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Issues paper

This report is for information

This report investigates how disability, age, sex, ethnicity and nationality are related to the selection of staff for inclusion in the 2014 Research Excellence Framework (REF 2014). It examines the question of whether the process of selecting staff was unbiased, or whether some staff were disadvantaged.

Selection of staff for inclusion in the REF 2014

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Selection of staff for inclusion in the REF 2014

To	Heads of HEFCE-funded higher education institutions
Of interest to those responsible for	Equality and diversity management, Human resources management, Institutional strategic planning, Research management
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Enquiries to	researchpolicy@hefce.ac.uk

Executive summary

Purpose

1. This study investigates how disability, age, sex, ethnicity, nationality and early career researcher status are related to the selection of staff for inclusion in the 2014 Research Excellence Framework (REF 2014).

Key points

Background

2. REF 2014 assessed the quality of research submitted by higher education institutions (HEIs) in the UK through a process of expert review. It replaced the Research Assessment Exercise (RAE), last conducted in 2008.

3. In 2009, HEFCE published a UK-wide equality and diversity assessment of the RAE 2008, 'Selection of staff for inclusion in RAE 2008' (HEFCE 2009/34). This investigated how disability, age, sex, ethnicity and nationality related to selection of staff for inclusion in the 2008 RAE.

4. REF 2014 was completed in December 2014. This study assesses the staff selected for the 2014 exercise in terms of disability, age, sex, ethnicity, nationality and early career researcher status. As with HEFCE/2009/34, the scope of our quantitative analysis is limited to assessing whether the process of selecting staff resulted in an unbiased outcome from an equality and diversity perspective, or whether some staff were disadvantaged.

5. This report forms part of a number of projects that together are intended to provide a comprehensive evaluation of REF 2014, and inform policy development for future exercises.

Methodology

6. This report bases its methodology on the two previous reports on the equality and diversity of selected staff. Following the same principles as the previous reports, we considered the selection rates for different cross-sections of potentially eligible staff in the REF 2014. By using statistical models, we compared staff on a 'like-for-like' basis by taking into account other characteristics that may affect whether or not a member of staff is selected.

7. The scope of this quantitative analysis is therefore limited to addressing whether there were specific differences between certain groups of academics in the process of being selected for inclusion in the REF. It does not attempt to comment on the research process as a whole, the process of accepting or rejecting individual articles, or whether the REF 2014 panels assessed the work of different groups of academics consistently.

Results and discussion

8. The selection rate for staff with declared disabilities was lower than for those without. Although this discrepancy can be partially explained when other factors are taken into account, the modelling still suggests that the proportion selected for inclusion in the REF 2014 is lower for staff with a declared disability.

9. As in HEFCE 2009/34, the data shows a marked difference between the rate of selection for men and women in REF 2014; 67 per cent of men were selected, compared with 51 per cent of women. However, the proportion of women submitted has increased (from 48 per cent in RAE 2008). When age is considered in combination with sex, the model output shows that the gap between selection proportions for men and women has decreased for the most populous age group, that of staff between 30 and 60 years old.

10. While the continued under-selection of female staff probably indicates deeply entrenched supply issues, it could also be caused by maternity leave and childcare responsibilities, which in academia most often affect women between the ages of 30 and 50.

11. Analysis of male and female selection rates at HEI level shows that the majority of institutions do not have equal selection rates by sex. However, there is little evidence of a relationship between these rates and the overall percentage of staff submitted to the REF by an HEI. This suggests that a more selective submission policy does not necessarily indicate a greater bias in sex selection rates.

12. Differences in selection rates across Units of Assessment (UOAs) were also considered for male and female staff. A range of selection indices were observed, from 0.9 (for Communication, Cultural and Media Studies, Library and Information Management) to 2.4 (for Allied Health Professions, Dentistry, Nursing and Pharmacy). No UOA was found to be statistically significantly different from the sector average selection index of 1.3.

13. The effect of nationality on selection rates was considered, with selection rates being highest for European Union (EU) staff and lowest for UK nationals. Although the differences are partially explained by other factors, EU and non-EU staff still experienced a higher selection rate than UK staff.

14. The selection rates were similar for all ethnicity groups, with the exception of Black and Asian UK and non-EU nationals who had statistically significant lower selection rates, even with modelling for other factors taken into account.

15. Early career researchers (ECRs) had a selection rate of 80 per cent, significantly higher than that for non-ECRs (58 per cent). Analysis by sex shows a larger selection difference between ECRs and non-ECRs for female than for male staff, suggesting that the sex disparity in selection rates is less for individuals at the start of their research careers.

16. Analysis of staff by full-time equivalence (FTE) shows that staff with contracts at less than 1 FTE were significantly less likely to be selected for the REF 2014. This difference increases

when other factors are taken into account, suggesting that these other factors have less influence on selection rates than FTE.

17. Although it is clear that there are still equality and diversity issues to be addressed in developing future REF exercises, the progress which has been made since RAE 2008 should not be overlooked.

18. Although many in the sector have noted the considerable volume of work, and the often challenging internal processes involved. In addition, the strengthened measures to promote equality and diversity in the REF 2014 were widely welcomed by the sector, allowing greater consistency and a fairer approach to staff selection.

19. The work undertaken to ensure that equality considerations were taken into account in the selection of staff for the REF has been recognised as having an overwhelmingly positive impact. Moreover, this impact extends beyond the results of staff selection, to establishing equality and diversity as important considerations in universities' everyday activities. This has given the sector a strong platform for further progress.

20. Despite the progress in some areas, the remaining equality challenges that remain have been thrown into sharp relief by this analysis. These include the continued under-selection of many black and minority ethnic staff (particularly black staff) and staff with disabilities, and the increase with age in the selection gap between men and women. The detailed analysis contained in this report will inform wider equality and diversity work in the sector, as well as being taken into account in preparations for any future REF.

Action required

21. No action is required in response to this document.

Further information

22. Further information about the REF 2014 is available at www.ref.ac.uk. Further information about the programme of work to evaluate REF 2014 can be found at www.hefce.ac.uk/rsrch/REFreview/.

Introduction

23. The Research Excellence Framework (REF) 2014 assessed the quality of research submitted by higher education institutions (HEIs) in the UK through a process of expert review. It replaced the Research Assessment Exercise (RAE), last conducted in 2008.
24. REF 2014 was conducted jointly by HEFCE, the Scottish Funding Council, the Higher Education Funding Council for Wales and the Department for Employment and Learning, Northern Ireland.
25. The primary purpose of REF 2014 was to assess the quality of research and produce outcomes for each submission made by institutions, for the following purposes:
- a. The four higher education funding bodies will use the assessment outcomes to inform the selective allocation of their grant for research to the institutions which they fund, with effect from 2015-16.
 - b. The assessment provides accountability for public investment in research and produces evidence of the benefits of this investment.
 - c. The assessment outcomes provide benchmarking information and establish reputational yardsticks, for use within the higher education sector and for public information.
26. 154 UK institutions made submissions in 36 subject-based units of assessment (UOAs). The submissions were assessed by panels of experts, who produced an overall quality profile for each submission. Each overall quality profile shows the proportion of research activity judged by the panels to have met each of the four starred quality levels, from unclassified to 4*, with 4* being the highest quality.
27. For each of their submissions, HEIs selected 'research-active' staff for inclusion from their 'eligible staff'. Eligible staff were those academic staff who met the criteria laid out in 'Assessment framework and guidance on submissions'¹.
28. In 2009, HEFCE published 'Selection of staff for inclusion in RAE 2008' (HEFCE 2009/34), a UK-wide equality and diversity assessment of the RAE 2008². This investigated how disability, age, sex, ethnicity and nationality related to the selection of staff for inclusion in the 2008 RAE.
29. The REF 2014 was completed in December 2014. This study assesses the staff selected for the 2014 exercise in terms of disability, age, sex, ethnicity, nationality and early career researcher status. As with HEFCE 2009/34, the scope of our quantitative analysis is limited to assessing whether the process of selecting staff resulted in an unbiased outcome from an equality and diversity perspective, or whether some staff were disadvantaged. We have not, for example, attempted to re-create the assessments of particular institutions, or assessed whether the research process as a whole is biased.
30. The UK funding bodies are committed to supporting and promoting equality and diversity in research careers. The REF 2014 Equality and Diversity Advisory Panel (EDAP) was established

¹ For more information see 'Evaluating the 2014 REF: feedback from participating institutions', available at www.hefce.ac.uk/rsrch/REFreview/feedback/.

² Available online at http://webarchive.nationalarchives.gov.uk/20100202100434/http://www.hefce.ac.uk/Pubs/HEFCE/2009/09_34/.

to advise the funding bodies, the REF team and the REF panels on implementing equality measures in the REF 2014. EDAP reviewed institutions' codes of practice on the selection of staff, and produced a report on good practice found in the codes³. At the end of the exercise EDAP produced a final report on the equality and diversity aspects of the REF⁴. In addition, EDAP provided advice on the selection of staff analysis which should be undertaken to produce this report.

31. Where possible this report considers the changes between RAE 2008 and REF 2014. However, this is only possible for the raw results as changes in the structure of the Higher Education Statistics Agency (HESA) staff record mean that the factors used in the modelling have also changed. Therefore there are no comparisons with the RAE 2008 modelled results.

Data

Methodology

32. This report bases its methodology on the two previous reports on the equality and diversity of selected staff.

33. Following the same principles as the previous reports, we considered the selection rates for different cross-sections of potentially eligible staff in the REF 2014. By using statistical models, we compared staff on a 'like-for-like' basis by taking into account other characteristics that may affect whether or not a member of staff is selected.

34. The scope of this quantitative analysis is therefore limited to addressing whether there were specific differences between certain groups of academics in the process of being selected for inclusion in the REF. It does not attempt to comment on the research process as a whole, the process of accepting or rejecting individual articles, or whether the REF 2014 panels assessed the work of different groups of academics consistently.

35. Identification of the staff selected for the REF 2014 came from the REF 2014 database and refers only to Category A staff⁵.

Data sources

36. The HESA staff record holds information on all contracted staff working at UK HEIs, and will therefore be the source of information about eligible staff in this report.

37. In this report, the following staff were considered eligible for the REF 2014:

- a. Staff holding academic contracts where the academic employment function was recorded as either 'research' or 'teaching and research'.
- b. Staff holding contracts that were active on 31 October 2013.
- c. Staff who were not recorded as research assistants.
- d. Staff whose scaled 'full-year' full-time equivalence (FTE) was 0.2 or greater⁶.

³ 'REF Codes of Practice for the selection of staff: A report on good practice', available at www.ref.ac.uk/pubs/refcodesofpracticegoodpracticereport/.

⁴ 'Equality and diversity in the REF: Final report by EDAP', available at www.ref.ac.uk/equality/edapreport/.

⁵ For the definition of Category A staff see: 'Assessment framework and guidance on submissions', available at www.ref.ac.uk/pubs/2011-02/.

38. In the REF 2014 eligibility criteria, 'FTE' refers to the FTE on the census date of the 31 October 2013. In the HESA staff record, the FTE is based on contracts held and the proportion of the academic year worked. FTE in this report is therefore scaled to give the FTE for the full year.

39. Research assistants can be submitted to the REF 2014 under exceptional circumstances, but are generally excluded. For this reason, research assistants have been excluded in this report.

40. Because of differences in HEIs' interpretations of the definition of eligibility, HEFCE 2009/34 did not use HESA data on whether a staff member was eligible for submission to RAE 2008, and which UOA they were associated with. For the purposes of comparison, this report will consider for evaluation the population of permanent academic staff (population B). This report will therefore draw on the methodology of the RAE 2001 report for selecting eligible staff⁷.

Cross-checking and data exclusions

41. REF 2014 applied validations to the staff identifiers used for both the REF 2014 data and the HESA data, decreasing the number of discrepancies between the data sources in previous years.

42. The initial population of staff submitted at UK HEIs was 52,865.

43. Of category A staff submitted to the REF 2014, 440 (0.8 per cent) were not found on the HESA staff record.

44. Another 120 Category A staff (0.2 per cent) were excluded from this report because they did not meet the eligibility criteria above. Of these, 75 (0.1 per cent) were not reported as being on a research contract, while 45 (less than 0.1 per cent) had a reported FTE lower than 0.2.

45. In addition to this, the following six institutions incorrectly identified research assistants on their HESA return⁸:

- Cardiff University
- Queen Mary University of London
- The University of Aberdeen
- Aston University
- Heriot-Watt University
- The University of Leicester.

46. This means that the reported eligible population for these institutions is higher than it would be with research assistants removed. The effect of this on the overall analysis has been analysed, and the analyses available in the report have been replicated to determine the effect of including these institutions. For the purposes of this report these institutions have been left in the population: the results are the unaffected unless otherwise specified.

⁶ For further information on defining eligibility and additional caveats, see <https://www.hesa.ac.uk/REF2014>.

⁷ For more information see 'Selection of staff for inclusion in RAE2001' (HEFCE 2006/32), http://webarchive.nationalarchives.gov.uk/20120118171947/http://www.hefce.ac.uk/pubs/hefce/2006/06_32/.

⁸ For more information see www.hesa.ac.uk/ref2014.

47. The REF 2014 Equality and Diversity Advisory Panel's (EDAP's) recommends that HEFCE should publish the selection rates by institution and sex. This data will be published once HEFCE has received the corrected data from the above institutions.

Populations

48. If an institution did not submit any staff to a particular UOA in the REF 2014, then staff associated with this UOA at the institution were excluded from the statistical models and the tabulations in the main report. We refer to these groups of staff as 'non-submitting departments'. Staff associated with UOAs in which their HEI did submit to the REF 2014 are referred to as 'submitting departments'. Results referring to all staff are available in Annex C.

49. Table 1 shows how the initial data extraction and the exclusions described above determine the overall numbers of staff, departments and institutions presented in this report.

Table 1: Numbers of eligible staff, UOAs within HEIs and HEIs

	Eligible staff	UOAs within HEIs	HEIs
Total eligible staff recorded in the 2013-14 corrected HESA record	97,225	2,519	157
Submitting departments only	82,840	1,843	154

Notes: Counts are based on the numbers of staff at institutions. Duplicate records for staff within an HEI are excluded.

Selection rates

50. In the results presented below we show the percentage of staff selected for inclusion in REF 2014 for different groups. For example, we find that for men and women the rates were 60 per cent and 44 per cent respectively. While this is of interest in itself, such simple comparisons of selection rates may reflect different patterns of employment between different groups of staff, not directly connected with the REF 2014.

51. For example, the selection pattern varies significantly by Unit of Assessment. In Education, 62 per cent of the eligible staff were female and the average percentage of staff selected was 21 per cent; whereas in Electrical and Electronic Engineering, Metallurgy and Materials, where only 12 per cent of the eligible staff were female, the average proportion of staff selected was 65 per cent.

52. To be selected, a member of staff must be associated with a body of research activity that their HEI has decided to submit for assessment. Usually this will involve being part of a department which makes a submission. Some individuals are not selected because they are associated with a non-submitting department: others are not selected even though they are associated with a submitting department. In the latter case, it is more likely that the decision will be perceived as being about that person's individual research output. We considered both selection processes, by tabulating selection rates for all eligible staff and selection rates for just those staff associated with submitting departments.

53. For staff associated with a submitting department, being selected will depend in part on the quality of their output as determined by the institution. Each institution will also have decided the threshold level of research quality that individual staff must achieve to be selected. We cannot assume that this threshold level is the same for different institutions, or even different submissions within the same institution. Clearly, an individual located in a department with a very high threshold level of research quality will be less likely to be selected, all other things being equal. Finally, staff may fail to be selected because of some prejudice or bias against them.

54. This report attempts to take account of the differing achievements of different groups of staff, and the different quality thresholds, through the construction of statistical models.

55. The modelling simultaneously allows for the following attributes:

- **Staff members' personal characteristics –**
 - age
 - sex
 - ethnicity
 - disability
- whether a staff member holds a PhD, their clinical status and their highest qualification in a relevant subject
- their location in the previous year, their contract status and the FTE of their contract
- their grade and whether or not they are an early career researcher.

56. The first four of these variables (age, sex, ethnicity and disability) distinguish the groups we are interested in. The other variables are our best proxies for research quality. Some of these factors, in particular grade and other aspects of employment status, are themselves issues where equal opportunities may be in question; this makes the inclusion of such variables problematic, particularly as being selected for the REF 2014 may improve someone's chances of being promoted to a higher grade. This report therefore provides the results of both a 'full statistical model' which includes all these variables, and a 'restricted model' which does not allow for grade, contract status or mode of employment.

57. To allow for varying quality thresholds for different institutions, the statistical model was constructed to allow for variation at the HEI level, for the UOAs across all HEIs, and for UOAs within an HEI or department, as well as by individual staff. Where an HEI made two or more submissions within one UOA, these have been combined to simplify the model structure. (Given the infrequency of such cases, this should not greatly affect the results.) Details of the modelling are at Annex D.

58. The results of the modelling are presented in terms of 'odds ratios'. A fuller explanation of the odds ratio statistic is given below, along with the presentation of the results for staff with and without disabilities.

Disability

59. Table C1 shows that the total population is 97,225 eligible staff, with 82,840 staff who are eligible **and** associated with submitting departments as shown in Table 2. Of these, 52,185 were submitted to REF 2014, 4 per cent of whom returned an unknown disability status.

60. Only the results for staff who are eligible and associated with submitting departments are shown in this section of the report. The results for all staff are shown in Annex C.

61. Table 2 shows the number of staff with and without recorded disabilities, and the numbers and percentages who were selected for inclusion in REF 2014. This shows that 61 per cent of staff with no declared disability were selected for REF 2014, compared with 47 per cent of staff with a declared disability.

62. The calculation and interpretation of the index in Table 2 is shown in paragraphs 65 and 66.

Table 2: Selection rates for REF 2014 staff with disabilities (excluding non-submitting UOAs within HEIs)

Disability	Selected	All	% Selected	Index
No disability specified	49,065	79,935	61%	1.00 (ref)
Disability specified	1,365	2,905	47%	0.56
Unknown	1,755	3,095	-	-
Total	52,185	82,840	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

63. Table 3 shows the comparable selection rates for RAE 2008. This shows that, while the selection rate for staff without a disability has remained broadly the same, the selection rate for those who declare a disability has dropped between RAE 2008 and REF 2014. (Note that in the RAE 2008 any staff with an unknown disability status were grouped into 'No disability specified'. For REF 2014 they are identified as a separate group.)

Table 3: Selection rates for RAE 2008 staff with disabilities (excluding non-submitting UOAs within HEIs)

Disability	Selected	All	% Selected	Index
No disability specified	43,605	71,565	61%	1.00 (ref)
Disability specified	895	1,750	51%	0.67
Total	44,505	73,310	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

64. Using statistical models we can explore the extent to which the selection rates can be compared on a 'like-for-like' basis after allowing for other factors. The results of this modelling can be most conveniently presented as a 'selection index'. Table 4 shows how this index is calculated for the actual raw figures shown in Table 2.

Table 4: Derivation of the selection index (excluding non-submitting UOAs within HEIs)

Disability	No disability specified (reference)	Disability specified
Percent selected	61%	47%
Percent not selected	39%	53%
Selected ÷ not-selected (odds ratio)	1.59	0.89
Odds ratio relative to odds ratio of reference group (selection index)	$1.59 \div 1.59 = 1.00$	$0.89 \div 1.59 = 0.56$

65. If the selection rate for staff without and with disabilities had been the same, the selection index would have been exactly equal to 1.00. The value 0.56 indicates that staff with disabilities had a lower selection rate than the reference group, staff without disabilities, as shown in Table 2. These ‘actual’ selection indices are unadjusted, in that they do not allow for other factors. Table 5 shows this actual index from Table 2 along with the indices from the statistical models which take other factors into account.

66. Two different statistical models are used in this report. The first is the restricted model which takes into account sex, age, terms of employment, the UOA, its rating, whether or not the staff member is an early career researcher, ethnicity, disability, nationality, employment function, FTE, whether or not the staff member has a PhD, the institution, the type of institution, whether or not the staff member moved institution in the last six months and whether or not they have a clinical contract. Further information on this is available in Annex D. The second model is the full model which takes into account factors relating to employment status by including the grade of the member of staff.

67. Table 5 shows that, while, the full and restricted model are not statistically significantly different from each other, the selection indices show that a higher proportion of staff without disabilities are selected for REF 2014. Once all of the factors above are taken into account, the proportion is still higher for staff without a declared disability, but the differences are smaller.

Table 5: Selection indices comparing staff with and without recorded disabilities (excluding non-submitting departments)

Disability?	Actual	Restricted model	Full model
Without disabilities	1.00 (ref)	1.00 (ref)	1.00 (ref)
With disabilities	0.56**	0.82	0.82

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

68. This means that the relative raw rates for disabled staff are lower for the REF 2014 than for the RAE 2008. Once the other factors in the model have been taken into account, the differences are smaller but still visible.

Sex

69. Table 6 shows the selection rates for men and women. This shows that the selection rate for female staff is 51 per cent compared with 67 per cent for male staff, which gives a selection index of 1.89.

Table 6: Selection rates for REF 2014 staff by sex (excluding non-submitting UOAs within HEIs)

Sex	Selected	All	% Selected	Index
Female	16,660	32,525	51%	1.00 (ref)
Male	35,525	53,410	67%	1.89
Total	52,185	85,935	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

70. Table 7 shows the corresponding results for RAE 2008 staff. The table shows that while the proportions of men submitted has remained the same, the proportion of female staff selected has increased from 48 per cent in 2008 to 51 per cent in 2014. The selection index has thus decreased from 2.21 in 2008 to 1.89 in 2014.

Table 7: Selection rates for RAE 2008 staff by sex (excluding non-submitting UOAs within HEIs)

Sex	Selected	All	% Selected	Index
Female	12,690	26,175	48%	1.00 (ref)
Male	31,815	47,140	67%	2.21
Total	44,500	73,310	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

71. Table 8 shows that accounting for all the factors in the restricted model reduces the selection index for the REF 2014 to 1.23. This means that the selection rate for female staff was closer to that of male staff once other factors had been taken into account. These differences are statistically significant at the 0.01 per cent level. Fitting the full model, which also accounted for grade, estimated the same reduction in the selection index. This suggests that those differences in selection rates by sex not explained by the restricted model were not explained by grade either.

Table 8: Selection indices comparing staff by sex (excluding non-submitting departments)

Sex	Actual	Restricted model	Full model
Female	1.00 (ref)	1.00 (ref)	1.00 (ref)
Male	1.89**	1.23**	1.23**

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

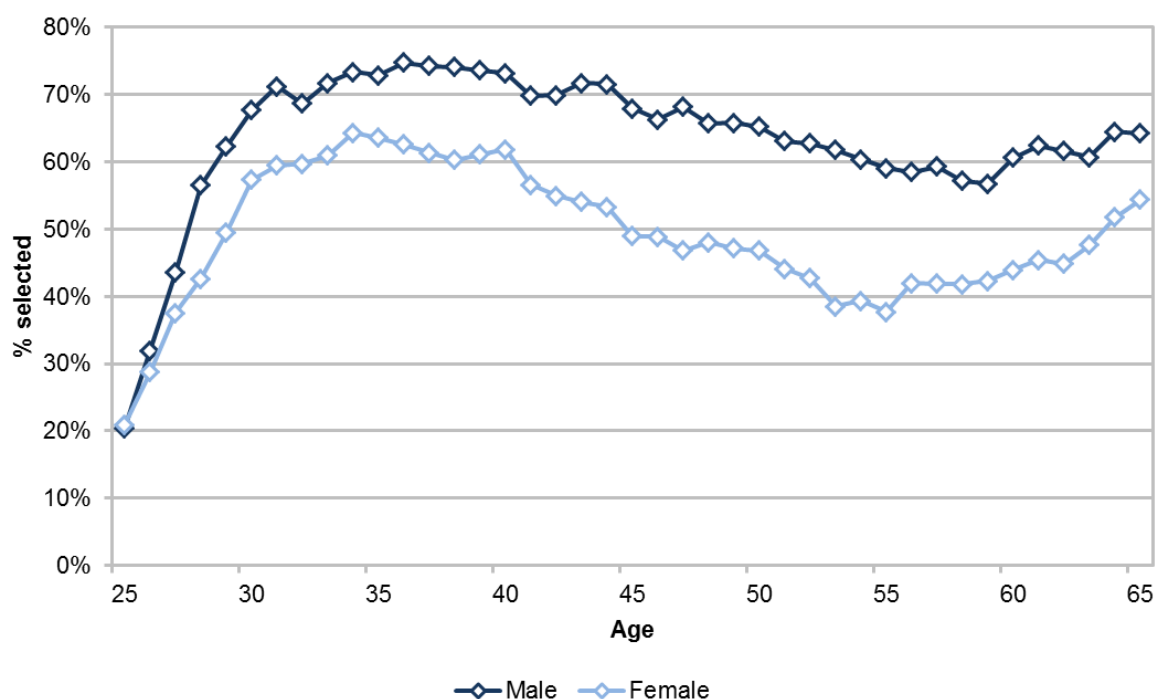
72. This shows that the difference in relative selection rates between male and female staff has decreased between RAE 2008 and REF 2014. However, even when other characteristics and model factors have been taken into account, male staff are more likely to be selected than female staff.

73. Following these results for sex, further analysis was undertaken to consider the joint effect of sex and other factors on selection rates. Sex by age is shown in the next section.

Sex and age

74. Figure 1 shows that the rates of selection varied by age for both men and women. The broad pattern was the same for both sexes: selection rates increased sharply up to about 30 and declined gradually from the mid-30s to the mid-50s, followed by a small rise in later years.

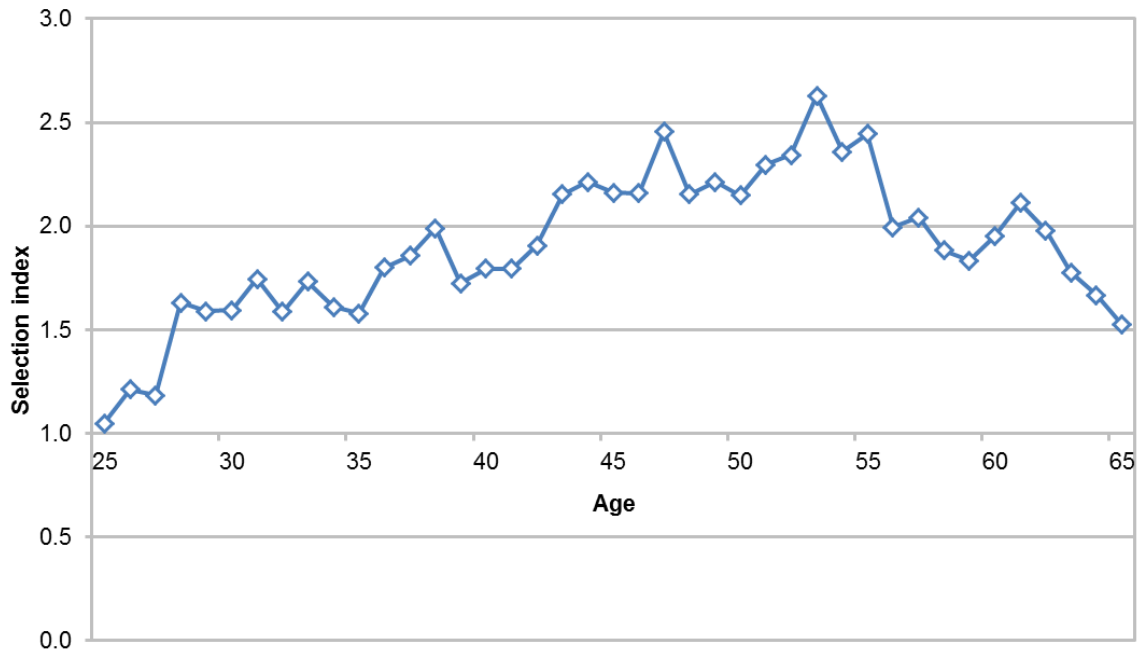
Figure 1: Selection rates for men and women by age (excluding non-submitting UOAs within HEIs)



75. However, as Figure 1 shows, the relationship between age and selection rate was not exactly the same for men and women. Therefore, the relative rates of men compared with

women must have also varied by age, with the biggest differences in the middle years, between about 35 and 55. This is illustrated in Figure 2, which shows how the selection index varied by age.

Figure 2: Actual selection indices for sex by age



Note: This chart refers to the selection index for male staff in comparison to female staff.

76. If selection rates were equal for male and female staff, the selection index would be 1 throughout Figure 2. However, as shown in Figure 3, the selection rate for male staff was greater than that of female staff for all ages. The largest gap between the sexes was for staff aged between 45 and 55.

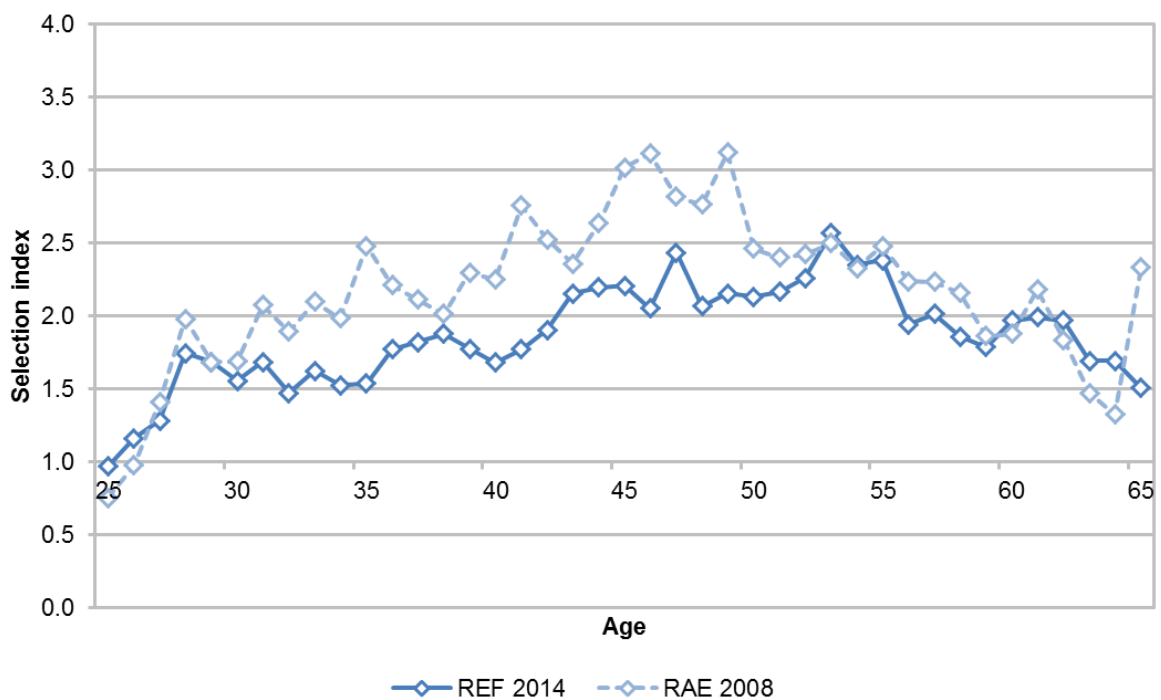
77. A comparison with the permanent staff population from the RAE 2008 is shown in Figure 3, and the respective selection indexes in Figure 4. This shows that up to the age of 50, the gap between male and female selection rates in REF 2014 is smaller than it was for the RAE 2008, although the gap persists. The gap has decreased for staff between 30 and 60 years old, which is the age group with the largest population of staff.

Figure 3: Selection rates for men and women by age (excluding non-submitting UOAs within HEIs) for REF 2014 and RAE 2008



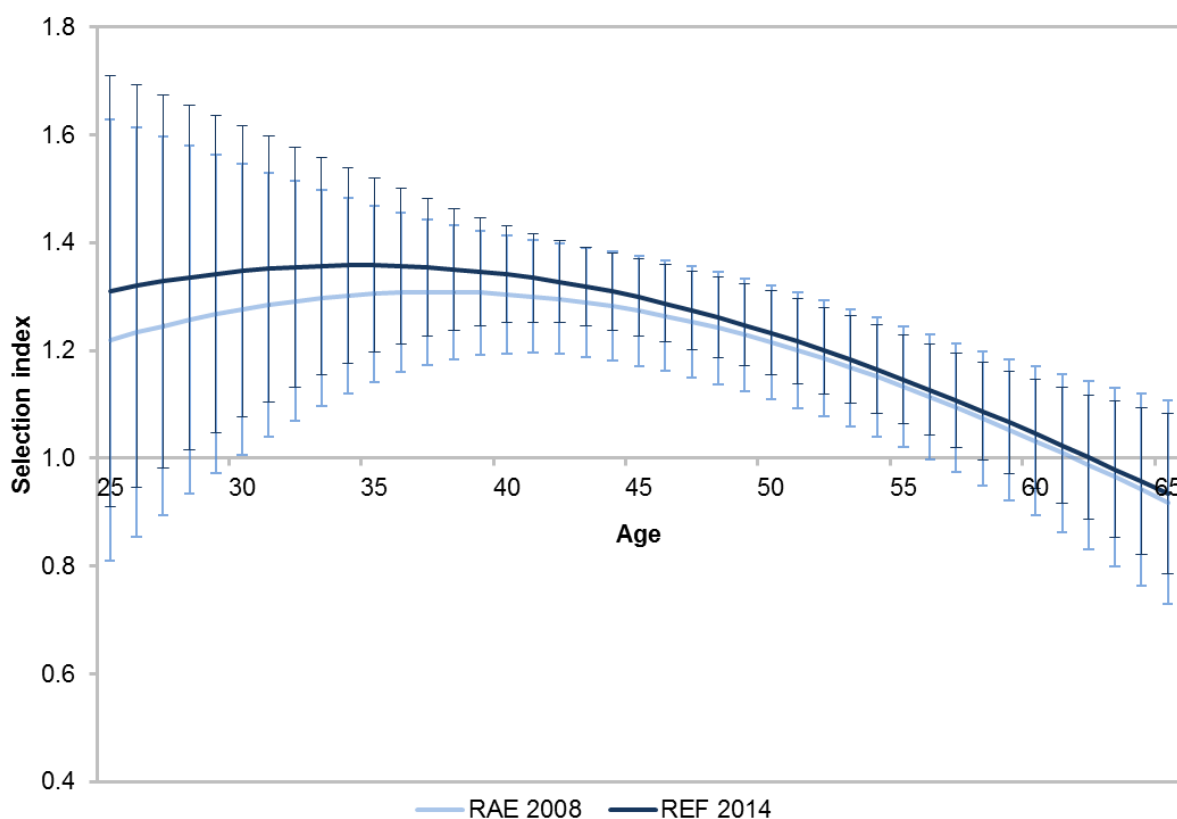
78. The selection indices for REF 2014 and RAE 2008 are similar for staff under 30 and staff over 50. Between these ages, Figure 4 shows that the selection index is closer to equality in the REF 2014 than for RAE 2008. This is the age group with the largest deviation from equality in RAE 2008.

Figure 4: Actual selection indices for sex by age for RAE 2008 and REF 2014



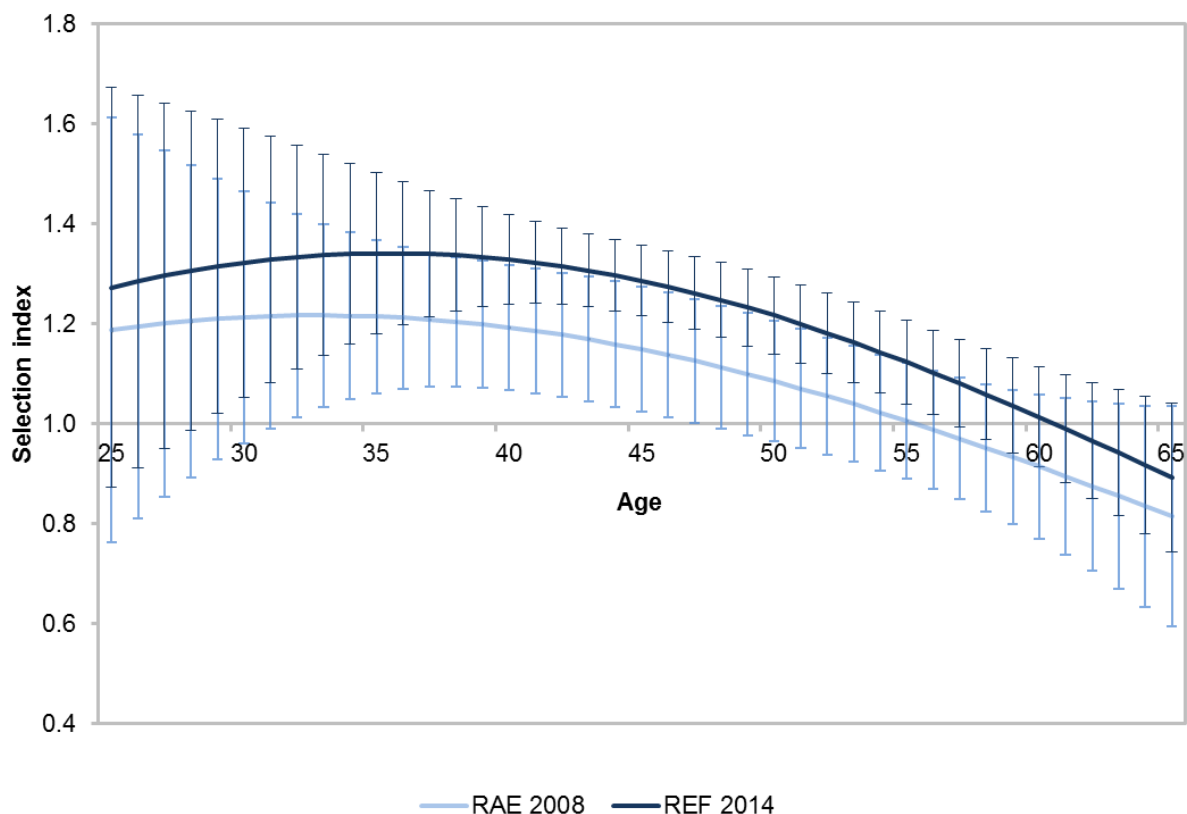
79. Considering the effects of the restricted model on the output, Figure 5 shows that the selection rate for male staff for REF 2014 is statistically significantly higher than 1 between the ages of 28 and 58, whereas in RAE 2008 the difference was significant between the ages of 30 and 55.

Figure 5: Restricted model selection index for sex by age (excluding non-submitting UOAs within HEIs)



80. Considering the effects of the full model which adds in the effect of grade on the output, Figure 6 shows that the selection rates for male staff for REF 2014 are statistically significantly higher than 1 between the ages of 29 and 56, whereas in RAE 2008 the difference was significant between the ages of 32 and 47. Therefore within this age range, even when accounting for different factors, a higher proportion of men than women were selected.

Figure 6: Full model selection index for sex by age (excluding non-submitting UOAs within HEIs)

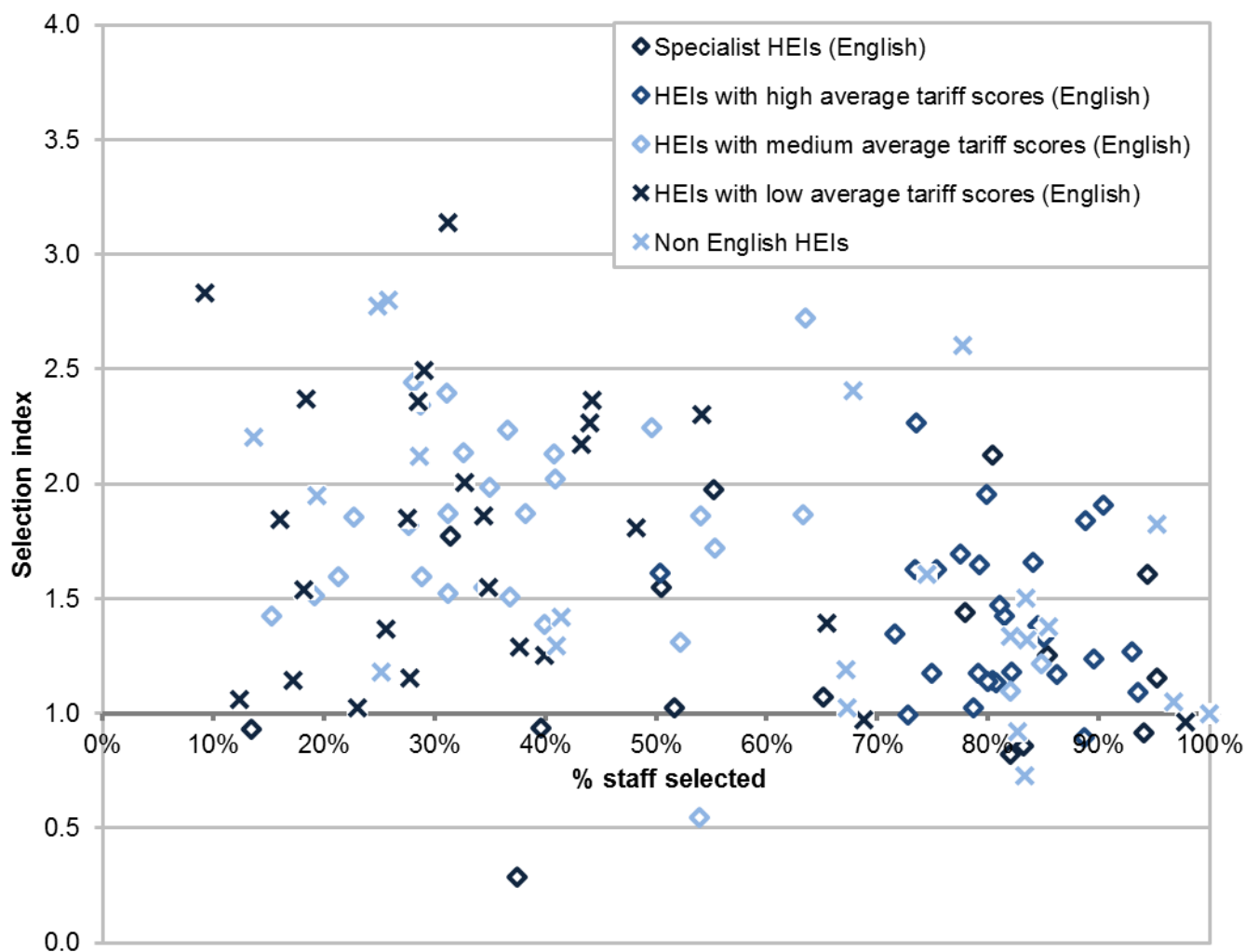


Sex and Institution

81. A recommendation from EDAP was to consider whether there were differences in selection rates for sex by institution. Figure 7 shows the changes in selection rates by institution and institution type. Equal selection rates have a value of 1, higher selection rates for men are indicated by a value greater than 1, and higher selection rates for women are indicated by a selection rate lower than 1.

82. Figure 7 shows that the majority of institutions do not have equal selection rates for male and female staff. The chart shows little evidence of a relationship between selectivity and selection index, but there are trends based on the institution type. Figure 7 shows that eight specialist institutions have selection indices of approximately 1, compared with three HEIs with high average tariff scores.

Figure 7: Selection rates for male and female staff by the percentage selected for REF 2014 and the institution type (excluding non-submitting UOAs within HEIs)



Notes: A specialist HEI is defined as an HEI that has 60 per cent or more of its courses in one or two subjects only. The tariff-based categorisation refers to the UCAS tariff scores required for admission. This categorisation was not available for non-English HEIs; all non-English HEIs have been grouped into a single category.

Nationality

83. This section considers REF 2014 staff by nationality. Table 9 shows that the selection rate is highest for European Union (EU) staff (excluding the UK), with the lowest being for UK nationals. Of UK nationals, 56 per cent were selected for REF 2014, compared with 75 per cent of EU staff and 70 per cent of non-EU staff. 1 per cent of eligible staff did not return a nationality.

Table 9: Selection rates for staff by nationality (excluding non-submitting UOAs within HEIs)

Nationality	Selected	All	% Selected	Index
UK	34,940	62,170	56%	1.00 (ref)
Other EU	9,695	12,880	75%	3.17
Non EU	6,870	9,765	70%	1.85
Unknown	675	1,470	-	-
Total	52,185	85,935	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

84. Table 10 compares the selection indices when accounting for the factors in the restricted and in the full models. This shows that there was broadly no difference between the restricted and the full models, and that both models are closer to equality than the raw results. However, they still show a statistically significantly higher selection rate for EU and non-EU staff than for UK staff. The differences between the full and restricted model show that grade does not affect the selection rate by nationality.

Table 10: Selection indices comparing staff by nationality (excluding non-submitting departments)

Nationality	Actual	Restricted model	Full model
UK	1.00 (ref)	1.00 (ref)	1.00 (ref)
Other EU	3.17**	1.44**	1.45**
Non EU	1.85**	1.19**	1.20**

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

Nationality and ethnicity

85. Around 10,000 staff in the population analysed were from ethnic minorities. To ensure sufficient numbers were available, a simplified classification into five ethnic groupings was used. These were: White, Black, Asian, Chinese and Other. (See Annex B for definitions of these groupings.) Table 11 shows the rates of selection for each ethnic grouping.

86. In the REF 2014, 7 per cent of eligible staff did not return an ethnicity and these have been excluded from this section of the analysis.

87. Table 11 shows the selection rates by ethnicity and nationality. It shows that for UK nationals the selection rate for Black staff is 35 per cent. This compares with 56 per cent for White staff and 68 per cent for Chinese staff. This trend also holds for EU national staff (excluding the UK).

88. Among non-EU staff, Black staff have the lowest selection rate at 46 per cent, while White staff have the highest selection rate at 76 per cent.

Table 11: Selection rates for staff by ethnicity (excluding non-submitting UOAs within HEIs)

Nationality	Ethnicity	Selected	All	% Selected	Index
UK	White	30,230	54,270	56%	1.00 (ref)
	Black	205	595	35%	0.42
	Asian	1,005	1,805	56%	1.00
	Chinese	595	875	68%	1.68
	Other	800	1,335	60%	1.19
EU	White	8,615	11,470	75%	1.00 (ref)
	Black	15	30	45%	0.27
	Asian	35	45	74%	0.94
	Chinese	20	20	90%	2.99
	Other	260	360	73%	0.89
Non EU	White	3,550	4,640	76%	1.00 (ref)
	Black	200	430	46%	0.26
	Asian	1,020	1,695	60%	0.46
	Chinese	960	1,405	68%	0.67
	Other	545	795	69%	0.68
Unknown		4,135	6,155	-	-
Total		52,185	6,155	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

89. The selection rates for each of these groups were different between the raw outputs and the modelled results shown in Table 12. The results vary by both nationality and ethnicity.

90. Among UK nationals, Black staff had a lower raw selection index of 0.42 compared with White staff. With the model factors taken into account, the difference in selection rate decreases, but the differences are still significant at the 1 per cent level. For Asian staff the raw selection rates were the same as for White staff, but once the model factors are taken into account the difference in selection rates becomes statistically significant at the 1 per cent level, with Asian staff having a lower selection rate than White staff. Selection rates for Chinese and Other ethnicities are not statistically significantly different from those for White staff at the 1 per cent level.

91. For EU national staff (excluding the UK), the only group that is statistically significant from White is Chinese staff, although it should be noted from Table 11 that there are only 20 Chinese EU national staff eligible for the REF 2014.

92. Considering non-EU staff, Asian staff had a much lower than expected raw selection rate. However, once the factors from the two models are taken into account, the selection indices increase from 0.46 to 0.79 and 0.80 respectively. Although this shows that some of the differences between the two groups are explained by the factors in the model, the difference between the two groups is still statistically significant at the 0.01 per cent level.

93. Similar differences are observed between Black and White staff. This difference is still statistically significant, but only at the 1 per cent level, and is therefore less so than that for Asian staff.

Table 12: Selection indices comparing staff by ethnicity (excluding non-submitting departments)

Nationality	Ethnicity	Actual	Restricted model	Full model
UK	White	(ref) 1.00	(ref) 1.00	(ref) 1.00
	Black	0.42**	0.72*	0.72*
	Asian	1.00	0.86*	0.88*
	Chinese	1.68	1.14	1.14
	Other	1.19	1.00	1.01
EU	White	(ref) 1.00	(ref) 1.00	(ref) 1.00
	Black	0.27	0.75	0.74
	Asian	0.94	0.89	0.89
	Chinese	2.99**	7.86*	7.37*
	Other	0.89	1.08	1.10
Non EU	White	(ref) 1.00	(ref) 1.00	(ref) 1.00
	Black	0.26**	0.78*	0.77*
	Asian	0.46**	0.79**	0.80**
	Chinese	0.67**	1.10	1.12
	Other	0.68**	1.04	1.05

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

Early career researchers

94. In REF 2014 it was possible to indicate whether a member of staff was an early career researcher (ECR). This section considers whether a staff member was flagged as an ECR on the HESA staff record, not whether they had ECR as a staff circumstance on the REF 2014

submission⁹. In the REF 2014, less than 1 per cent of eligible staff did not record whether or not they were an early career researcher.

95. Table 13 shows that ECRs had a selection rate of 80 per cent, which was higher than that for non-ECRs at 58 per cent.

Table 13: Selection rates for staff by whether or not they are an ECR (excluding non-submitting UOAs within HEIs)

ECR?	Selected	All	% Selected	Index
Not ECR	42,815	74,175	58%	1.00 (ref)
ECR	9,365	11,740	80%	2.89
Unknown	5	40	-	-
Total	52,185	85,940	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

96. Table 14 shows that once all the factors in both models are taken into account, the selection rates are still higher than would be expected for ECRs. This difference is statistically significant at the 0.01 per cent level.

Table 14: Selection indices comparing staff who are early career researchers (excluding non-submitting departments)

ECR?	Actual	Restricted model	Full model
Not ECR	(ref) 1.00	(ref) 1.00	(ref) 1.00
ECR	2.89**	3.18**	5.09**

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

Early career researchers and sex

97. In this section, ECRs are split by sex to consider whether there are greater differences by sex for those who are early in their career than for other members of staff.

98. Table 15 shows that the selection rate for ECRs for both sexes is higher than for non-ECRs, but that the selection index is higher for female ECRs than male ECRs. This suggests that the difference between ECRs and non-ECRs is larger for female than for male staff. This results in a smaller difference between male and female ECRs than for non-ECRs.

⁹ For more information, see https://www.hesa.ac.uk/index.php?option=com_studrec&task=show_file&mdl=13025&href=a^ ^ECR STAT.html.

Table 15: Selection rates for staff by ECR status and sex (excluding non-submitting UOAs within HEIs)

Sex	ECR?	Selected	All	% Selected	Index
Male	Not ECR	29,770	46,440	64%	1.00 (ref)
	ECR	5,755	6,960	83%	2.68
Female	Not ECR	13,045	27,735	47%	1.00 (ref)
	ECR	3,610	4,780	76%	3.48
Total		52,180	85,915	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

99. Table 16 shows that the difference between ECR and non-ECR staff increases when accounting for background characteristics. For male staff members, the selection index increases from 2.68 to 4.37 in the restricted model and 4.42 in the full model. For female staff the selection index increases from 3.48 to 5.77 and 5.80 respectively.

Table 16: Selection indices comparing staff by ECR status and sex (excluding non-submitting departments)

Nationality	ECR	Actual	Restricted model	Full model
Male	Not ECR	(ref) 1.00	(ref) 1.00	(ref) 1.00
	ECR	2.68**	4.37**	4.42**
Female	Not ECR	(ref) 1.00	(ref) 1.00	(ref) 1.00
	ECR	3.48**	5.77**	5.80**

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

Full-time equivalence

100. Table 17 considers the selection rate for staff by FTE. The highest selection rate of 68 per cent was among staff with an FTE between 0.2 and 0.4. This is the lowest FTE level eligible for the REF 2014. The lowest selection rate was 39 per cent, for staff between 0.6 and 0.8 FTE.

Table 17: Selection rates for staff by FTE (excluding non-submitting UOAs within HEIs)

FTE	Selected	All	% Selected	Index
1.0 FTE	43,480	69,245	63%	1.00 (ref)
0.8 to less than 1.0 FTE	3,485	6,255	56%	0.97
0.6 to less than 0.8 FTE	1,235	3,210	39%	0.48
0.4 to less than 0.6 FTE	1,735	3,890	45%	0.62
0.2 to less than 0.4 FTE	2,250	3,335	68%	1.23
Total	52,185	85,935	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

101. Table 18 shows that staff with a contract at less than 1 FTE are significantly less likely to be selected for the REF 2014, once other background characteristics are accounted for in both the full and restricted models. FTE is the only characteristic considered in this report where this change occurs between the actual results and the model results.

Table 18: Selection indices comparing staff by FTE (excluding non-submitting departments)

FTE	Actual	Restricted model	Full model
1.0 FTE	(ref) 1.00	(ref) 1.00	(ref) 1.00
0.8 to less than 1.0 FTE	0.97	0.53**	0.55**
0.6 to less than 0.8 FTE	0.48**	0.53**	0.56**
0.4 to less than 0.6 FTE	0.62**	0.53**	0.55**
0.2 to less than 0.4 FTE	1.23**	0.60**	0.62**

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

Full-time equivalence and sex

102. This section looks at whether or not these differences in FTE are also explained by sex.

103. Table 19 shows that the selection rate is higher for men than women. For male staff the range of selection indices is from 0.36 to 1.32, whereas for female staff it is from 0.48 to 1.02. While the selection index for low-FTE female staff is not significantly different from that of full-time female staff, there is a significant difference for male staff.

Table 19: Selection rates for staff by FTE and sex (excluding non-submitting UOAs within HEIs)

Sex	FTE	Selected	All	% Selected	Index
Male	1.0 FTE	30,325	44,855	68%	1.00 (ref)
	0.8 to less than 1.0 FTE	1,960	3,080	64%	0.84
	0.6 to less than 0.8 FTE	510	1,190	43%	0.36
	0.4 to less than 0.6 FTE	1,035	1,975	52%	0.53
	0.2 to less than 0.4 FTE	1,690	2,305	73%	1.32
Female	1.0 FTE	13,155	24,385	54%	1.00 (ref)
	0.8 to less than 1.0 FTE	1,525	3,175	48%	0.79
	0.6 to less than 0.8 FTE	725	2,020	36%	0.48
	0.4 to less than 0.6 FTE	700	1,915	36%	0.49
	0.2 to less than 0.4 FTE	560	1,025	54%	1.02
Total		52,185	85,935	61%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

104. Table 20 shows the results accounting for other background characteristics. This shows that low-FTE staff have a lower selection rate than expected given their background characteristics. All of the groups that were significantly different from staff working at 1 FTE are still significant when splitting by age.

105. For male staff, accounting for the factors in both of the models, the selection rate between 0.2 and 0.4 FTE reduces from being higher for the raw rates, at 1.32, to lower for the modelled rates, at 0.57 for the restricted model and 0.61 for the full model. For female staff, the selection index for the low-FTE contracts changed from 1.02 for the raw results to 0.46 for the restricted model and 0.49 in the full model.

Table 20 Selection indices comparing staff by FTE and sex (excluding non-submitting UOAs within HEIs)

Sex	FTE	Actual	Restricted model	Full model
Male	1.0 FTE	(ref) 1.00	(ref) 1.00	(ref) 1.00
	0.8 to less than 1.0 FTE	0.84**	0.66**	0.68**
	0.6 to less than 0.8 FTE	0.36**	0.49**	0.50**
	0.4 to less than 0.6 FTE	0.53**	0.56**	0.59**
	0.2 to less than 0.4 FTE	1.32**	0.57**	0.61**
Female	1.0 FTE	(ref) 1.00	(ref) 1.00	(ref) 1.00
	0.8 to less than 1.0 FTE	0.79**	0.51**	0.54**
	0.6 to less than 0.8 FTE	0.48**	0.51**	0.54**
	0.4 to less than 0.6 FTE	0.49**	0.47**	0.51**
	0.2 to less than 0.4 FTE	1.02	0.46**	0.49**

Notes: * denotes significant differences at the 1 per cent level. ** denotes significant differences at the 0.01 per cent level.

Unit of Assessment and sex

106. Selection rates vary across UOAs. Table 21 shows that overall selection rates vary from 31 per cent in Education to 90 per cent for Classics and Philosophy.

107. There is also a wide range in the male-female selection indices for different UOAs. The selection index for the sector as a whole is 1.3. Communication, Cultural and Media Studies, Library and Information Management and Physics had a selection index of 0.9 (meaning that slightly more women were selected than men), compared with a selection index of 2.4 for Allied Health Professions, Dentistry, Nursing and Pharmacy (meaning that substantially more men were selected than women).

Table 21: Selection rates by UOA (not excluding non-submitting UOAs within HEIs)

	Selected	All	% selected	% female selected	% male selected	Selection index
Clinical Medicine	3,655	5,175	71%	64%	74%	1.6
Public Health, Health Services and Primary Care	1,340	1,960	68%	62%	75%	1.8
Allied Health Professions, Dentistry, Nursing and Pharmacy	2,855	8,590	33%	26%	45%	2.4
Psychology, Psychiatry and Neuroscience	2,580	3,650	71%	65%	75%	1.6
Biological Sciences	2,370	3,200	74%	66%	77%	1.7
Agriculture, Veterinary and Food Science	1,045	1,435	73%	67%	76%	1.6
Earth Systems and Environmental Sciences	1,310	1,730	76%	70%	77%	1.5
Chemistry	1,220	1,445	85%	82%	85%	1.3
Physics	1,680	1,965	86%	87%	85%	0.9
Mathematical Sciences	1,890	2,200	86%	81%	87%	1.6
Computer Science and Informatics	2,035	3,380	60%	50%	63%	1.6
Aeronautical, Mechanical, Chemical and Manufacturing Engineering	1,160	1,500	77%	78%	77%	1.0
Electrical and Electronic Engineering, Metallurgy and Materials	1,040	1,325	79%	79%	78%	1.0
Civil and Construction engineering	405	505	81%	78%	81%	1.2
General Engineering	2,405	3,370	71%	70%	72%	1.1
Architecture, Built Environment and Planning	1,065	2,030	52%	49%	54%	1.2
Geography, Environmental Studies and Archaeology	1,665	2,020	83%	81%	83%	1.2
Economics and Econometrics	750	975	77%	71%	79%	1.5
Business and Management Studies	3,410	8,005	43%	34%	48%	1.7
Law	1,550	2,645	59%	52%	64%	1.7
Politics and International Studies	1,250	1,620	77%	74%	79%	1.3
Social Work and Social Policy	1,320	2,295	58%	53%	63%	1.5
Sociology	710	910	78%	75%	81%	1.5

Anthropology and Development Studies	560	705	79%	74%	83%	1.7
Education	1,250	4,100	31%	27%	36%	1.5
Sport and Exercise Sciences, Leisure and Tourism	810	1,780	45%	39%	49%	1.5
Area Studies	470	620	76%	70%	79%	1.7
Modern Languages and Linguistics	1,355	1,740	78%	74%	83%	1.7
English Language and Literature	1,965	2,560	77%	74%	79%	1.3
History	1,705	2,065	83%	81%	84%	1.2
Classics	360	400	90%	90%	90%	1.0
Philosophy	580	650	90%	90%	89%	1.0
Theology and Religious Studies	405	525	77%	72%	79%	1.5
Art and Design: History, Practice and Theory	1,830	4,515	41%	39%	42%	1.1
Music, Drama, Dance and Performing Arts	1,200	2,135	56%	56%	56%	1.0
Communication, Cultural and Media Studies, Library and Information Management	975	1,980	49%	51%	48%	0.9
Total	52,185	85,935	61%	51%	67%	1.3

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts. * denotes significant differences at the 5 per cent level when taking into account the factors in the full model.

Discussion

108. As with the RAE 2008 analysis, it is important to appreciate the limitations of this work. A difference in the selection rates between one group of staff and another does not necessarily mean that one group has been treated unfairly. Conversely, if there has been no reported difference in selection rates, this does not mean that there have been no cases of bias.

109. The statistical models we have used to measure the effect of individual factors account for many variables that are thought to affect selection to the REF, but not everything can be accounted for. With this in mind, we discuss the evidence for sector-wide bias below with respect to the equality factors we have analysed.

110. Our analysis shows that there has been modest progress in reducing the selection gaps that were present in the previous Research Assessment Exercises. Most notably, the differences between the proportion of men and women being selected has continued to shrink.

111. The selection rate for staff with declared disabilities was lower than for those without. Although this discrepancy can be partially explained when other factors are taken into account, the modelling suggests that the proportion of staff with a declared disability selected for inclusion in the REF is lower than for staff without a declared disability

112. As in HEFCE 2009/34, the data shows a marked difference between the rate of selection for men and women in REF 2014; 67 per cent of men were selected compared with 51 per cent of women. However, the proportion of women submitted has increased (from 48 per cent in RAE 2008). In addition, when the modelling is applied the difference in the selection indices decreases, suggesting that factors other than sex may explain the selection differences between men and women.

113. When age is considered in combination with sex, the model output shows that the relative rates of selection of men and women varied by age, with the largest gap affecting staff aged between 45 and 55.

114. Comparisons with RAE 2008 show that up to the age of 50 the gap between male and female selection rates in REF 2014 has decreased. Between the ages of 30 and 50, the age group with the largest deviation from equality in RAE 2008, the selection index is closer to equality in the REF 2014.

115. Analysis of male and female selection rates at HEI level shows that the majority of institutions do not have equal selection rates by sex. However, there is little evidence of a relationship between selectivity (the overall percentage of staff submitted to the REF by an HEI) and selection index. This suggests that a more selective submission policy does not necessarily indicate a greater bias in sex selection rates.

116. The effect of nationality was considered, with selection rates being highest for EU staff and lowest for UK nationals. Although the differences are partially explained by other factors, there was still a higher selection rate for EU and non-EU staff than for UK staff.

117. The selection rates were similar for all ethnicity groups, with the exception of Black and Asian UK and non-EU nationals, who had statistically significant lower selection rates even with modelling for other factors taken into account.

118. ECRs had a selection rate of 80 per cent, significantly higher than that for non-ECRs (58 per cent). Analysis by sex shows a larger selection difference between ECRs and non-ECRs for female staff than for male staff, suggesting that the sex disparity in selection rates is less for individuals at the start of their research careers.

119. Analysis of staff by FTE shows that staff with a contract at less than 1 FTE were significantly less likely to be selected for the REF 2014. This difference increases when other factors are taken into account, suggesting that these other factors have less influence on selection rates than FTE.

120. The overall selection rates of eligible staff vary across UOAs, from 31 per cent in Education to 90 per cent for Classics and Philosophy. The selection rates by sex also vary widely. The selection index for the sector is 1.3, but the selection indices at UOA level vary from 0.9 (for Communication, Cultural and Media Studies, Library and Information Management) to 2.4 (for Allied Health Professions, Dentistry, Nursing and Pharmacy), although no UOA was found to be statistically significantly different from the sector average.

121. Although it is clear that there are still equality and diversity issues to be addressed in developing future REF exercises, the progress which has been made since RAE 2008 should not be overlooked. EDAP's final report concluded that:

'the REF has helped raise the profile of equality and diversity in research careers, seeking to influence cultural and management changes within the sector [...] It is important to build on the positive advances made within the sector and we urge all concerned to maintain momentum for future improvements.'¹⁰

122. Although many in the sector have noted the considerable volume of work and the often challenging internal processes involved, the strengthened measures to promote equality and diversity in the REF 2014 were widely welcomed by the sector, allowing greater consistency and a fairer approach to staff selection. Further feedback from the sector can be found in the report 'Evaluating the 2014 REF: Feedback from participating institutions'¹¹.

123. To prepare for the development of the next REF, we need a thorough, robust and, where appropriate, independent evaluation of REF 2014. This report forms part of a number of projects that together are intended to provide a comprehensive evaluation of REF 2014, and inform policy development for future exercises¹².

124. Despite the progress seen in some areas, it is important to remain mindful of the remaining equality challenges which have been thrown in to sharp relief by this analysis. These include the continued under-selection of many black and minority ethnic staff (particularly black staff) and staff with disabilities, and the increase with age in the selection gap between men and women. This indicates deeply entrenched supply issues, which are one of the key focuses of the Athena SWAN Charter (see paragraph 127). The detailed analysis contained within this report will inform wider equality and diversity work in the sector, as well as being taken into account in preparations for any future REF.

125. The work undertaken to ensure that equality considerations were taken into account in selecting staff for the REF has been recognised as having an overwhelmingly positive impact. EDAP's final evaluation stated that 'the measures have supported the inclusion of a wider pool of individuals who might have been excluded previously'. Moreover, this impact extends beyond the results of staff selection, to establishing equality and diversity as important considerations in universities' everyday activities. The EDAP evaluation also reported that the 'equality measures have helped influence cultural and management changes within the sector with REF-like processes being applied within institutions in key areas such as promotion and reward'¹³. This has given the sector a strong platform for further progress.

126. The success of this work may be seen as part of a larger trend in the higher education sector. The integral importance of equality and diversity to the success of all aspects of university missions has been recognised and embraced across the sector. This is evident in many ways, from the rationale for equality and diversity work carried out by Equality Challenge Unit in 2014¹⁴

¹⁰ See www.ref.ac.uk/equality/edapreport/.

¹¹ Available online at www.hefce.ac.uk/rsrch/REFreview/feedback/.

¹² For more information about these projects see www.hefce.ac.uk/rsrch/REFreview/.

¹³ See www.ref.ac.uk/equality/edapreport/.

¹⁴ 'The rationale for equality and diversity: How vice-chancellors and principals are leading change', October 2014, available at www.ecu.ac.uk/publications/rationale-equality-diversity-vice-chancellors-principals-leading-change/.

to the growing use of equality targets as institutional performance indicators¹⁵. Much work has been undertaken at both sector and institutional level to address inequalities.

127. The most high profile of these initiatives is the Athena SWAN Charter, which has now been running for 10 years. Athena SWAN was originally developed to encourage universities and their science, technology, engineering and mathematics departments to address sex imbalances. In 2015 the remit of the Charter was expanded to cover arts, humanities and social sciences, and an analogous charter mark for race equality was introduced. Alongside the Charter, there is an awards scheme, whereby institutions (including research institutes) and departments can apply for gold, silver and bronze awards in recognition of progress towards sex equality objectives.

128. Since 2012, the award of National Institute of Health Research funding for biomedical research centres and units and to university medical schools has been contingent on holding an Athena SWAN silver award. The introduction of conditionality for research funding has led to a rapid increase in the number of institutions and departments applying for awards. To date, there are 129 Athena SWAN Charter members; 74 HEIs hold institutional awards and 375 departments hold departmental awards.

129. There is evidence that Athena SWAN is helping to embed equality considerations in university and departmental working practices. An impact evaluation in 2013 showed that Athena SWAN had had a demonstrable positive impact on the working environment and practices in institutions and departments holding awards, and that this impact was greater in departments with higher levels of award¹⁶. Moreover, staff in departments that hold an award feel a greater sense of belonging than those in departments without.

130. Diversity in university leadership and governance is also high on the agenda. Since 2014, the Leadership Foundation for Higher Education has offered the Aurora development programme. This is a women-only development programme targeted at middle managers who wish to progress to senior management and leadership. It is open to both academic and professional staff, and has so far involved over 500 women from across the UK.

131. As part of their commitment to creating the conditions for excellence in higher education, the funding bodies are determined to continue to facilitate further progress towards greater equality and diversity across the sector over coming years. They will be working closely with stakeholders to achieve this, including those involved in supporting research careers.

¹⁵ See www.kingston.ac.uk/news/article/1472/16-mar-2015-kingston-university-takes-steps-to-close-the-bme-attainment-gap.

¹⁶ See www.ecu.ac.uk/publications/evaluating-athena-swan/.

Annex A: Terminology and abbreviations

Terminology

Academic staff	<p>Staff employed under a contract of salaried employment with an HEI, whose primary employment function is teaching, research or both.</p>
Eligible staff	<p>Staff eligible for inclusion in the submission to the REF 2014: that is, staff whose research outputs may be included in the submission. Eligible staff were defined as staff who met the following conditions:</p> <ol style="list-style-type: none"> a. Staff holding academic contracts where the academic employment function was recorded as either ‘research’ or ‘teaching and research’ b. Staff holding contracts that were active on 31 October 2013. c. Staff who were not recorded as research assistants. d. Staff whose scaled ‘full-year’ full-time equivalence was 0.2 or greater.
Non-submitting department	<p>A department where there are no submissions.</p>
Quality profile	<p>This is a measure of the quality of research described by the submissions from a UOA within an HEI. The profile gives the proportion of research activity found at each quality level on a five-point scale: 4*, 3*, 2*, 1* and unclassified, where 4* is the highest.</p>
Research outputs	<p>Publicly available assessable outcomes of the research of selected staff (or, if confidential, available to be assessed). Each selected staff member may submit a maximum of four research outputs for the REF 2014.</p>
Selected staff	<p>Eligible staff whose research outputs are included in a REF 2014 submission.</p>
Selection index	<p>When using simple summary statistics, this is a ratio of odds ratios based on the selection rate</p>

	<p>of one particular staff and the selection rate of a reference group of staff.</p> $\frac{S_j \times (100 - S_r)}{S_r \times (100 - S_j)}$ <p>where:</p> <p>S_j is the selection rate of the jth staff group</p> <p>S_r is the selection rate of the reference staff group</p> <p>When based on a model, the selection index is the exponential of the coefficient identifying the staff group.</p>
Selection rate	<p>Expressed as a percentage, as follows:</p> $\frac{100 \times (\text{Number of selected staff})}{(\text{Number of eligible staff})}$
Submission	<p>A set of information provided to the REF 2014 by an HEI pertaining to a UOA. The submissions are assigned to a quality profile. In a few cases HEIs made more than one submission for one UOA; these are referred to as multiple submissions.</p>
Unit of Assessment (UOA)	<p>One of 36 discipline areas to which REF 2014 submissions may have been made by an HEI.</p>
UOA within HEI	<p>The submissions associated with a UOA for a particular HEI. Usually identical to a submission. Used as an approximation to a submission for most of the analysis in this report.</p>

Abbreviations

ECR	Early career researcher
EDAP	The REF 2014 Equality and Diversity Advisory Panel
EU	European Union
FTE	Full-time equivalent
HEFCE	Higher Education Funding Council for England
HEI	Higher education institution
HESA	Higher Education Statistics Agency
RAE	Research Assessment Exercise
RAE 2001	Research Assessment Exercise that took place in 2001
RAE 2008	Research Assessment Exercise that took place in 2008
REF	Research Excellence Framework
REF 2014	Research Excellence Framework that took place in 2014
ref	The reference group used to calculate the selection index
UOA	REF 2014 Unit of Assessment

Annex B: HESA data: definitions, quality checks and groupings

Introduction

1. This annex gives details of the derivation of the base data used in constructing the dataset used in the modelling. Throughout the annex, fields taken from the Higher Education Statistics Agency (HESA) record are given in capitals using the field names from the HESA coding manual. The data used in the modelling was derived from modified versions of the 2007-08 HESA staff person and staff contract tables.

Creating UOA and field ratings

2. The Research Excellence Framework (REF) 2014 uses 36 Units of Assessment (UOAs) to categorise submissions. In the 2008 Research Assessment Exercise (RAE) there were 68 UOAs, which were mapped to the REF 2014 UOAs as shown in Table B1¹⁷. For the first time in the HESA 2013-14 staff record, all eligible staff were required to submit a UOA¹⁸.

Table B1: Mapping of REF 2014 UOAs to RAE 2008 UOAs

REF 2014 Unit of assessment	Name	RAE 2008 Unit of assessment	Name
1	Clinical Medicine	1	Cardiovascular Medicine
		2	Cancer Studies
		3	Infection and Immunology
		4	Other Hospital Based Clinical Subjects
		5	Other Laboratory Based Clinical Subjects
2	Public Health, Health Services and Primary Care	6	Epidemiology and Public Health
		7	Health Services Research
		8	Primary Care and Other Community Based Clinical Subjects
3	Allied Health	10	Dentistry

¹⁷ For more information see <http://www.ref.ac.uk/results/analysis/>.

¹⁸ For more information see https://www.hesa.ac.uk/index.php?option=com_studrec&task=show_file&mdl=13025&href=a^ ^REF UOA2014.html.

	Professions, Dentistry, Nursing and Pharmacy	11	Nursing and Midwifery
		12	Allied Health Professions and Studies
		13	Pharmacy
4	Psychology, Psychiatry and Neuroscience	9	Psychiatry, Neuroscience and Clinical Psychology
		44	Psychology
5	Biological Sciences	14	Biological Sciences
		15	Pre-clinical and Human Biological Sciences
6	Agriculture, Veterinary and Food Sciences	16	Agriculture, Veterinary and Food Science
7	Earth Systems and Environmental Sciences	17	Earth Systems and Environmental Sciences
8	Chemistry	18	Chemistry
9	Physics	19	Physics
10	Mathematical Sciences	20	Pure Mathematics
		21	Applied Mathematics
		22	Statistics and Operational Research
11	Computer Science and Informatics	23	Computer Science and Informatics
12	Aeronautical, Mechanical, Chemical and Manufacturing Engineering	26	Chemical Engineering
		28	Mechanical, Aeronautical and Manufacturing Engineering
13	Electrical and Electronic Engineering, Metallurgy and Materials	24	Electrical and Electronic Engineering
		29	Metallurgy and Minerals
14	Civil and Construction	27	Civil Engineering

Engineering			
15	General Engineering	25	General Engineering and Mineral and Mining Engineering
16	Architecture, Built Environment and Planning	30	Architecture and the Built Environment
		31	Town and Country Planning
17	Geography, Environmental Studies and Archaeology	32	Geography and Environmental Studies
		33	Archaeology
18	Economics and Econometrics	34	Economics and Econometrics
19	Business and Management Studies	35	Accounting and Finance
		36	Business and Management Studies
20	Law	38	Law
21	Politics and International Studies	39	Politics and International Studies
22	Social Work and Social Policy	40	Social Work and Social Policy and Administration
23	Sociology	41	Sociology
24	Anthropology and Development Studies	42	Anthropology
		43	Development Studies
25	Education	45	Education
26	Sport and Exercise Sciences, Leisure and Tourism	46	Sports-Related Studies
27	Area Studies	47	American Studies and Anglophone Area Studies
		48	Middle Eastern and African Studies
		49	Asian Studies

		50	European Studies
28	Modern Languages and Linguistics	51	Russian, Slavonic and East European Languages
		52	French
		53	German, Dutch and Scandinavian Languages
		54	Italian
		55	Iberian and Latin American Languages
		56	Celtic Studies
		58	Linguistics
29	English Language and Literature	57	English Language and Literature
30	History	62	History
31	Classics	59	Classics, Ancient History, Byzantine and Modern Greek Studies
32	Philosophy	60	Philosophy
33	Theology and Religious Studies	61	Theology, Divinity and Religious Studies
34	Art and Design: History, Practice and Theory	63	Art and Design
		64	History of Art, Architecture and Design
35	Music, Drama, Dance and Performing Arts	65	Drama, Dance and Performing Arts
		67	Music
36	Communication, Cultural and Media Studies, Library and Information Management	37	Library and Information Management
		66	Communication, Cultural and Media Studies

3. Using this UOA information, the appropriate rating profile for that UOA was added to the dataset¹⁹. Because it was necessary to reduce the multi-level profile of ratings to a single indicator for the modelling process, the percentage of research activity rated as 4* was used to allow some consistency with previous reports. The groupings used are shown in Table B2. 4* represents work whose quality was judged to be world-leading²⁰.

Table B2: Grouping the quality rating

Rating group	Percentage of research activity rated as 4*
0	0-<5
1	5-<10
2	10-<15
3	15-<20
4	20-<25
5	25-<30
6	30-<35
7	35+

Ethnicity groupings

4. In this analysis six ethnicity groupings were used. These groupings were derived from the more detail classification used on the HESA staff record²¹. The mapping is shown in Table B3.

Table B3: Mapping to ethnicity groups

Ethnicity group	Ethnicity fields
White	10 White
	13 White – Scottish
	14 Irish Traveller
	15 Gypsy or Traveller
	19 Other White background
Black	21 Black or Black British – Caribbean
	22 Black or Black British – African
	29 Other Black background
Asian	31 Asian or Asian British – Indian

¹⁹ For more information see <http://results.ref.ac.uk/>.

²⁰ For more information see <http://www.ref.ac.uk/intro/>.

²¹ For more information see https://www.hesa.ac.uk/index.php?option=com_studrec&task=show_file&mdl=13025&href=a^ ^REF UOA2014.html.

	32 Asian or Asian British – Pakistani
	33 Asian or Asian British – Bangladeshi
	39 Other Asian background
Chinese	34 Chinese
Other	41 Mixed – White and Black Caribbean
	42 Mixed – White and Black African
	43 Mixed – White and Asian
	49 Other mixed background
	50 Arab
	80 Other ethnic background
Unknown	90 Not known
	98 Information refused

Grade groupings

5. In this analysis seven grade groupings were used. These groupings were derived from the 'More detail' classification used on the HESA staff record²². The mapping is shown in Table B4.

Table B4: Mapping to grade groups

Grade group	Level fields
Senior management	A0 Head of institution – vice-chancellor or principal
	B1 Deputy vice-chancellor or pro vice-chancellor
	B2 Chief operating officer, registrar, university secretary
	C1 Head or director of major academic area
	C2 Director of major function or group of functions (for instance finance, corporate services, human resources)
Professor and academic leadership	D1 Head of a distinct area of academic responsibility (for instance head of school, division, department or centre), size 1
	D2 Head of school, division, department or centre, size 2
	D3 Head of school, division, department or centre, size 3
	E1 Head of a sub-set of academic area, or directors of a small centre
	E2 Senior function head

²² For more information see https://www.hesa.ac.uk/index.php?option=com_studrec&task=show_file&mdl=13025&href=a^ ^LEVE LS.html.

	F1 Professor
	F2 Function head
Senior lecturer	I0 Non-academic staff section manager, senior lecturer (pre-1992), principal lecturer (post-1992), reader, principal research fellow
Lecturer B	J0 Section or team leader (professional, technical, administrative), lecturer B (pre-1992), senior lecturer (post-1992), senior research fellow
Lecturer A	K0 Senior professional or technical staff, lecturer A (pre-1992), lecturer (post-1992), research fellow, researcher or senior research assistant, teaching fellow
Research assistant	L0 Professional, technical or senior administrative staff, research assistant, teaching assistant
Other	M0 Assistant professional staff, administrative staff N0 Junior administrative staff, clerical staff, technician or craftsperson, operative O0 Routine task provider P0 Simple task provider

FTE groupings

6. In this analysis five grade groupings were used. These groupings were derived from the contract full-time equivalence (FTE) information on the HESA contract record²³. The mapping is shown in Table B5.

Table B5: Mapping to FTE groups

FTE group	FTE
1	1.0
2	0.8 - < 0.1
3	0.6 - < 0.8
4	0.4 - < 0.6
5	0.2 - < 0.4

Mode groupings

7. Two modes of employment were used in the model: full-time and part-time staff. Atypical staff were removed from the population. Table B6 shows the mapping to the HESA staff record²⁴.

²³ For more information see https://www.hesa.ac.uk/index.php?option=com_studrec&task=show_file&mdl=13025&href=a^ ^LEVE LS.html.

Table B6: Mapping to mode groups

Mode group	Level fields
Full-time	1 Full-time
	2 Full-time, term-time only
Part-time	3 Part-time
	4 Part-time, term-time only

Nationality groupings

8. In this analysis three nationality groupings and two European Union (EU) groupings were used. These groupings were derived from the 'More detail' classification used on the HESA staff record²⁵. The mapping is shown in Table B7.

Table B7: Mapping to nationality groups

EU national group	Nationality group	Nationality fields
EU	UK	GB United Kingdom
		XL Channel Islands not otherwise specified
		IM Isle of Man
		JE Jersey
		GG Guernsey
		ZZ Not known
		EU
	BE Belgium	
	BG Bulgaria	
	XA Cyprus (European Union)	
	XC Cyprus (not otherwise specified)	
	CZ Czech Republic	
	DK Denmark	
	EE Estonia	

²⁴ For more information see https://www.hesa.ac.uk/index.php?option=com_studrec&task=show_file&mnl=13025&href=a^ ^MOE MP.html.

²⁵ For more information see https://www.hesa.ac.uk/index.php?option=com_studrec&task=show_file&mnl=13025&href=a^ ^NATI ON.html.

FI Finland
FR France
DE Germany
GR Greece
HU Hungary
IE Ireland
IT Italy
LV Latvia
LT Lithuania
LU Luxemburg
MT Malta
NL Netherlands
PL Poland
PT Portugal
RO Romania
SK Slovakia
SI Slovenia
ES Spain
SE Sweden

Non-EU

International

Otherwise

Annex C: Tables including non-submitting UOAs

1. This annex contains tables on all staff who are eligible for the Research Excellence Framework (REF) 2014 including those who are from non-submitting Units of Assessment (UOAs).

Disability

Table C1: Selection rates for REF 2014 staff with disabilities (including non-submitting UOAs within higher education institutions (HEIs))

Disability	Selected	All	% Selected	Index
No disability specified	49,065	90,220	54%	1.00 (ref)
Disability specified	1,365	3,460	39%	0.55
Unknown	1,755	3,545	-	-
Total	52,185	97,225	54%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Sex

Table C2: Selection rates for REF 2014 staff by sex (including non-submitting UOAs within HEIs)

Sex	Selected	All	% Selected	Index
Female	16,660	38,040	44%	1.00 (ref)
Male	35,525	59,180	60%	1.93
Total	52,185	97,225	54%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Sex and age

Figure C1: Selection rates for men and women by age (including non-submitting UOAs within HEIs)

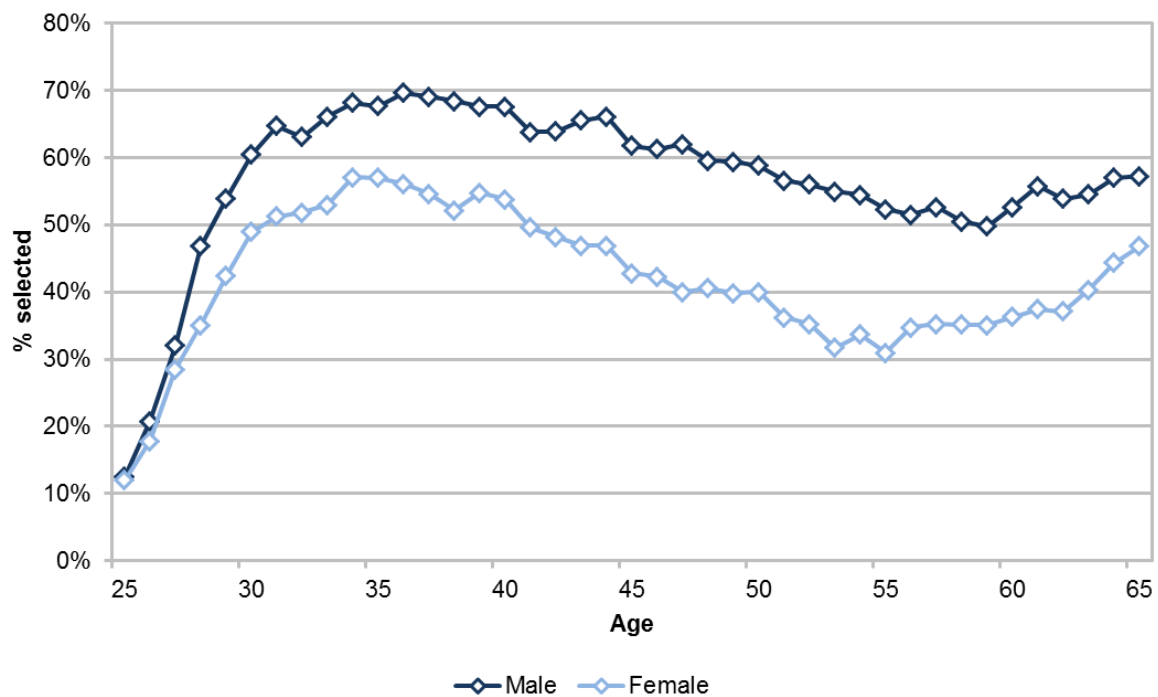
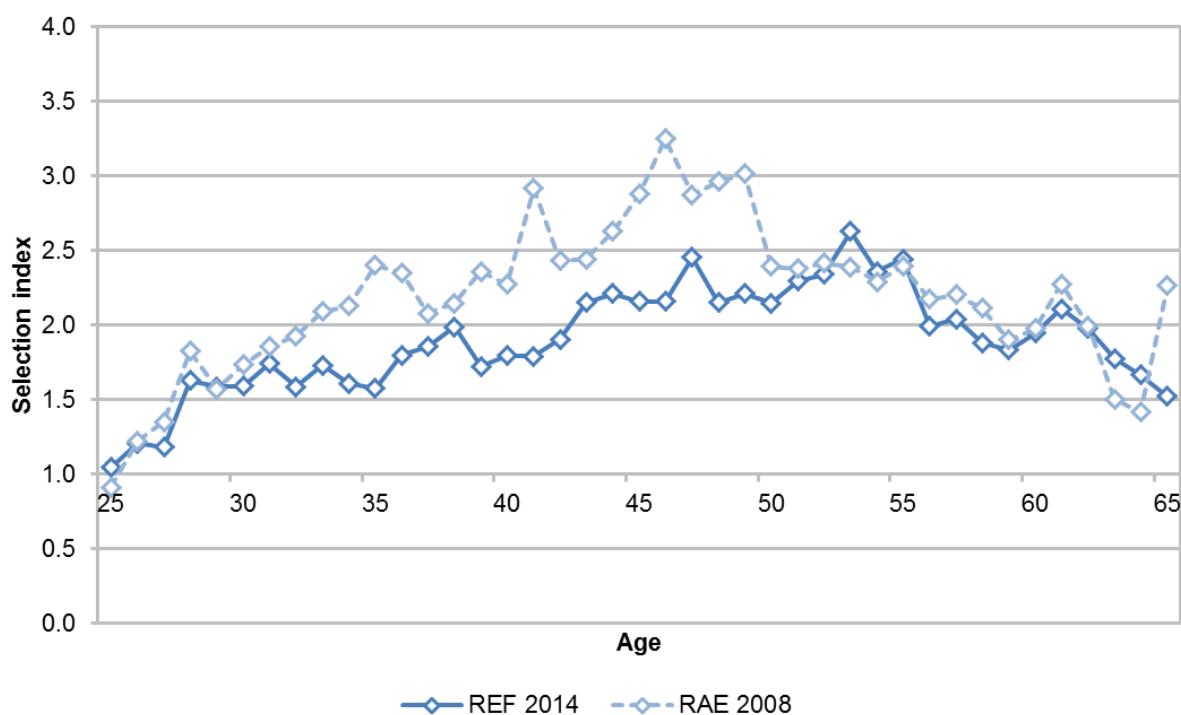


Figure C2: Selection rates for men and women by age (including non-submitting UOAs within HEIs) for REF 2014 and the Research Assessment Exercise (RAE) 2008



Figure C3: Actual selection indices for sex by age for RAE 2008 and REF 2014



Nationality

Table C3: Selection rates for staff by nationality (including non-submitting UOAs within HEIs)

Nationality	Selected	All	% Selected	Index
UK	34,940	71,375	49%	1.00 (ref)
Other EU	9,695	13,835	70%	1.43
Non EU	6,870	10,545	65%	1.33
Unknown				
Total	51,510	95,755	54%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Nationality by Ethnicity

Table C4: Selection rates for staff by ethnicity (including non-submitting UOAs within HEIs)

Nationality	Ethnicity	Selected	All	% Selected	Index
UK	White	30,230	62,455	48%	1.00 (ref)
	Black	205	750	27%	0.40
	Asian	1,005	2,095	48%	0.98
	Chinese	595	960	62%	1.73
	Other	800	1,510	53%	1.20
EU	White	8,615	12,325	70%	1.00 (ref)
	Black	15	35	38%	0.26
	Asian	35	50	69%	0.98
	Chinese	20	20	90%	3.88
	Other	260	390	67%	0.88
Non EU	White	3,550	4,905	72%	1.00 (ref)
	Black	200	505	39%	0.25
	Asian	1,020	1,885	54%	0.45
	Chinese	960	1,535	63%	0.64
	Other	545	880	62%	0.63
Total		48,050	90,305	53%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Early career researchers

Table C5: Selection rates for staff if they are an early career researcher (ECR) (including non-submitting UOAs within HEIs)

ECR?	Selected	All	% Selected	Index
Not ECR	42,815	83,925	51%	1.00 (ref)
ECR	9,365	12,270	76%	3.10
Total	52,180	96,195	54%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Early career researchers and sex

Table C6: Selection rates for staff by ECR status and sex (including non-submitting UOAs within HEIs)

Sex	ECR?	Selected	All	% Selected	Index
Male	Not ECR	29,770	51,465	58%	1.00 (ref)
	ECR	5,755	7,215	80%	2.87
Female	Not ECR	13,045	32,460	40%	1.00 (ref)
	ECR	3,610	5,055	71%	3.72
Total		52,180	96,195	54%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Full-time equivalence

Table C7: Selection rates for staff by Full-time equivalence (FTE) (including non-submitting UOAs within HEIs)

FTE	Selected	All	% Selected	Index
1.0 FTE	43,480	77,075	56%	1.00 (ref)
0.8 to less than 1.0 FTE	3,485	7,145	49%	0.73
0.6 to less than 0.8 FTE	1,235	3,970	31%	0.35
0.4 to less than 0.6 FTE	1,735	4,850	36%	0.43
0.2 to less than 0.4 FTE	2,250	4,185	54%	0.90
Total	52,185	97,225	54%	n/a

Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Full-time equivalence and sex

Table C8: Selection rates for staff by FTE and sex (including non-submitting UOAs within HEIs)

Sex	FTE	Selected	All	% Selected	Index
Male	1.0 FTE	30,325	49,145	62%	1.00 (ref)
	0.8 to less than 1.0 FTE	1,960	3,450	57%	0.81
	0.6 to less than 0.8 FTE	510	1,455	35%	0.34
	0.4 to less than 0.6 FTE	1,035	2,395	43%	0.47
	0.2 to less than 0.4 FTE	1,690	2,740	62%	1.00
Female	1.0 FTE	13,155	27,935	47%	1.00 (ref)
	0.8 to less than 1.0 FTE	1,525	3,695	41%	0.79
	0.6 to less than 0.8 FTE	725	2,515	29%	0.45
	0.4 to less than 0.6 FTE	700	2,455	28%	0.45
	0.2 to less than 0.4 FTE	560	1,445	39%	0.71
Total		52,185	97,225	54%	n/a

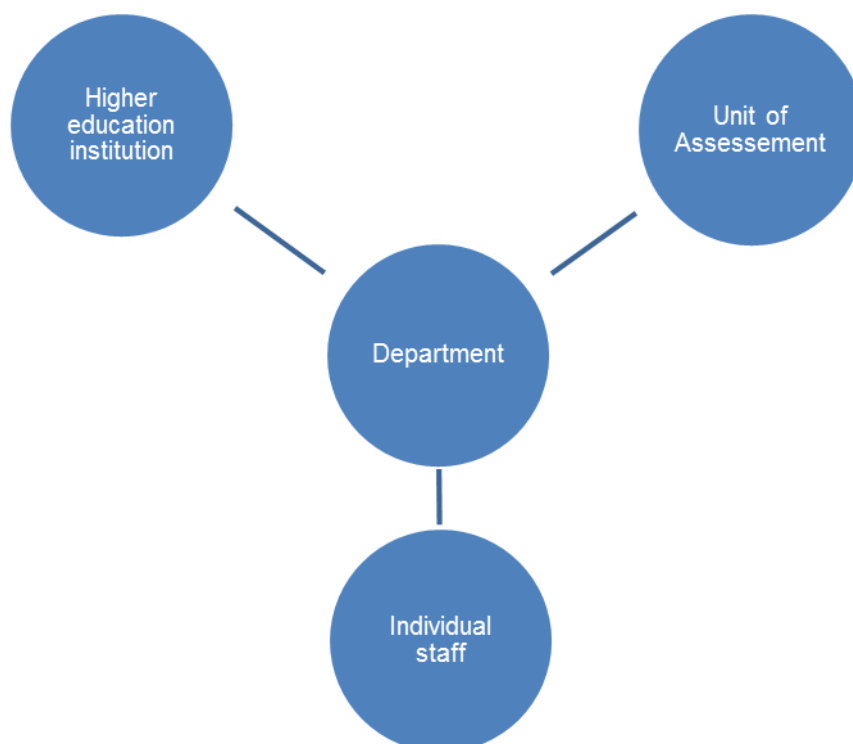
Notes: All data tables have entries rounded to the nearest five; this may cause discrepancies between the reported total and the sum of parts.

Annex D: Model of staff selection

Introduction

1. The statistical models from which these results are derived are cross-classified multi-level models. The schematic for the structure is given in Figure D1, the restricted model in Equation D1 and the full model in Equation D2.

Figure D1: Schematic of the structure for the model



2. Figure D1 shows that individual staff are assumed to be within a department within a higher education institution. Individual departments are also assumed to be within a Unit of Assessment, giving a cross-classification at the highest level.
3. The model used is a logistic regression model on the probability of being selected for the Research Excellence Framework (REF) 2014.
4. The statistical form of the restricted model is given in Equation D1.

Equation D1: Restricted model format

$$\begin{aligned} \text{selected} &\sim \text{Binomial}(\text{const}_{ijkl}, \pi_{ijkl}) \\ \text{logit}(\pi_{ijkl}) &= \beta_{0jkl}\text{const} + \beta_1\text{sex} + \beta_2\text{age} + \beta_3\text{age.age} + \beta_4\text{age.age.age} + \beta_5\text{terms} + \beta_6\text{rating} \\ &\quad + \beta_8\text{ECR} + \beta_{10}\text{disability} + \beta_{11}\text{nationality} + \beta_{12}\text{nationality.ethnicity} \\ &\quad + \beta_{13}\text{employmentfunction} + \beta_{14}\text{FTE} + \beta_{15}\text{PhD} + \beta_{16}\text{mainpanel} + \beta_{17}\text{clinical} \\ &\quad + \beta_{18}\text{previousinstitution} + \beta_{19}\text{tariffgroup} + \beta_{20}\text{age.employmentfunction} \\ &\quad + \beta_{21}\text{age.age.employmentfunction} + \beta_{22}\text{age.sex} + \beta_{23}\text{age.age.sex} \\ &\quad + \beta_{24}\text{age.rating} + \beta_{25}\text{rating.employmentfunction} + \beta_{26}\text{mainpanel.PhD} \\ &\quad + \beta_{27}\text{age.PhD} + \beta_{28}\text{age.age.PhD} + \beta_{29}\text{tariffgroup.PhD} \\ &\quad + \beta_{30}\text{nationality.ethnicity} \\ \beta_{0jkl} &= \beta_0 + f_{01} + v_{0kl} + u_{0jkl} \end{aligned}$$

Here *i* represents the individual, *j* represents the sector-wide Unit of Assessment, and *k* represents a particular Unit of Assessment within a particular HEI (*l*). The variables in the model are defined in Table D1.

5. The statistical form of the restricted model is given in Equation D2.

Equation D2: Full model format

$$\begin{aligned} \text{selected} &\sim \text{Binomial}(\text{const}_{ijkl}, \pi_{ijkl}) \\ \text{logit}(\pi_{ijkl}) &= \beta_{0jkl}\text{const} + \beta_1\text{sex} + \beta_2\text{age} + \beta_3\text{age.age} + \beta_4\text{age.age.age} + \beta_5\text{terms} + \beta_6\text{rating} \\ &\quad + \beta_7\text{grade} + \beta_8\text{ECR} + \beta_9\text{nationality.ethnicity} + \beta_{10}\text{disability} + \beta_{11}\text{nationality} \\ &\quad + \beta_{12}\text{employmentfunction} + \beta_{13}\text{FTE} + \beta_{14}\text{PhD} + \beta_{15}\text{mainpanel} + \beta_{16}\text{clinical} \\ &\quad + \beta_{17}\text{previousinstitution} + \beta_{18}\text{tariffgroup} + \beta_{19}\text{age.employmentfunction} \\ &\quad + \beta_{20}\text{age.age.employmentfunction} + \beta_{21}\text{age.sex} + \beta_{22}\text{age.age.sex} + \beta_{23}\text{age.rating} \\ &\quad + \beta_{24}\text{rating.employmentfunction} + \beta_{25}\text{mainpanel.PhD} + \beta_{26}\text{age.PhD} \\ &\quad + \beta_{27}\text{age.age.PhD} + \beta_{28}\text{tariffgroup.PhD} + \beta_{30}\text{rating.grade} + \beta_{31}\text{age.grade} \\ &\quad + \beta_{32}\text{grade.employmentfunction} + \beta_{33}\text{grade.previousinstitution} + \beta_{34}\text{ECR.age} \\ \beta_{0jkl} &= \beta_0 + f_{01} + v_{0kl} + u_{0jkl} \end{aligned}$$

Here *i* represents the individual, *j* represents the sector-wide Unit of Assessment, and *k* represents a particular Unit of Assessment within a particular HEI (*l*). The variables in the model are defined in Table D1.

Table D1: Variables used in the model

Type of variable	Model variable name	Description
Continuous	Age	Individual's age (in years)
Dummy or categorical	Grade	Individual's grade Senior management (ref) Professor and academic leadership (1) Senior lecturer (2) Lecturer B (3) Lecturer A and Research

Type of variable	Model variable name	Description
		assistants (4)
	Rating	REF 2014 level of 4* rates research Less than 5 (ref) 5 to less than 10 (1) 10 to less than 15 (2) 15 to less than 20 (3) 20 to less than 25 (4) 25 to less than 30 (5) 30 to less than 35 (6) Greater than or equal to 35 (7)
	Nationality	Individual's nationality UK national (ref) European Union (EU) national (1) Non-EU national (2)
	Ethnicity	Ethnicity of individual White (ref) Black (1) Asian (2) Chinese (3) Other (4)
	Employmentfunction	Primary employment function Research only (ref) Teaching and research (1)
	Mainpanel	Main panel A (ref) B (1) C (2) D (3)
	Tariffgroup	Tariff group of institution

Type of variable	Model variable name	Description
		Specialist institutions (ref) Higher education institutions (HEIs) with high average tariff scores (1) HEIs with medium average tariff scores (2) HEIs with low average tariff scores (3) Scotland (4) Wales (5) Northern Ireland (6)
	Previousinstitution	Employment in the previous year Current HEI (ref) Other research HEI (1) Other (2)
	FTE	Academic full-time equivalence (FTE) of individual 1.0 FTE (ref) 0.8 to less than 1.0 FTE (1) 0.6 to less than 0.8 FTE (2) 0.4 to less than 0.6 FTE (3) 0.2 to less than 0.4 FTE (4)
Single dummy or categorical	Disability	Whether an individual has declared a disability No disability declared (ref) Disability declared (1)
	Sex	Individual's sex Female (ref) Male (1)
	Mode	Mode of employment Full-time (ref) Part-time (1)

Type of variable	Model variable name	Description
	Terms	Permanent (ref) Fixed term (1)
	ECR	Whether the individual is an early career researcher (ECR) Not an ECR (ref) ECR (1)
	PhD	Whether an individual holds a PhD as their highest qualification Without PhD (ref) With PhD (1)
	Clinical	Whether an individual is on clinical rates Not on clinical rates (ref) On clinical rates (1)
Structural	Const	One for all individuals
	F	Random effect relating to a particular HEI
	V	Random effect relating to the sector-wide Unit of Assessment (UOA)
	U	Random effect relating to a particular UOA within an HEI

Notes: Those categories marked with '(ref)' are the reference categories for each categorical or dummy variable and are not formally included in the model structure.