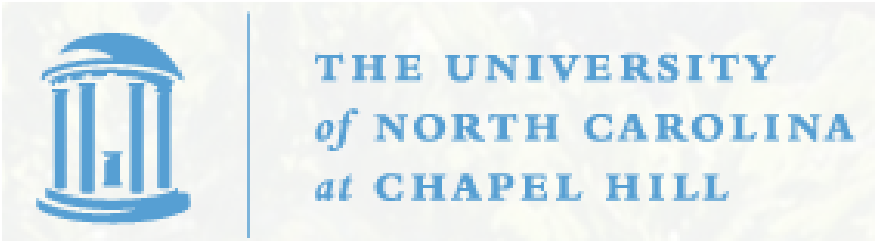
CHESS RATINGS: DECONSTRUCTING THE GENDER GAP

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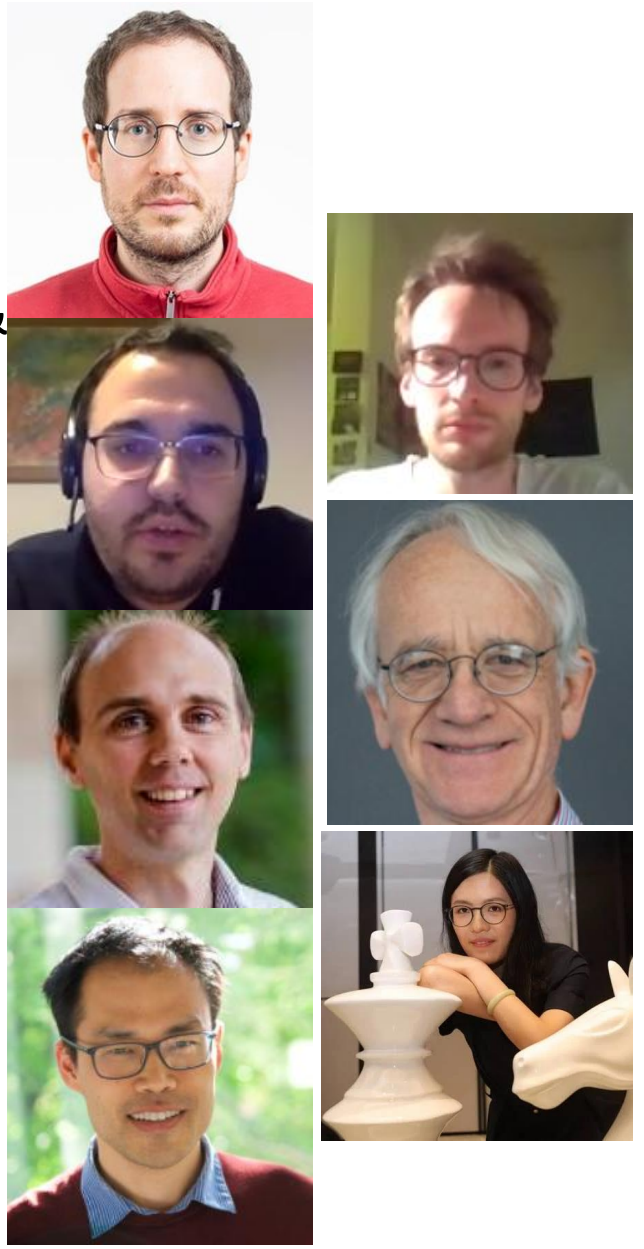


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Our Collaboration

- György Barabás, Biology, Linköping University
- Nikos Bosse, Epidemiology, London School of Hygiene & Tropical Medicine, UK
- Jose Camacho Collados, School of Computer Science and Informatics, Cardiff University, UK, International Master
- Richard Smith, Statistics, University of North Carolina, USA (rls@email.unc.edu)
- David Smerdon, Economics, University of Queensland, Australia, Grandmaster
- Hou Yifan, Physical Education, Peking University, China, Grandmaster and former women's world champion
- Wei Ji Ma, Psychology and Neuroscience, New York University, USA, FIDE Master
- Paper submitted for publication:

  Deconstructing the gender gap in chess ratings



Objectives of the Study

- The top of the FIDE rating list is dominated by men, and there is a large "gender gap" between men and women
  - Top 1 (Carlsen v. Hou): 227 points difference (October 2026)
  - Mean of top 10: 235.5 points difference (October 2026)
  - Mean of everyone: over 200 points difference
- The *participation rate* hypothesis has been discussed many times, but is not generally accepted as an explanation
- We propose a new statistical method for studying this hypothesis, and also consider a number of alternative explanations for the gender gap
- We apply these tests to the entire FIDE list (all countries combined), but also break it down by federation
- We also consider the effect of various exclusion mechanisms: by age (exclude juniors), by activity status and through a rating floor

Key Findings

- If we adjust for participation rates, age and experience, the gender gap is much reduced
- For some individual federations, it is eliminated entirely
- The remaining diferences are primarily due to a an over-representation of low-rated women
- Women are more likely than men to drop out at an early age

Data Sources

- Primary source of data was the December 2019 FIDE rating list — all players at least 1001 Elo
- Also used lists from 2012–2019 to determine experience (proxy: total number of rated games) and age of retirement (for those who became inactive)
- 343,479 total players, 10.6% women
- Data filters used in some analyses:
  - exclude juniors (age ≤ 20 as of December 2019)
  - exclude inactive players
  - exclude all players below a rating threshold (1400 or 1600)
  - for federation analyses: exclude federations with <30 active female players

Permutation Tests

- Select a statistic of interest, e.g., the difference between the means of the top 10 male and female players
- Randomly permute the male/female labels of all players in the database, keeping the total numbers the same, and calculate the statistic of interest for the permuted sample
- Repeat 1,000,000 times
- The *p-value* of the test is the proportion of permuted samples for which the statistic of interest is at least as large (in either direction) as the true statistic
- Standard statistical interpretation: if the p-value is < 0.05, the result is "significant". In this case, our interpretation is that the observed gender gap cannot be attributed to the participation rate
- Modification: Benjamini-Hochberg "false discovery rate" instead of p-value (for comparing across federations)

Results

- Overall differences are statistically significant, but not if we exclude juniors, inactive players and those rated below 1600 (bottom right panel in Fig. 1)
- After correcting for participation rate, expected top-10 gap is 88.7 and expected top-1 gap is 87.3 (compared with 229.1 and 208 as of Dec 2019)
- Excluding juniors and inactive players, these expected differences become 139.7 and 125.7 (top-10 gap still significantly different, top-1 gap is not)
- We also computed results for individual federations, correcting for overall differences in age and experience (Figs. 2,3)
- The *differential dropout hypothesis* (e.g. Li, Glickman and Chabris, 2025) is also supported by our analysis (Fig. 4)

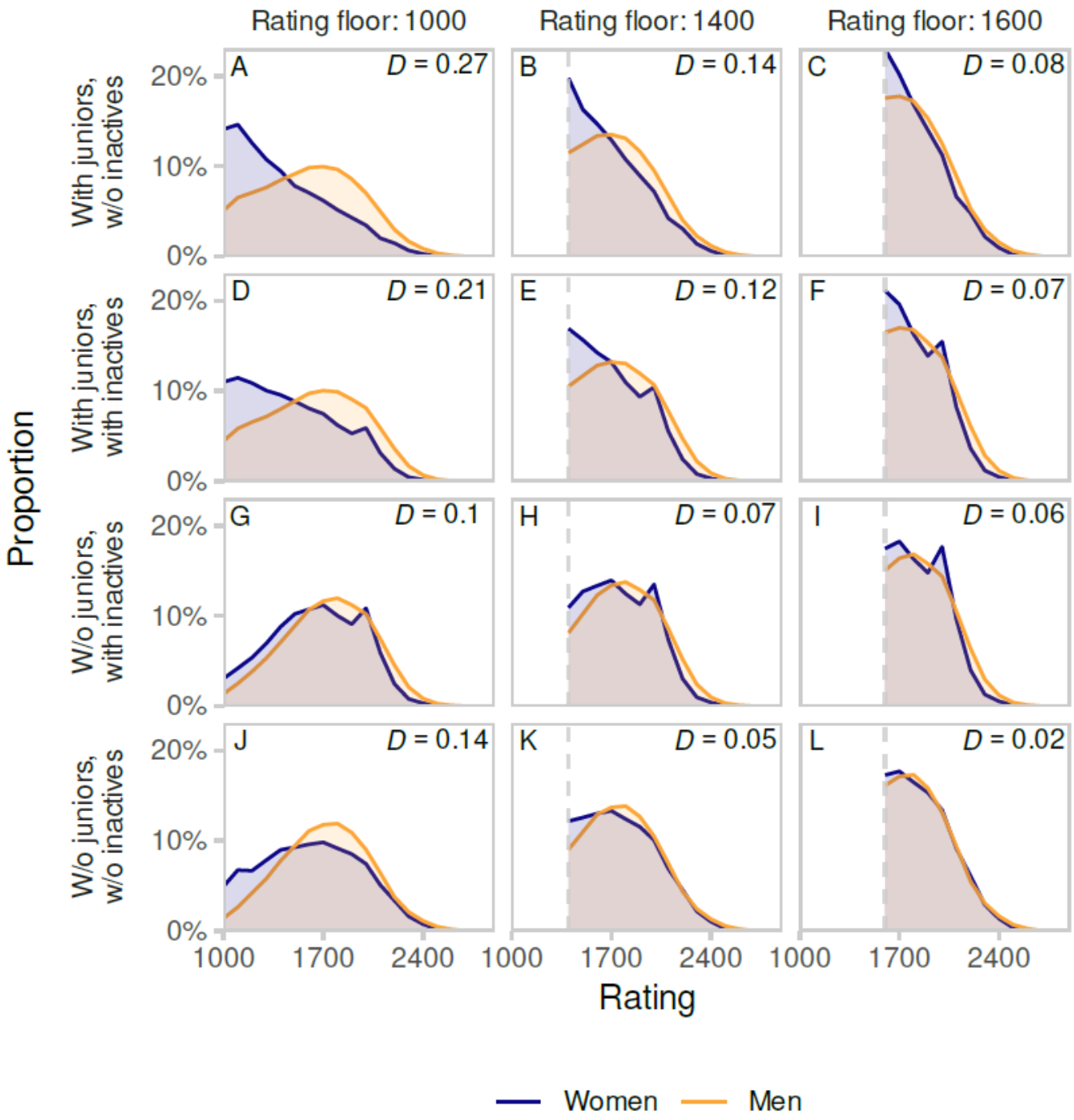


Fig. 1: Chess rating distributions of women and men across the world, binned from 1000 up to 2900 in bins of 100 Elo points.

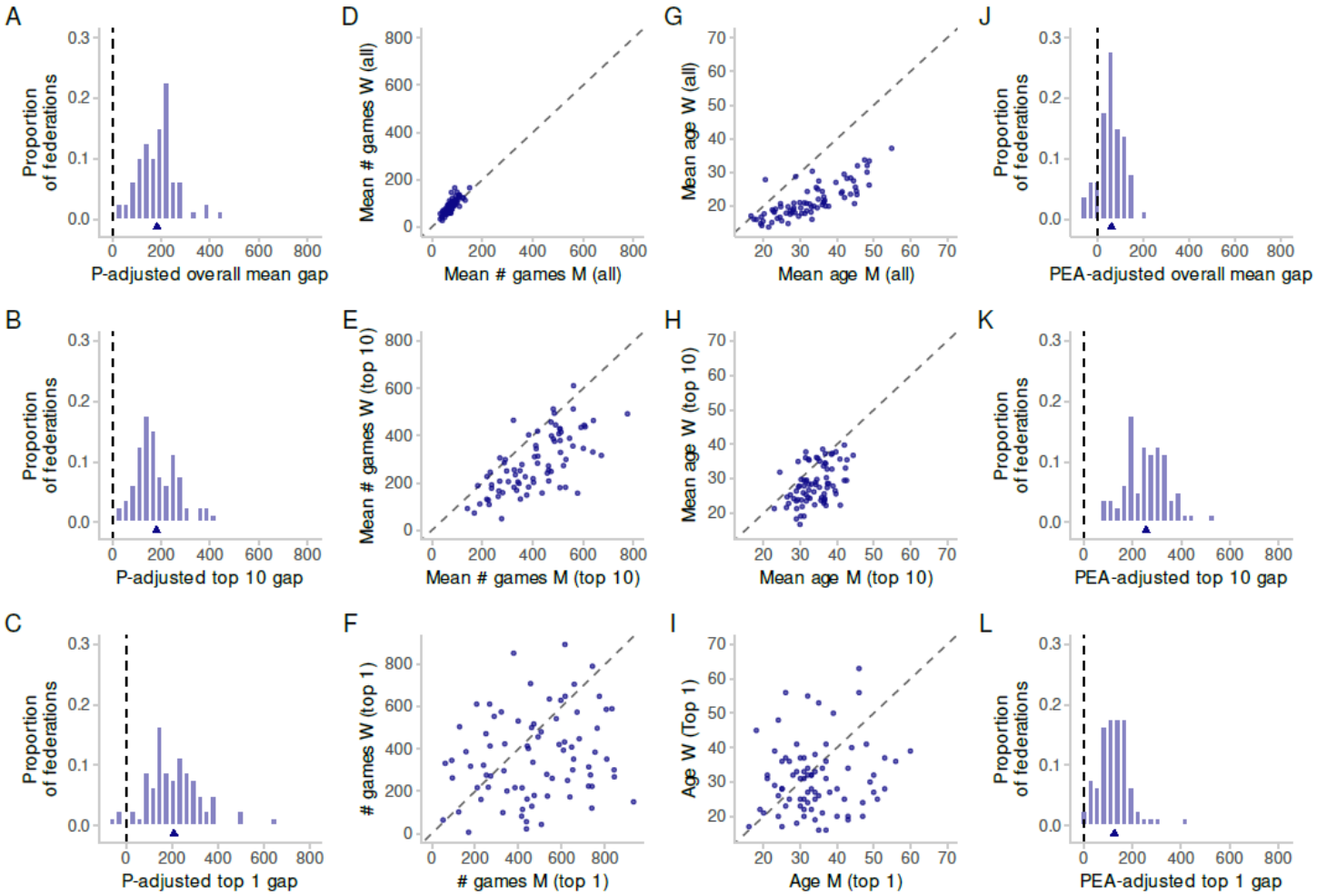


Fig. 2: Adjusting gender gaps for differences in participation, experience, and age, by federation.

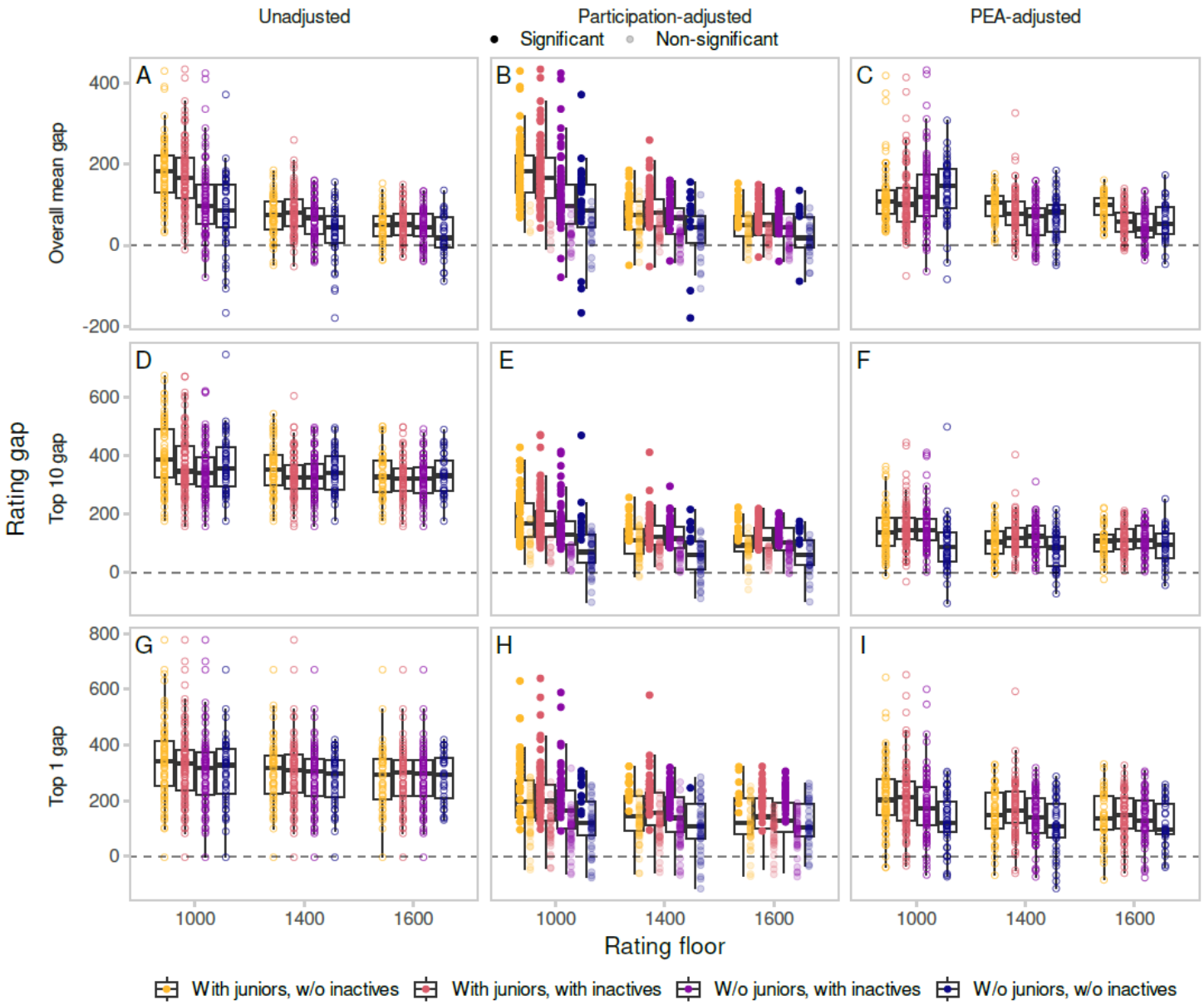


Fig. 3: Summary of rating gap results

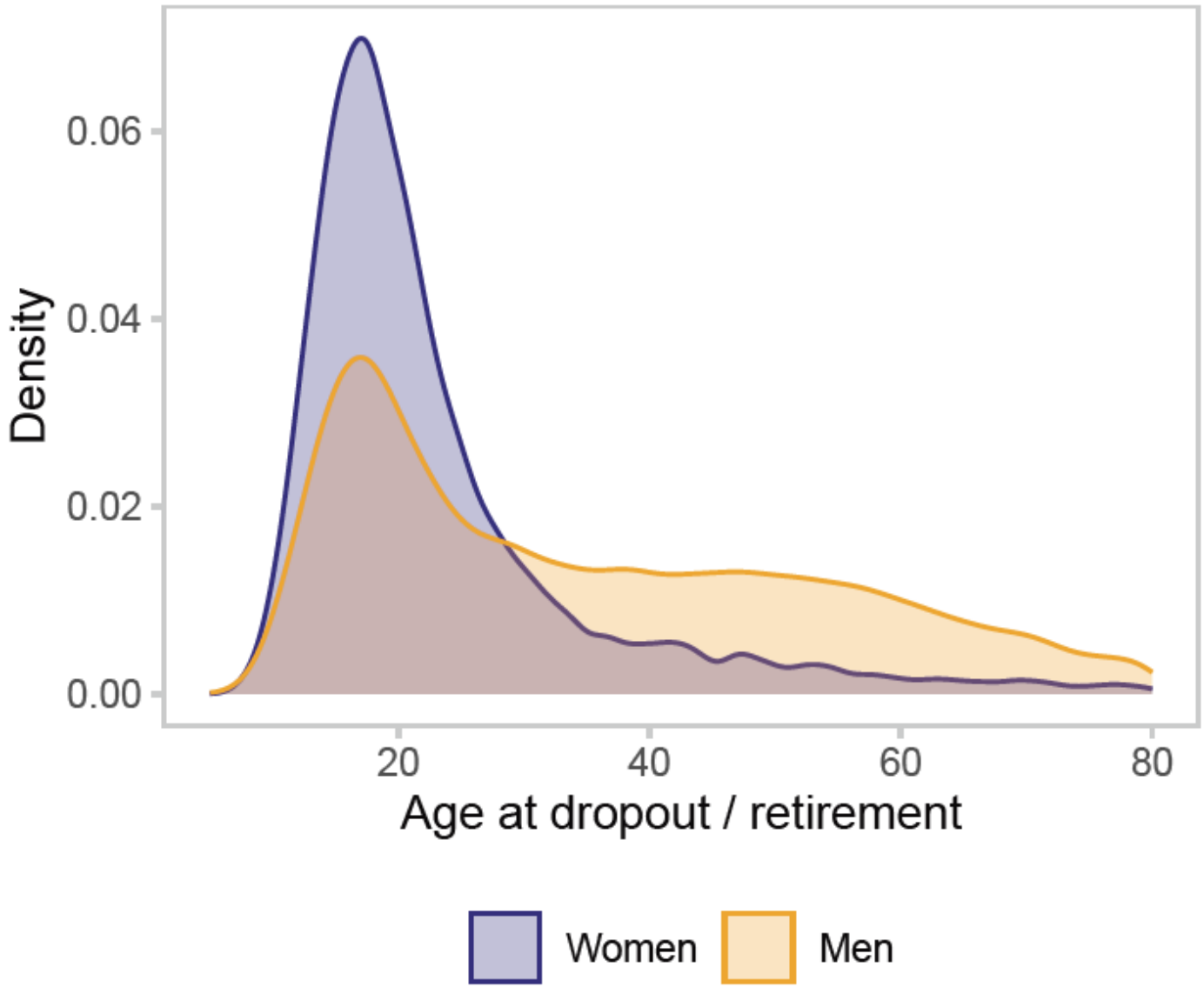


Fig. 4: Distribution of the age at retirement

Discussion

- Correcting for the participation gap reduces but not eliminates the gender gap in ratings
- Much of the remaining difference is due to
  - Juniors (66.3% of active women, 29.9% of active men)
  - Overrepresentation of low-rated women
- When juniors and low-rated players are excluded from the analysis, the gender gap is near zero, though it persists in the top-10 rating differences

Perceived Reasons for the Gender Gap

- Biological differences, e.g. in spatial perception
  - Debatable whether this is innate
- Differences in interest and preferences
  - "things" versus "people"
- Differences in competitiveness
  - Unclear whether this applies among individuals who have *already selected* into playing competitive chess
- Field-specific ability beliefs
  - "Chess is only for really smart people"
  - Effect of stereotypes
  - Do women play worse against men than against other women?
  - Influence of parents and teachers
- Factors affecting top players
  - Differences in prize money
  - Differences in levels of support, e.g. coaches or seconds, access to high-performance computing
  - Childcare responsibilities

Conclusions

- The gender gap is real, but much reduced after correcting for participation rates, age and experience differences
- A large part of the difference is explained by differential dropout rates
- The situation could improve if federations invested more in developing opportunities for women