Supplementary Data

# Additional Methods

## Data Collection and Dataset Creation

Each match year, applicants complete a voluntary survey from the NRMP, and reports are published with summary match data. Matches are published as the number matching to the applicant’s preferred specialty.1 Therefore, the proportion matching to their preferred specialty is the number of applicants matched to their first-ranked specialty over the total number of applicants ranking that specialty first.1 MD seniors are 4th year students in US allopathic medical schools, DO seniors are 4th year students in US osteopathic medical schools, US IMGs are US citizens who attended an international medical school outside the US or Canada, and non-US IMGs are non-US citizens who attended an international medical school outside the US or Canada.1-12 Most applicants completed the survey and consented to NRMP research across all years.2-13 Although Step 1 scores were self-reported, most Step 1 scores were verified by the NRMP with the US allopathic and osteopathic medical schools for MD and DO seniors.3,4,6,7,9,10,12 Self-reported Step 1 scores were highly correlated with verified scores; therefore, the self-reported scores were assumed to be accurate.3,4,6,7,9,10,12

Since applicant-level data are not reported, we combined the match outcome (matched and unmatched to preferred specialty), applicant type, specialty choice, Step 1 score range, and match year variables into 3,520 combinations.2-12 Abstraction was performed by 5 co-authors (BS, CE, AB, TS, KH). Each co-author validated their abstractions about 30 days after their initial abstraction. In addition, a random 10% of the frequency tables were validated by a 6th co-author (DN). After excluding those combinations with zero applicants, we had 2,516 frequency tables. The frequency tables were then expanded into an applicant-level dataset using the counts.

1. National Resident Matching Program. *Results and Data 2022 Main Residency Match*. National Resident Matching Program; 2022.

2. National Resident Matching Program. *Charting Outcomes in the Match for International Medical Graduates*. National Resident Matching Program; 2016.

3. National Resident Matching Program. *Charting Outcomes in the Match for U.S. Allopathic Seniors*. National Resident Matching Program; 2016.

4. National Resident Matching Program. *Charting Outcomes in the Match: Senior Students of U.S. Osteopathic Medical Schools*. National Resident Matching Program; 2018.

5. National Resident Matching Program. *Charting Outcomes in the Match: International Medical Graduates*. National Resident Matching Program; 2018.

6. National Resident Matching Program. *Charting Outcomes in the Match: U.S. Allopathic Seniors*. National Resident Matching Program; 2018.

7. National Resident Matching Program. *Charting Outcomes in the Match: Senior Students of U.S. DO Medical Schools*. National Resident Matching Program; 2020.

8. National Resident Matching Program. *Charting Outcomes in the Match: International Medical Graduates*. National Resident Matching Program; 2020.

9. National Resident Matching Program. *Charting Outcomes in the Match: Senior Students of U.S. MD Medical Schools*. National Resident Matching Program; 2020.

10. National Resident Matching Program. *Charting Outcomes in the Match: Senior Students of U.S. DO Medical Schools*. National Resident Matching Program; 2022.

11. National Resident Matching Program. *Charting Outcomes in the Match: International Medical Graduates*. National Resident Matching Program; 2022.

12. National Resident Matching Program. *Charting Outcomes in the Match: Senior Students of U.S. MD Medical Schools*. National Resident Matching Program; 2022.

13. National Resident Matching Program. *Charting Outcomes in the Match for U.S. Osteopathic Medical Students and Graduates*. National Resident Matching Program; 2016.

# Tables

## Supplemental Table 1. Full Models For Primary Analysis

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Adjusted Difference in Match Probability as % (95% CI) | Adjusted Difference in Match Probability as % (95% CI), Incremental Score | Adjusted Difference in Match Probability as % (95% CI) after Multiple Imputation |
| Applicant Degree Type |  |  |  |
| US MD | Reference | Reference | Reference |
| DO | -7.1 (-11.3, -2.9) | -7.1 (-11.4, -2.9) | -6.9 (-11.3, -2.5) |
| US IMG | -45.6 (-50.6, -40.5) | -45.6 (-50.7, -40.5) | -44.7 (-49.6, -39.7) |
| Non-US IMG | -56.6 (-61.5, -51.6) | -56.6 (-61.5, -51.7) | -56.9 (-62.1, -51.7) |
| USMLE Step 1 score |  |  |  |
| 10-point increments |  | 5.3 (4.9, 5.6) |  |
| 180 or less | Reference |  | Reference |
| 181-190 | -5.7 (-17.1, 5.7) |  | -2.9 (-19.6, 13.9) |
| 191-200 | 3.0 (-3.1, 9.1) |  | 7.2 (0.5, 13.9) |
| 201-210 | 6.6 (1.4, 11.8) |  | 10.1 (4.8, 15.4) |
| 211-220 | 9.8 (5.5, 14.1) |  | 13.0 (7.4, 18.5) |
| 221-230 | 12.9 (8.7, 17.1) |  | 16.2 (10.5, 21.9) |
| 231-240 | 15.5 (11.8, 19.2) |  | 18.4 (13.4, 23.4) |
| 241-250 | 16 (13.1, 19.0) |  | 18.4 (14.8, 22.0) |
| 251-260 | 14.7 (12.4, 17.0) |  | 16.3 (14.4, 18.2) |
| 260 or greater | 12.5 (11.1, 14.0) |  | 14.1 (12.9, 15.3) |
| Year |  |  |  |
| 2016 | Reference | Reference | Reference |
| 2018 | 0.9 (-0.4, 2.2) | 0.9 (-0.4, 2.2) | 0.5 (-0.8, 1.9) |
| 2020 | 1.2 (-0.6, 3.0) | 1.3 (-0.5, 3.1) | 0.9 (-0.9, 2.7) |
| 2022 | 0.3 (-2.6, 3.3) | 0.4 (-2.6, 3.3) | 0.0 (-3.1, 3.0) |
| Specialty |  |  |  |
| Anesthesiology | Reference | Reference | Reference |
| Emergency | 1.2 (0.6, 1.8) | 1.2 (0.6, 1.8) | 1.4 (0.8, 2.0) |
| Family | 8.4 (7.9, 8.9) | 8.4 (8.0, 8.8) | 9.1 (8.5, 9.7) |
| Internal | 7.3 (6.3, 8.3) | 7.3 (6.3, 8.3) | 7.6 (6.5, 8.7) |
| Neurology | 5.8 (5.3, 6.8) | 5.8 (5.3, 6.2) | 6.0 (5.6, 6.5) |
| OB/GYN | -7.6 (-7.9, -7.3) | -7.6 (-7.9, -7.2) | -7.5 (-7.9, -7.2) |
| Orthopaedic | -44.2 (-47.6, -40.9) | -44.2 (-47.7, -40.8) | -45.0 (-48.5, -41.5) |
| Pediatric | 9.6 (9.3, 9.9) | 9.6 (9.3, 9.9) | 10.0 (9.7, 10.3) |
| Psychiatry | 1.4 (0.4, 2.4) | 1.4 (0.4, 2.3) | 2.2 (1.1, 3.3) |
| Surgery | -16.5 (-16.9, -16.1) | -16.5 (-16.9, -16.1) | -17.2 (-17.6, -16.8) |
| AIC | 69,822 | 69,818 | 71,967 |
| BIC | 70,059 | 69,979 | 72,205 |
| N | 95,892 | 95,892 | 99,089 |

Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion; CI, confidence interval; DO, osteopathic medical school senior; MD, United States allopathic medical school senior; Non-US IMG, non-United States citizen and international medical school graduate; OB/GYN, Obstetrics and Gynecology; US IMG, United States citizen and international medical school graduate; USMLE, United States Medical Licensing Examination

## Supplemental Table 2. Adjusted Match Probabilities Between Applicant Types By USMLE Step 1 Score

|  |  |  |  |
| --- | --- | --- | --- |
| Step 1 Score\* | Degree Type | Adjusted Difference in Match Probability as % (95% CI)\*\* | N |
| ≤200 | US MD | Reference | 6,409 |
|  | DO | -2.0 (-9.5, 5.5) |  |
|  | US IMG | -53.5 (-60.0, -47.0) |  |
|  | Non-US IMG | -54.0 (-58.3, -49.7) |  |
| 201-210 | US MD | Reference | 10,857 |
|  | DO | -9.7 (-15.7, -3.7) |  |
|  | US IMG | -55.2 (-62.8, -47.6) |  |
|  | Non-US IMG | -62.9 (-68.9, -56.9) |  |
| 211-220 | US MD | Reference | 15,179 |
|  | DO | -10.7 (-17.1, -4.3) |  |
|  | US IMG | -56.1 (-63.4, -48.9) |  |
|  | Non-US IMG | -66.8 (-73.2, -60.5) |  |
| 221-230 | US MD | Reference | 18,659 |
|  | DO | -10.9 (-15.8, -6.0) |  |
|  | US IMG | -48.0 (-54.0, -42.1) |  |
|  | Non-US IMG | -62.8 (-68.3, -57.3) |  |
| 231-240 | US MD | Reference | 18,801 |
|  | DO | -8.4 (-14.2, -2.6) |  |
|  | US IMG | -40.3 (-46.8, -33.7) |  |
|  | Non-US IMG | -52.4 (-58.7, -46.1) |  |
| 241-250 | US MD | Reference | 14,987 |
|  | DO | -3.7 (-6.0, -1.4) |  |
|  | US IMG | -29.2 (-36.1, -22.3) |  |
|  | Non-US IMG | -40.7 (-44.9, -36.5) |  |
| >250 | US MD | Reference | 11,000 |
|  | DO | -2.9 (-5.4, -0.4) |  |
|  | US IMG | -24.9 (-29.6, -20.3) |  |
|  | Non-US IMG | -25.2 (-28.9, -21.4) |  |
| Missing | US MD | Reference | 8,497 |
|  | DO | -9.6 (-18.0, -1.3) |  |
|  | US IMG | -62.5 (-72.3, -52.7) |  |
|  | Non-US IMG | -62.6 (-70.8, -54.3) |  |

Abbreviations: CI, confidence interval; DO, osteopathic medical school senior; MD, United States allopathic medical school senior; Non-US IMG, non-United States citizen and international medical school graduate; US IMG, United States citizen and international medical school graduate

\*Very low and very high score ranges were merged (<=200 and >250) due to few applicants in those categories.

\*\* Estimates were adjusted for USMLE Step 1 score range and specialty choice.

## Supplemental Table 3. Adjusted Match Probabilities Between Applicant Types By Year

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Degree Type | Adjusted Difference in Match Probability as % (95% CI)\* | N |
| 2016 | US MD | Reference | 21,142 |
|  | DO | NA\*\* |  |
|  | US IMG | -52.9 (-56.7, -49.1) |  |
|  | Non-US IMG | -62.5 (-65.0, -60.0) |  |
| 2018 | US MD | Reference | 24,155 |
|  | DO | -9.8 (-15.0, -4.7) |  |
|  | US IMG | -47.2 (-52.4, -41.9) |  |
|  | Non-US IMG | -57.6 (-64.1, -51.1) |  |
| 2020 | US MD | Reference | 25,903 |
|  | DO | -4.2 (-7.1, -1.3) |  |
|  | US IMG | -40.8 (-45.4, -36.3) |  |
|  | Non-US IMG | -51.5 (-56.7, -46.3) |  |
| 2022 | US MD | Reference | 24,692 |
|  | DO | -5.3 (-11.1, 0.4) |  |
|  | US IMG | -43.8 (-50.6, -37.0) |  |
|  | Non-US IMG | -56.0 (-61.8, -50.2) |  |

Abbreviations: CI, confidence interval; DO, osteopathic medical school senior; MD, United States allopathic medical school senior; Non-US IMG, non-United States citizen and international medical school graduate; US IMG, United States citizen and international medical school graduate

\*Estimates were adjusted for specialty choice and USMLE Step 1 score.

\*\*USMLE Step 1 data was not reported for DO seniors in 2016.

# Figures

## Supplemental Figure 1



Supplemental Figure 1. The figure displays the R packages and versions used for the analysis.

## Supplemental Figure 2



Supplemental Figure 2 Abbreviations: DO, osteopathic medical school senior; MD, United States allopathic medical school senior; Non-US IMG, non-United States citizen and international medical school graduate; US IMG, United States citizen and international medical school graduate; USMLE, United States Medical Licensing Examination

Supplemental Figure 2. The figure displays the probability of matching into applicants’ preferred specialties between US MD and non-US MD applicants stratified by year. Estimates were adjusted for USMLE Step 1 score range and specialty choice. An estimate for DO vs. MD seniors in the 2016 match year is not presented, since Step 1 scores were not reported for DO seniors in 2016.