 2016 and 83.1% in 2024 ( $\tau = 0.056$ ,  $p = 0.910$ ) (Fig. 1; Table 1).

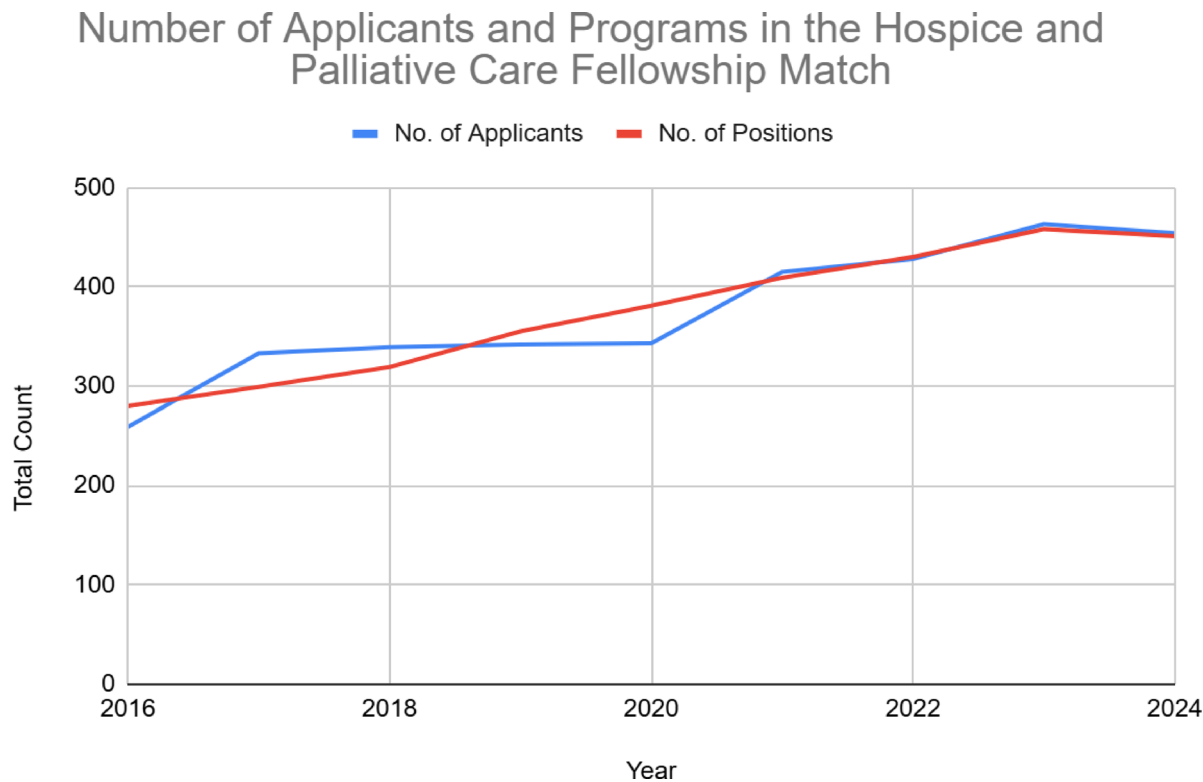
### Demographic and urbanization status variations

In 2023 and 2024, 423 female applicants (64.9%) and 218 male applicants (33.4%) applied for the Palliative Care fellowship, with the remainder not identifying as male or female, or preferring not to answer. Females were more likely to apply for Hospice and Palliative care compared to females applying to all fellowships (64.9% vs. 47.0%,  $p < 0.001$ ) and constituted a significantly greater proportion of matched applicants than all fellowships combined (65.1% vs. 48.7%,  $p < 0.001$ ). Conversely, males were less likely to apply to Hospice and Palliative Care fellowship (33.4% vs. 51.4%,  $p < 0.001$ ) and were significantly underrepresented in Hospice and Palliative Care compared to matched applicants of all fellowships (33.1% vs. 49.8%,  $p < 0.001$ ). Females were also significantly more likely to apply and match to Palliative Care fellowship than males of the same category ( $p < 0.001$  for both comparisons).

Asian applicants were less likely to apply to Hospice and Palliative Care compared to all fellowships (25.9% vs. 32.4%,  $p < 0.001$ ), while White applicants were more likely to apply to Hospice and Palliative Care than to all fellowships (58.7% vs. 49.8%,  $p < 0.001$ ). Similar trends for seen those actually matched into Hospice and Palliative Care fellowship (Asian applicants that matched in Hospice and Palliative Care fellowship versus all fellowships: 26.7% vs. 31.3%,  $p < 0.001$ ; White applicants that matched in Hospice and Palliative Care fellowship versus all fellowships: 58% vs. 51.7%,  $p < 0.001$ ).

There was no statistical difference in the proportion of applicants from rural areas applying to Hospice and Palliative Care versus to all fellowships (16.0% vs. 13.3%,  $p = 0.055$ ). In contrast, applicants from urban areas were less likely to apply to Hospice and Palliative Care than all fellowships (22.7% vs. 26.7%,  $p = 0.024$ ) (Table 2). Trends were also calculated among those from rural (16.0% vs. 13.1%,  $p = 0.040$ ) versus urban (23.0% vs. 25.5%,  $p = 0.148$ ) areas who ultimately matched.

Heterosexual applicants were significantly less likely to apply to Hospice and Palliative Care than all fellowships (79.1% vs. 87.2%,  $p < 0.001$ ), while gay/lesbian and bisexual applicants applied to Hospice and Palliative Care



**Fig. 1.** Temporal trends in the number of hospice and palliative care positions and applicants.

Year	US MD	Non- US MD
2016	85.7	89.3
2017	79.5	80.7
2018	84.0	73.7
2019	86.8	78.3
2020	87.0	82.7
2021	86.7	79.5
2022	87.3	83.7
2023	87.4	79.6
2024	88.8	73.5
Total	86.1	79.8
Tau	0.788	−0.222
P-value	0.002	0.477

**Table 1.** Match rates of US MD versus Non-US MD graduates.

at significantly higher rates than all other fellowships ( $p=0.045$  and  $p<0.001$  respectively). Similarly, matched heterosexual applicants were significantly underrepresented compared to all fellowships (79.2% vs. 87.1%,  $p<0.001$ ), while matched applicants identifying as bisexual made up a significantly higher proportion of the matched demographic than all fellowships (5.4% vs. 2.3%,  $p<0.001$ ). Matched gay/lesbian applicants also trended towards a higher representation in the Hospice and Palliative Care match, although this finding was not statistically significant (3.5% vs. 4.9%,  $p=0.075$ ). These demographic details are highlighted in Table 2.

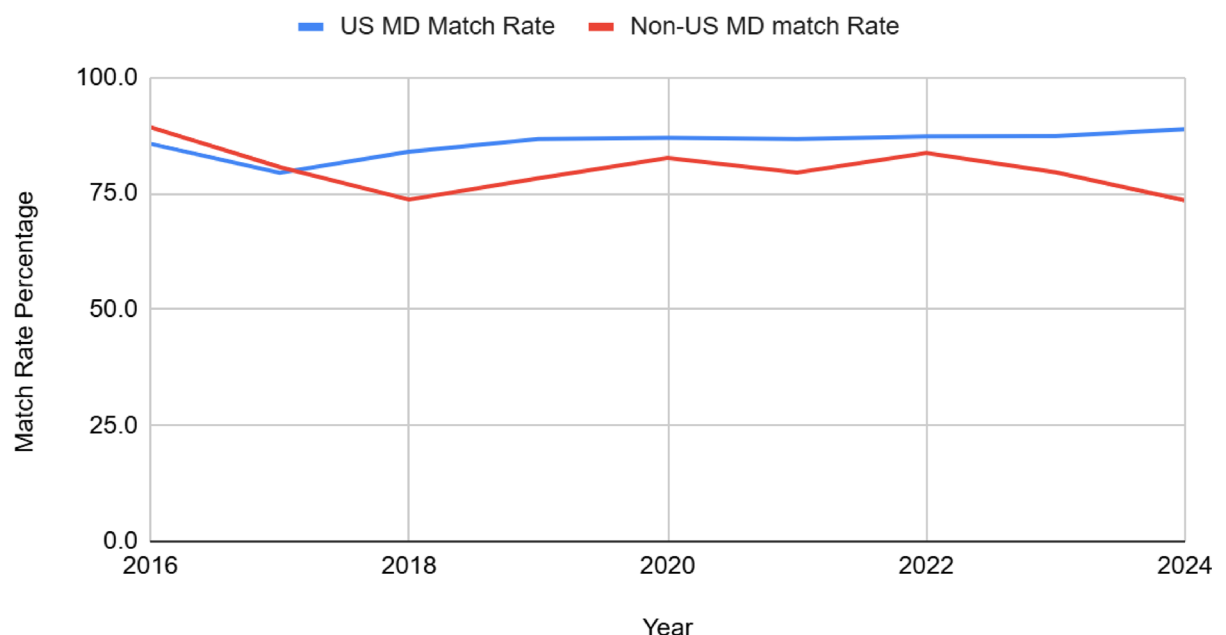
**Match rates of US MD versus non-US MD graduates**

US MD graduates had a significantly higher match rate than non-US MD graduates over the study period (86.1% vs. 79.8%,  $p<0.001$ ). However, during the initial study period, 2016 and 2017 US MD had a lower match rate than non-US MD graduates (85.7% vs. 89.3% in 2016), (79.5 vs 80.7 in 2017). Over time, there was a slight increase in the annual match rate for US MD graduates (85.7% in 2016 to 88.8% in 2024,  $\tau=0.778$ ,  $p=0.002$ ), while there was a decrease in the annual match rate for non-US MD graduates (89.3% to 79.8%) which was not statistically significant ( $\tau=-0.222$ ,  $p=0.477$ ) (Fig. 2; Table 3).

	Applicant Hosp/Palliative	Matched Hosp/Palliative	Percent matched	Chi-squared (Applicant vs. Matched)
Female	423	400	94.6	0.920
Male	218	203	93.1	0.888
Bisexual	33	33	100.0	0.802
Gay/Lesbian	31	30	96.8	0.913
Heterosexual	516	486	94.2	0.996
Asian	169	164	97.0	0.750
Black	30	28	93.3	0.972
White	383	356	93.0	0.784
Hispanic	61	59	96.7	0.878
Rural	104	98	94.2	0.996
Suburban	381	356	93.4	0.870
Urban	148	141	95.3	0.911
1st Generation to go to College	93	84	90.3	0.765
1st Generation to go to Medical School	475	439	92.4	0.591
Total	652	614	94.2	

**Table 2.** Hospice and palliative care demographic applicants and matched applicants.

## Match Rates in Hospice and Palliative Care Fellowship Match



**Fig. 2.** Temporal trends in match rates between US MD and non-US MD graduates.

### Variations in the percentage of US MD, US DO, US IMG, and non-US IMG graduates

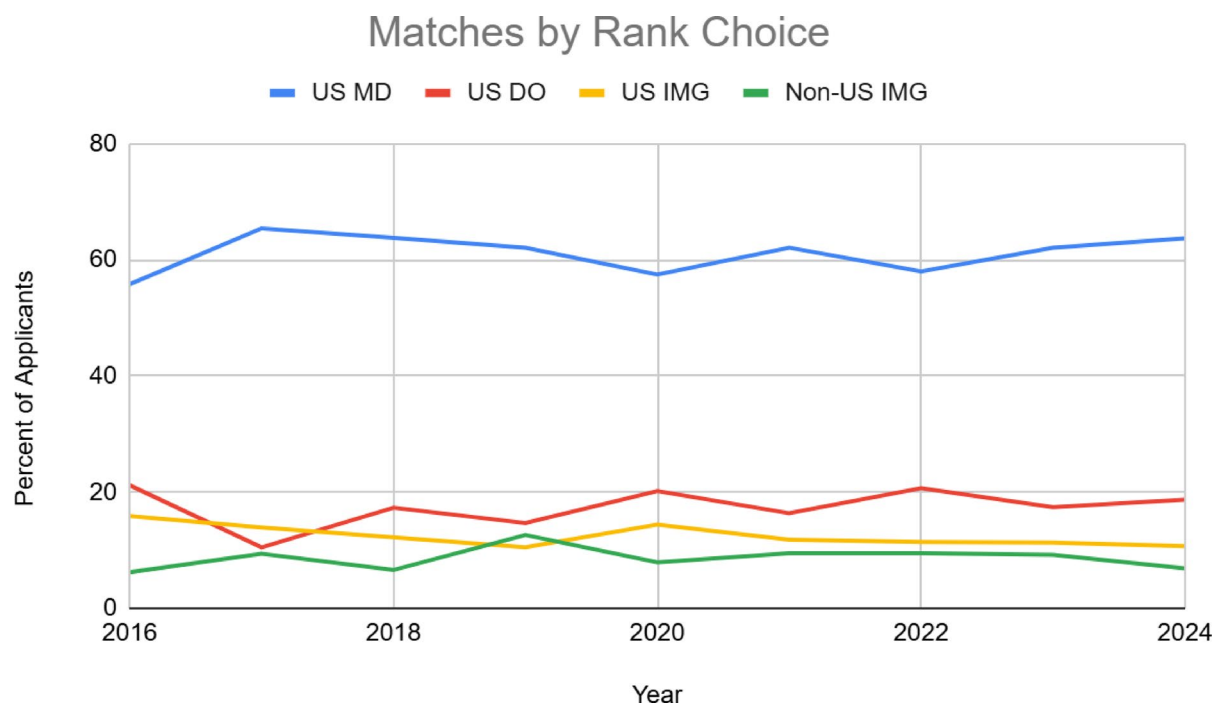
The number of US MD graduates in Hospice and Palliative care fellowship trended towards an increase from 55.8 to 63.7%, though this change was not statistically significant ( $\tau = -0.029$ ,  $p = 0.915$ ). Similarly, for non-US IMGs ( $\tau = -0.141$ ,  $p = 0.600$ ), and US DOs ( $\tau = 0.167$ ,  $p = 0.612$ ) the trend remained unchanged. In contrast, the only statistically significant trend among medical training backgrounds was with US IMGs, with the percentage in Hospice and Palliative Care fellowship decreasing significantly from 15.9% to 10.7% over the study period ( $\tau = -0.611$ ,  $p = 0.025$ ) (Fig. 3; Table 4).

### Applicant match data by choice of program

Over the 8-year study period, trends in the percentage of applicants matching to their first-choice program ( $\tau = -0.333$ ,  $p = 0.260$ ), second choice ( $\tau = 0.222$ ,  $p = 0.477$ ), third choice ( $\tau = 0.514$ ,  $p = 0.058$ ), or fourth or lower choice ( $\tau = 0.310$ ,  $p = 0.249$ ) remained unchanged (Fig. 4; Table 5).

Year	Total number of applicants	Total number of positions
2016	259	280
2017	333	299
2018	339	319
2019	342	355
2020	343	381
2021	415	409
2022	428	430
2023	463	458
2024	454	451
Tau	0.94	0.94
p-value	<0.001	<0.001

**Table 3.** Palliative care fellowship match data on available positions.



**Fig. 3.** Temporal trends in demographics of matriculating match candidates.

Year	US MD	US DO	US IMG	Non US-IMG
2016	55.8	21.2	15.9	6.2
2017	65.4	10.5	13.9	9.4
2018	63.8	17.3	12.2	6.6
2019	62.1	14.7	10.5	12.6
2020	57.5	20.2	14.4	7.9
2021	62.1	16.4	11.8	9.5
2022	58	20.7	11.4	9.5
2023	62.1	17.4	11.3	9.2
2024	63.7	18.7	10.7	6.9
Tau	0.029	0.167	-0.611	0.141
P-value	0.915	0.612	0.025	0.600

**Table 4.** Variations among US MD, US DO, US IMG, and non-US IMG graduates.

## 1st Choice, 2nd Choice, 3rd Choice and >3rd Choice

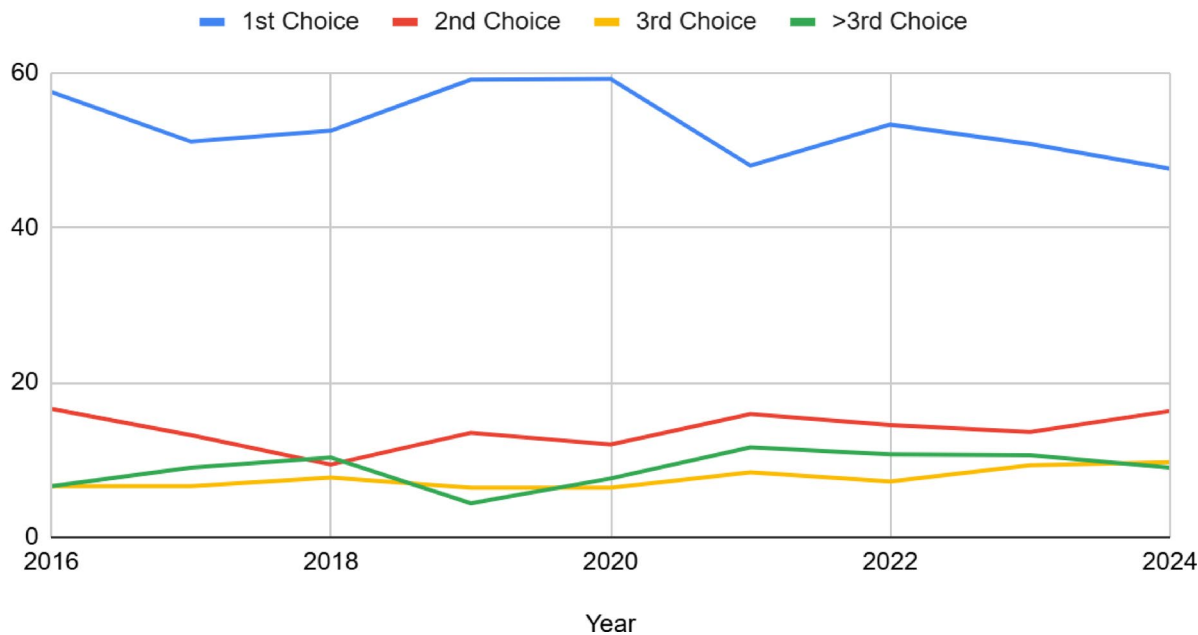


Fig. 4. Temporal trends in matches by rank choice.

Year	Matches by rank choice			
	1st choice	2nd choice	3rd choice	> 3rd choice
2016	57.5	16.6	6.6	6.6
2017	51.1	13.2	6.6	9.0
2018	52.5	9.4	7.7	10.3
2019	59.1	13.5	6.4	4.4
2020	59.2	12.0	6.4	7.6
2021	48	15.9	8.4	11.6
2022	53.3	14.5	7.2	10.7
2023	50.8	13.6	9.3	10.6
2024	47.6	16.3	9.7	9.0
Tau	−0.333	0.222	0.514	0.310
P-value	0.260	0.477	0.058	0.249

Table 5. Palliative care matches by rank choice.

### Unmatched applicants

The percentage of unmatched applicants showed a statistically significant decrease from 12.7% in 2016 to 8.4% in 2024 ( $\tau = -0.783$ ,  $p = 0.004$ ).

### Discussion

This study provides the first comprehensive analysis of demographic variations and temporal trends in the United States Hospice and Hospice and Palliative Care fellowship match data from the NRMP. Over the study period, the number of Palliative Care fellowship training programs, positions, and applicants increased. Female applicants represented a larger proportion of applications and had significantly higher match rates than males. White applicants were more likely to apply for and match into Hospice and Palliative Care fellowships compared to their representation in all fellowships. Heterosexual applicants were less likely to pursue Hospice and Palliative Care fellowships compared to all fellowships. US MDs demonstrated higher match rates than non-US MDs. Lastly, the rate of applicants going unmatched has decreased over the study period.

Our study reveals that females are more likely to apply for and match into Hospice and Palliative Care fellowships compared to their representation in all fellowships. Moreover, significantly more females applied than males (423 vs. 219 applicants). This trend is noteworthy and aligns with prior research indicating that sex-specific factors, such as the perceived alignment of a specialty with personal values and professional aspirations,

significantly influence subspecialty selection<sup>9</sup>. A survey by LeGrand and Heintz et al. (2012) investigating the demographics, motivations, and decision-making processes of residents pursuing palliative medicine fellowships found that a majority of respondents (61%) were women<sup>9</sup>. Female physicians often gravitate toward fields like Hospice and Palliative Care, which prioritize work-life balance and patient-centered care<sup>10</sup>. Moreover, this may stem from the fellowship's potential to offer career transitions into less chaotic, procedure-intensive settings. Conversely, males demonstrate substantially lower interest in Hospice and Palliative Care, a pattern also observed in pediatric palliative care<sup>11</sup>. However, the match rates between females and males were similar, with only a small difference (94.6% vs. 93.1%), suggesting minimal clinical significance.

Racial disparities were evident in our analysis. Compared to all fellowships, Asian applicants were less likely to apply for or match into Hospice and Palliative Care fellowships, whereas White applicants showed the opposite trend. These findings align with research from other subspecialties, where factors such as mentorship availability, cultural influences, and the perceived emotional demands of the specialty play a significant role<sup>12</sup>. To effectively meet the diverse needs of patients, it is essential for the Hospice and Palliative Care workforce to become more inclusive and diverse. Although our study found no significant differences in application or match rates for Black individuals, this could be attributed to the underpowered nature of the outcome. Existing research highlights a severe lack of racial diversity in palliative medicine, with fewer than 5% of hospice and palliative medicine fellows identifying as Black. Research by Bell et al. underscores critical disparities in palliative care training among Black medical trainees, particularly at institutions with higher percentages of Black student enrollment<sup>13</sup>. Additionally, none of the historically Black colleges and universities with medical schools offer dedicated palliative care training, such as courses, clerkships, rotations, or affiliated hospice and palliative care fellowship programs<sup>13</sup>. Moreover, institutions with the highest Black student enrollment were less likely to provide palliative care training during internal or family medicine residencies compared to those with the lowest Black enrollment<sup>13</sup>. Addressing these racial gaps is crucial to fostering a more equitable and representative healthcare workforce. The fellowship, however, demonstrated notable diversity and inclusion within its workforce, with a higher number of bisexual applicants and a trend toward greater representation of gay and lesbian applicants compared to their representation in all fellowships.

Notable geographic trends were observed in match rates and fellowship applicants. Rural applicants were more likely than urban applicants to match into Hospice and Palliative Care fellowships, potentially reflecting a stronger commitment to addressing the high demand for Palliative Care services in underserved rural areas. This finding supports the hypothesis that rural programs often attract applicants driven by a dedication to bridging rural healthcare gaps, including the need for Palliative Care services. Conversely, applicants from metropolitan areas showed a preference for more technologically complex specializations<sup>14</sup>. This contrast underscores the diverse motivations and preferences influencing medical career trajectories, shaped by geographic and program-specific contexts.

Significant variations in match rates were observed based on educational backgrounds, with US MDs matching at significantly higher rates than non-US MDs, and this disparity increasing over time. Similar patterns have been documented in other subspecialties where US MD graduates typically have an advantage in the matching process<sup>15</sup>. This trend may be attributed to program preferences for applicants who do not require visa sponsorship. Lastly, compared to other applicants in our demographic dataset, those who were the first in their family to attend college had a slightly lower match rate of 90.3%. This disparity may be attributed to financial and resource-related challenges, limited familial exposure to higher education, and reduced access to relatable mentors and networking opportunities.

## Limitations

This study has various limitations that must be noted. First, while it analyzes match outcomes from 2016 to 2024, the conclusions represent previous patterns and may not effectively forecast future trends. Second, the lack of statistics on the number of fellowship program applications and interview invites limits our knowledge of the matching process. Third, the demographic data, including race and ethnicity, were only accessible for the last two years, making it difficult to identify consistent long-term patterns. Fourth, it is unclear how residency program rankings and other training-related characteristics influence match success. Fifth, our study may be subject to biases inherent in the questionnaire-based format of the NRMP database. These include response bias, recall bias, and social desirability bias, which are common limitations of self-reported data. However, because the NRMP collects responses anonymously, these biases may be reduced to some extent. Nonetheless, the findings of our study should be interpreted with caution. Lastly, various confounding factors, such as geographic location, personal preferences, and training backgrounds are likely to influence match outcomes and should be investigated further.

## Conclusion

In summary, the number of Hospice and Palliative Care fellowship training programs, positions, and applicants increased. Female applicants, compared to males, and White applicants, relative to their representation in all fellowships, accounted for a larger proportion of applications and had higher match rates. Heterosexual applicants were less likely to pursue Hospice and Palliative Care fellowships compared to all fellowships. US MDs consistently demonstrated higher match rates than non-US MDs. Future research should focus on initiatives to address challenges such as the underrepresentation of certain demographics in palliative care and the growing demand for trained professionals as the population ages. This will be crucial for developing a more diverse and resilient palliative care workforce capable of meeting future healthcare needs.



## Data availability

All data can be requested by emailing the corresponding author with a reasonable request.

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## Author contributions

All authors contributed to writing and reviewing the article. Additionally, Samuel Flesner and Aman Goyal did the statistical analysis and utilized software. Amir Sohail and Mohamed Daoud did validation and supervision. Aman Goyal and Amir Sohail did conceptualization. Urooj Shamim, Sonia Hurjkalani, and Priya Goyal worked on figures, tables, and data curation.

## Declarations

## Competing interest

The authors declare no competing interests.

## Additional information

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