BMJ Open Ophthalmology

Predictors of ophthalmology career success (POCS) study

Aditi Das [iD],[1] Daniel Smith,[2] Rashmi G Mathew[1]

[1]Directorate of Undergraduate Medical Education, Moorfields Eye Hospital NHS Foundation Trust, London, UK
[2]General Medical Council, London, UK

Correspondence to
Dr Aditi Das; aditidas@nhs.net

ABSTRACT

Objective Ophthalmology is the busiest outpatient specialty with demand predicted to rise over 40% in the next 20 years. A significant increase in the number of trainee ophthalmologists is required to fill currently vacant consultant posts and meet the UK's workforce demands by 2038. Our aim was to understand what determines success in ophthalmology training, in order to inform future ophthalmologists, refine recruitment and facilitate workforce planning.

Methods and Analysis This was a retrospective longitudinal cohort study using routinely collected data available from UK Medical Education Database (UKMED) (https://www.ukmed.ac.uk/). Data were analysed on 1350 candidates who had applied for ophthalmology specialty training (OST) between 2012 and 2018, as well as 495 candidates who had attempted Fellow of the Royal College of Ophthalmologists (FRCOphth) Part 1 between 2013 and 2018. Participants who had not obtained their primary medical qualification from the UK medical schools were excluded. Primary outcome measures included gaining a place on the OST programme and passing the FRCOphth Part 1 examination on first attempt.

Results Higher education performance measure decile scores at medical school are strongly predictive in securing an OST post and passing the part 1 examination first time (p<0.001). Candidates who attempt FRCOphth Part 1 prior to their ST1 application are more likely to get a place on OST on first attempt. Socioeconomic factors, gender and ethnicity do not influence success in OST entry. Male trainees are more likely to pass FRCOphth Part 1 on their first attempt.

Conclusion This study is the first quantitative assessment of the factors that determine success in OST recruitment and ophthalmology postgraduate examinations in the UK. Similar studies should be undertaken in all other medical and surgical specialties to understand what factors predict success.

Key messages

What is already known about this subject?
► Candidates choosing ophthalmology as a career will demonstrate a high level of commitment prior to their application.

What are the new findings?
► Academic performance at medical school is predictive of success in gaining a place on ophthalmology specialty training (OST) and passing the part 1 fellowship examination on first attempt.
► Attempting the Fellow of the Royal College of Ophthalmologists (FRCOphth) Part 1 examination increases the chances of getting a place on the OST training programme on the first application. Socioeconomic factors, ethnicity and gender do not appear to influence success in OST entry. Males are more likely to pass the FRCOphth Part 1 on the first sitting.

How might these results change the focus of research or clinical practice?
► The predictors of ophthalmology career success (POCS) study provides evidence that can help to positively influence recruitment and the examination process for future trainees and postgraduate bodies.

INTRODUCTION

Ophthalmology is the busiest outpatient specialty in the National Health Service. The Royal College of Ophthalmologists (RCOphth) has predicted that demand for specialist eye care will rise by 30%–40% over the next 10 years.[1] The RCOphth also reported a pressing need to train more doctors to meet the current 'severe' national shortage of ophthalmologists.[1 2]

While the demand for more trainee ophthalmologists poses an immediate challenge to the health system, it presents an opportunity for us to reflect on the state of the current ophthalmology specialty training (OST) recruitment process. In particular, understanding what determines success in ophthalmology will help to support future OST applicants, refine recruitment and facilitate workforce planning.

OST has long been considered an attractive, but highly competitive career choice. In 2019, there were 356 applications for 110 ST1 Ophthalmology posts, rendering a competition ratio of 3.24.[3] As a run-through specialty, it leads directly to a certificate of completion of training, thus providing a streamlined route to consultancy. Candidates are enticed by the combination of medicine and surgery and moreover, ophthalmology lends itself to a more desirable work–life balance than other surgical specialties.[4] In a US survey, ophthalmologists demonstrated high career satisfaction rates, with 93% stating that they

would rechoose their own specialty.[5] Unlike other surgical specialties, ophthalmology attracts a high number of female doctors. Notably, 31% of consultants in ophthalmology are female; almost three times higher a figure than that reported by the Royal College of Surgeons.[1 6]

In the UK, ophthalmology trainees are selected through a national recruitment programme. This selection process is comprised of an interview and portfolio review. The interview features a critical appraisal, clinical scenario, improvement of patient care and communication station. A recent addition to the interview process is a multispecialty recruitment assessment. A maximum of 200 points can be gained from the interview and 100 points from the portfolio review, in which candidates are formally scored on their experience of teaching, audit, research, prior examination success and commitment to the specialty.

The FRCOphth Part 1 is the first of four RCOphth mandated examinations required to gain the Fellowship in Ophthalmology (Fellow of the Royal College of Ophthalmologists (FRCOphth)). During the period of data collection for this study, the scoring criteria for the OST selection process was revised. Between 2012 and 2015, the raw score for the FRCOphth Part 1 was 3 points, and 2 points in 2016. From 2017 to 2018, candidates were again awarded a score of 3 points for successful completion of the examination. All scores within the portfolio were doubled for 2018 due to the introduction of digital scoring, so it did not change the weighting of the examination.[7]

This study aimed to explore the factors that lead to success in securing an OST post and passing postgraduate examinations on first attempt. It is anticipated that this study will encourage other specialties to adopt a similar methodology to understand the predictors of success within their respective fields.

METHODS

Design

This was a retrospective longitudinal cohort study of graduates from all medical schools in the UK. The study used routinely collected data available from UK Medical Education Database (UKMED) (https://www.ukmed.ac.uk/).

UKMED[8] is a medical education research database that collates data on UK medical students and trainee doctors, in order to highlight the path of doctors through school, university and their career. A wide range of data is collected by UKMED, including candidates' demographic details, examination results and annual review of competency progression (ARCP) outcomes. The development and rationale for UKMED has previously been described by Dowell *et al.*[9]

Study population

Online supplemental figure 1 shows the flow of data through the study. In line with UKMED statistical disclosure controls, all numbers are reported to the nearest

multiple of 5.[10] For the analysis of applications to OST, the cohort was defined as anyone who made one or more applications to OST on the ORIEL recruitment system between 2012 and 2018 and had their application(s) in the UKMED table ORIEL_RECRUIT_OUTCOMES.[8] ORIEL is the system used to process applications to specialty training in the UK. It is managed by Health Education England on behalf of the four UK nations.[11]

Data analysis was undertaken on 1350 candidates who obtained their primary medical qualification (PMQ) from UK medical schools. This was because comprehensive demographic records and postgraduate performance information were only available for the UK cases.

For analysis of the membership examinations, the cohort included anyone who had taken the FRCOphth Part 1 between 1 August 2013 and 31 July 2018; the period covered by the General Medical Council (GMC)'s postgraduate examination data collection and held in the UKMED table EXAM_TOTAL_SCORES.[8] UKMED postgraduate examination data are left censored, and examination attempts occurring before 1 August 2013 are not present. To conduct further analysis, only first attempts were taken from those with a UK PMQ. The dataset contained 655 cases who had attempted the part 1 examination and had this recorded as their first attempt, of which 495 had obtained their PMQ in the UK.

Data in UKMED are held at the level of individual applications. Our unit of analysis was the applicant. We summarised the recruitment outcomes for each specialty and year the doctor applied to specialty training. Therefore, for each year of application, we could determine which specialties the doctor applied to and whether they were offered a place on the given training programme in that application year. The year of application for each individual was ranked, and the case with the first rank (ie, the earliest year) was taken as the first application. We used the first application to OST, which for 1215 candidates (90% of 1350) was in the same application year as their first application to any specialty training programme.

Statistical analysis

Source data were retrieved from the UKMED database and an SPSS file was created, with one row per person. Analysis was conducted using SPSS V.26. Univariate analysis was initially conducted to understand the relationship between demographic, educational and trainee behaviour predictor variables and the outcomes of interest. Variables that were statistically significant (after applying a Bonferroni correction for multiple testing) were then included in a logistic regression model. This was to understand which variables independently predicted the outcomes of interest, after controlling for the other variables included in the model.

Data management—measures

Socioeconomic and demographic measures

The following variables were included: sex, ethnicity, higher education statistics agency (HESA) disability summary, indices of multiple deprivation (IMD) quintile, participation of local areas (POLAR) quintile, bursary (for taking UKCAT test), bursary and parental education and SEC combined or graduate on entry. SEC is the socioeconomic background of the student's parent, stepparent or guardian who earns the most. For students over 21, it comes from their own occupation. The UK Clinical Aptitude Test (UKCAT) is an admissions test used by certain UK Universities for their medical and dental degree programmes.

UKMED includes measures that are derived from the postcode on application to medical school. IMD quintiles are created by ranking each small area within the four nations, with a lower score indicating greater deprivation. These scores are put into quintiles with 1 being the most deprived. POLAR quintile is a measure of how many 18 year olds from an area started a higher education course during a specified time period. Polar quintiles range between 1 and 5, with one being the lowest score and 5 the highest. For both IMD and POLAR quintiles, the reference data closest to the proceeding year of the student commencing medical school were used.[8]

Academic measures

Examination relative to application

The year of first application was obtained and the date of the first attempt at FRCOphth Part 1 was compared with the deadline date for applications for that year. For example, for 2014, the OST application deadline was 1 November 2013. If a candidate took the examination before that date they were classified as taking it before their OST application. The November date was based on the documentation in the Health Education England Applicant Handbook provided each year. As examination data were not available before 1 August 2013, this variable was only available for those applying for the first time from 2014 onwards (N=970).

Only applied to OST

If the applicant had no applications to specialties other than OST in the ORIEL dataset, in the first year they applied to OST they were classified as only having applied to OST.

Educational performance measure (EPM) score

Students in a graduating cohort are ranked on their medical school performance through their EPM. Medical schools decide which assessments to include in the EPM; these assessments must meet specific criteria and are published on the school's website.[12] In 2012, foundation programme applicants were ranked by their medical schools into EPM quartiles, whereas applicants from 2013 onwards were ranked into deciles. To allow cases from 2012 and later years to be combined in one analysis, EPM quartiles and deciles were converted into normal deviate scores, the approach taken by Garrud and McManus.[13] Normal deviate scores were used as means of placing quartiles and deciles on the same scale. The midpoints for each relevant section under the normal curve were taken to obtain the Z-score. For example, if the first 25% of cases occur under the part of the curve that has a midpoint of −1.0491, so the bottom 12.5% of cases would be to the left of −1.0491.

Programme specialty at the time of the examination

This was derived by linking the examination data file to the national trainee survey (NTS) data. Data were linked to the NTS record that fell within the year of the examination return. For example, if the examination date was between the 1 August 2017 and 31 July 2018, the 2018 NTS record was used to define the candidate's specialty and training level at the time of the examination. This is the approach used by the GMC's progression reports.[14]

We used the Strengthening the Reporting of Observational Studies in Epidemiology cohort checklist when writing our writing report.[15]

RESULTS

Success in obtaining an OST programme place on first attempt

Univariate analysis was undertaken for the 1350 graduates of the UK medical schools who applied to OST, looking at each demographic variable of interest. Overall, 37.8% of UK applicants were successful on their first application in the period of interest (2012–2018). Online supplemental table 1 details the results of this analysis. The following variables were significant at p<0.05 after applying the Bonferroni correction for running 18 tests:

► Applicants attempting the FRCOphth Part 1 prior to commencing training were more likely to be offered a place.
► Applicants only applying to OST were more likely to be offered a place.
► Applicants applying in 2012 were more likely to be offered a place.
► Younger applicants were more likely to be offered a place.
► Applicants from certain medical schools were more likely to be offered an OST post, for example, applicants from Cambridge were particularly successful.

There was no difference in success in obtaining an OST post on first attempt for many of the variables assessed. These included sex, ethnicity, HESA disability summary, IMD quintile, POLAR quintile, SEC combined or graduate on entry, bursary (for taking UKCAT test), bursary, parental education, course type or intercalation. These variables are defined in the UKMED data dictionary – VW_UKMED_PERSON_FULL table.[8]

Those who were offered a place on an OST programme had a higher mean EPM normal deviate score than those who were not offered a place (0.370, (N=560) compared with −0.236, (N=295)). F=101.633, p<0.001.

Table 1 Logistic regression predicting offer at first application to OST

Variable	B	Wald	Sig.	Exp(B)	95% CI for exp(B)	
					Lower	Upper
Age on first application	−0.101	6.710	0.010	0.904	0.837	0.976
EPM normal deviate	0.931	78.809	0.000	2.537	2.066	3.117
Examination taken prior to application	1.022	26.825	0.000	2.778	1.887	4.089
Only applied to OST	−0.050	0.081	0.776	0.951	0.674	1.343
Year of first application	0.050	0.625	0.429	1.051	0.928	1.191
Medical school applicant graduated from		46.443	0.028			

Cases with EPM scores only (applying from 2012 onwards) N=850, missing data in 20 cases.
EPM, educational performance measure; OST, ophthalmology specialty training.

Variables that were statistically significant were used in a multivariate logistic regression model presented in table 1. Younger applicants were more likely to be successful. An increase of 1 in the EPM normal deviate score equated to a 2.5 times greater likelihood of being offered a place on OST. Attempting the part 1 examination prior to application meant that someone was 2.6 times more likely to be offered a place on OST. These differences were present after controlling for medical school. Medical school was significant overall when controlling for the other variables included in the model, but there was no significant effect for any individual school. Only applying to OST and the year of first application were not significant predictors, once included in a multivariate model.

On the first application, 42% (565/1350) applied only to OST. Overall, 785 candidates applied to multiple specialties in their first year of application to OST. The most common applications in their first year of any application to specialty training, which was not always OST, were to the following specialties: general practice (GP) (385), core surgical training (285), core medical training (235) and clinical radiology (150). Note that the first year of application to OST was the first year of application to any specialty training in 90% of cases (N=1350), 10% of those in the study applied to other specialties in recruitment years before their first application to OST.

Results in FRCOphth Part 1
Online supplemental table 2 gives univariate results. The following groups had higher pass rates on the FRCOphth Part 1: men and those who took the examination while in an ophthalmology training programme. White candidates were close to significance at p=0.052 following Bonferroni correction.

Those who passed the examination on first attempt had a higher mean EPM normal deviate score than those who did not pass (0.463, (N=165) compared with −0.172 (N=215)). F = 55.376, P <0.001.

Variables that were statistically significant or close to significance were used in the multivariate logistic regression model presented in table 2. As was the case with entry into OST, an increase of one in the EPM normal deviate score suggested that a candidate was 2.5 times

more likely pass the FRCOphth Part 1 on first attempt. Men were 2.5 times more likely to pass on first attempt and ethnicity was not a significant factor, when included in a multivariate model. Candidates who were already on an OST programme when they took the examination were more likely to pass on first attempt, after controlling for EPM deviate score, compared with those not in OST.

DISCUSSION
Success on application to OST
Academic performance
High educational performance measure (EPM) scores at medical school are strongly predictive in securing an OST programme place and passing the FRCOphth Part 1. It is known that trainees who pursue more competitive specialties tend to have higher EPM scores.[16] At present, EPM is used by foundation schools for recruitment purposes, but not by specialty training bodies. This is for a number of reasons; EPM scores are only available for UK applicants and they are not consistently derived across all the UK medical schools. Unlike the United States Medical licencing examination, which is taken by all medical students, there is no national standardisation to the EPM.

EPM is known to be a significant predictor of success in completing foundation training.[17] In addition, medical school academic outcomes are linked to performance on the Membership of the Royal College of Physicians (MRCP) examination, and being on the GMC Specialist Register.[18] Postgraduate schools may therefore wish to provide some weighting for the EPM in the recruitment process for UK graduates. To eliminate institutional bias, it may be possible in the future to adjust the EPM to make it more nationally comparable using 'peer competition rescaling'.[19]

Medical school attended
This study showed an association between medical school and first time OST entry at the univariate level only. In the univariate analysis, there was an association between applicants from the universities of Cambridge, Oxford and Imperial and higher rates of first time OST entry. This trend disappeared at the multivariate level. Interestingly, McManus *et al* found that schools that taught more

Table 2 Logistic regression predicting pass at first attempt of FRCOphth Part 1

Exp(B)	Sig.	Wald	B	Variable	95% CI for exp(B) Lower	Upper
Sex—men	0.914	13.297	0.000	2.494	1.526	4.077
Ethnicity		5.934	0.313			
Asian or Asian British	−0.492	3.567	0.059	0.611	0.367	1.019
Black or black British	−1.263	2.678	0.102	0.283	0.062	1.283
Mixed	−1.040	1.127	0.288	0.354	0.052	2.410
No record (missing and not stated)	−0.306	0.294	0.588	0.736	0.244	2.226
Other ethnic groups	−0.400	0.666	0.414	0.671	0.257	1.751
EPM normal deviate	0.900	35.955	0.000	2.459	1.832	3.299
Training programme at time examination taken —OST reference category		14.430	0.002			
No training record	−1.387	13.985	0.000	0.250	0.121	0.517
Foundation	−0.879	8.154	0.004	0.415	0.227	0.759
Other specialtyincluding general practice	−21.467	0.000	0.999	0.000	0.000	
Constant	0.208	0.345	0.557	1.232		

Overall model X^2=92.701

Cases with EPM scores only (applying from 2012 onwards) N=380, missing data in 10 cases.
EPM, educational performance measure; FRCOphth, Fellow of the Royal College of Ophthalmologists; OST, ophthalmology specialty training.

general practice did have more graduates entering GP training. However, increased medical school teaching of psychiatry, surgery and anaesthetics did not result in more specialist trainees.[20]

Applicant behaviour

Commitment to the specialty is an important predictor of success at gaining a place on OST. Univariate analysis found that candidates applying for OST only and those who attempted FRCOphth Part 1 prior to their OST application were more likely to gain entry on the first attempt. Multivariate analysis only found that candidates who took the FRCOphth Part 1 before applying were more likely to be successful. This is because applying to OST only and taking the examination early were related; 61% of those applying to OST only had attempted the examination compared with only 35% of those applying to other specialties. Overall, these findings are in keeping with the literature, which reports that doctors who choose to pursue ophthalmology generally demonstrate interest early on in their careers.[21]

Candidates in our study who applied to OST alone may have had more conviction about their career choice, as demonstrated by choosing to attempt the FRCOphth Part 1 examination prior to application. Although FRCOphth Part 1 is not a prerequisite for OST entry, the RCOphth allocates points for its successful completion in the OST application process.[7] Our analysis included OST applications from 2012 to 2018. Attempting the FRCOphth Part 1 prior to OST application was associated with first time

entry into OST, regardless of the application criteria at the time at which the candidate applied.

Demographic factors

In this cohort, younger applicants were more likely to be accepted onto OST on first attempt. Older candidates may have taken longer to make a career choice or have had difficulties progressing through their education or training.

This study evaluated the influence of socioeconomic factors, ethnicity and gender on OST entry. No significant association was found between socioeconomic factors, gender, ethnicity and entry to OST.

That there were no sex differences in success agrees with Woolf *et al*, who only found a sex difference for GP and paediatrics, with women being more likely to be appointed.[22]

Ethnicity did not influence success in this cohort; a finding that is not in keeping with the wider literature. For example, Kumwenda *et al* found that applicants from white ethnic backgrounds were significantly more likely to be allocated to a higher choice foundation school than black or Asian applicants.[23]

The lack of association between socioeconomic factors and success at being offered an OST place may be due to an element of self-selection. Other researchers have found that doctors from families where neither parent was educated to degree level were less likely to pursue a hospital specialty and more likely to choose general practice, compared with their peers with a family background

in higher education. Moreover, private school educated doctors were 1.8 and 1.4 times more likely to train in surgical or medical specialties (relative to general practice), respectively, than those who attended a state school.[24] This study did not analyse if those applying to OST were demographically different to those applying to other specialties, as our dataset was restricted only to candidates who applied to OST.

Examination success
Demographic factors

In this cohort, sex was associated with examination success, but ethnicity was not. Male trainees were 2.5 times more likely to pass FRCOphth Part 1 on their first attempt; a finding which is reflected in other specialties. Males sitting the Part A Membership of the Royal College of Surgeons examination were almost three times as likely to pass than females.[25] McManus *et al* reported that men do better on part 1 and part 2 of the MRCP(UK) examinations.[26]

Woolf *et al* have previously published widely on the phenomenon of differential attainment. Their 2011 meta-analysis showed that ethnic minority medical graduates in the UK had 2.5 times higher odds of failing examinations compared with their white peers.[27] However, no association was found between ethnicity and passing FRCOphth Part 1 on first attempt in this study's cohort (when included in the multivariate model that adjusts for EPM deciles).

Candidate behaviour

Candidates who were already in OST were more likely to pass the FRCOphth Part 1 examination first time. Based on this data, it could be argued that it may not be in trainees' best interests to take the examination before starting OST, given the cost and time requirement. Indeed, the FRCOphth Part 1 is known to be one of the most expensive of the common postgraduate examinations.[28] It is also considered to be a very difficult examination to pass with an average overall pass rate of 46%.[29]

However, this is offset by this study's previously stated finding; that candidates who had previously taken FRCOphth Part 1 were more likely to get an OST place on first attempt. Overall, it would appear that although FRCOphth Part 1 is more difficult to pass outside of training, attempting the examination is more likely to assist with first time OST entry.

Academic performance

As with selection into OST, EPM deciles were highly predictive of passing the part 1 examination on first attempt. As McManus *et al* note, there is an academic backbone to medicine and those that do well academically at the start of the careers generally continue to be successful.[30]

Strengths and limitations

This study is the first of its kind to evaluate the factors that predict success in ophthalmology training and has applicability to other specialties. A key strength of this study is that it is based on a complete dataset of all OST applications within the UK from 2012 to 2018.

For the purpose of this study, successful candidates are defined as those who gain a place on OST or pass post-graduate examinations on the first attempt. Indeed, first time achievement is not an absolute predictor of long-term success and many doctors do not succeed on first attempt. It is also understood that the self-selected nature of our cohort may account for the lack of correlation between socioeconomic factors and success at gaining a place on OST.

This study has not explored motivations for applying to OST over other specialties using the career intention items in the NTS. Nor has it explored whether the quality of a candidate's ophthalmology training or designated deanery are associated with passing FRCOphth Part 1 on first attempt.

CONCLUSION

A number of factors that predict success in gaining a place in OST and in passing postgraduate examinations on the first attempt were identified. Subsequent studies will continue to follow this cohort through OST to understand how trainees perform in later examinations, including the refraction examination and FRCOphth Part 2. It is also possible to monitor ARCP outcomes and see whether certain trainees take longer to complete their training. Whether or not early academic achievement influences long-term success on the OST programme will be an interesting finding for the RCOphth and other Royal Colleges. Finally, it is hoped that UKMED studies such as this can help to understand whether the quality of OST training affects a trainee's career progression and examination success. Quality of training may be measured by a number of factors, including the level of clinical and educational support received, protected teaching time and opportunities for continuous professional development. These measures are available on the GMC's annual NTS survey.[31]

UKMED data are refreshed annually, and it would be possible to run this analysis each year as the cohort size increases. Current and prospective OST candidates can learn from previous UKMED data trends in order to decide when to attempt examinations and to help make informed career choices. Periodic analysis of UKMED OST applicant and trainee data is also important to ensure that recruitment processes and examination success remain fair and equitable in subsequent years.

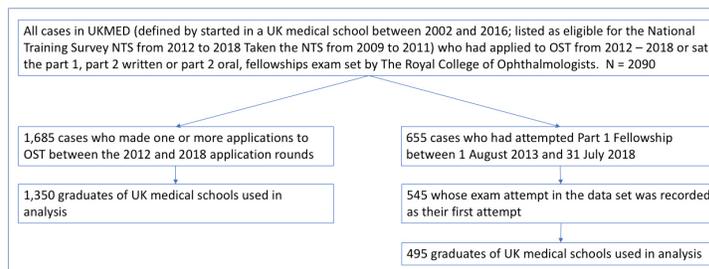## REFERENCES

1 Hingorani M, Harcourt J. The Royal College of ophthalmologists (RCOphth) workforce census 2018, 2018. Available: https://www.rcophth.ac.uk/wp-content/uploads/2019/02/RCOphth-Workforce-Census-2018.pdf [Accessed 28 Jun 2020].
2 Kingsfund.org. The healthcare workforce in England, 2018. Available: https://www.kingsfund.org.uk/sites/default/files/2018-11/The%20health%20care%20workforce%20in%20England.pdf [Accessed 28 Jun 2020].
3 Health education England specialty recruitment competition ratios, 2019. Available: https://specialtytraining.hee.nhs.uk/Portals/1/Competition%20Ratios%202019_1.pdf [Accessed 28 Jun 2020].
4 Lambert TW, Goldacre MJ, Bron AJ. Career choices for ophthalmology made by newly qualified doctors in the United Kingdom, 1974-2005. *BMC Ophthalmol* 2008;8:3.
5 American Academy of Ophthalmology. American Academy of ophthalmologists (AAO) high career satisfaction rates among ophthalmologists, 2021. Available: https://www.aao.org/headline/high-career-satisfaction-rates-among-ophthalmologi [Accessed 28 Jun 2020].
6 Royal College of Surgeons of England (RCSEng) - (2020) Statistics: Women in Surgery. Available: https://www.rcseng.ac.uk/careers-in-surgery/women-in-surgery/statistics/ [Accessed 28 Jun 2020].
7 NHS. England, H.-H.E. Portfolio review: ophthalmology, 2020. Available: https://severndeanery.nhs.uk/recruitment/vacancies/show/ophth-1-2020/portfolio-review-lib [Accessed 06 May 2021].
8 Smith D. UKMED – 2019 V1 - March Data Dictionary, 2019. Available: https://www.ukmed.ac.uk/documents/UKMED_data_dictionary.pdf [Accessed 06 Jun 2019].
9 Dowell J, Cleland J, Fitzpatrick S, *et al*. The UK medical education database (UKMED) what is it? why and how might you use it? *BMC Med Educ* 2018;18:6.
10 UKMED. Process for completing UKMED research version 4 –2019, 2019. Available: https://www.ukmed.ac.uk/documents/UKMED_research_process.pdf [Accessed 13 Mar 2019].
11 Health Education England. Oriel - Making Your Application, 2020. Available: https://specialtytraining.hee.nhs.uk/Recruitment/Oriel-Making-your-application [Accessed 06 May 2021].
12 NHS. Educational performance measure (EPM) 2019 framework, 2019. Available: http://www.foundationprogramme.nhs.uk/sites/default/files/2018-07/UKFP%202019%20EPM%20Framework%20Final_0.pdf
13 Garrud P, McManus IC. Impact of accelerated, graduate-entry medicine courses: a comparison of profile, success, and specialty destination between graduate entrants to accelerated or standard medicine courses in UK. *BMC Med Educ* 2018;18:1–250.
14 GMC. GMC - Progression reports, 2020. Available: https://www.gmc-uk.org/education/reports-and-reviews/progression-reports [Accessed 07 May 2020].
15 von Elm E, Altman DG, Egger M, *et al*. Strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ* 2007;335:806–8.
16 Kumwenda B, Cleland J, Prescott G, *et al*. Relationship between sociodemographic factors and specialty destination of UK trainee doctors: a national cohort study. *BMJ Open* 2019;9:e026961.
17 Smith DT, Tiffin PA. Evaluating the validity of the selection measures used for the UK's Foundation medical training programme: a national cohort study. *BMJ Open* 2018;8:e021918.
18 McManus IC, Woolf K, Dacre J, *et al*. The Academic Backbone: longitudinal continuities in educational achievement from secondary school and medical school to MRCP(UK) and the specialist register in UK medical students and doctors. *BMC Med* 2013;11:242.
19 Tiffin PA. Exploring the validity of the 2013 UKCAT SJT- prediction of undergraduate performance in the first year of medical school: summary version of report., 2017. Available: https://www.ucat.ac.uk/media/1119/exploring-the-validity-of-the-2013-ukcat-sjt-prediction-of-ug-performance-in-1st-yr-of-med-school-summary-version-posted-27032017.pdf
20 McManus IC, Harborne AC, Horsfall HL, *et al*. Exploring UK medical school differences: the MedDifs study of selection, teaching, student and F1 perceptions, postgraduate outcomes and fitness to practise. *BMC Med* 2020;18:136.
21 Lambert TW, Smith F, Goldacre MJ. Career specialty choices of UK medical graduates of 2015 compared with earlier cohorts: questionnaire surveys. *Postgrad Med J* 2018;94:191–7.
22 Woolf K, Jayaweera H, Unwin E, *et al*. Effect of sex on specialty training application outcomes: a longitudinal administrative data study of UK medical graduates. *BMJ Open* 2019;9:e025004.
23 Kumwenda B, Cleland JA, Prescott GJ, *et al*. Relationship between sociodemographic factors and selection into UK postgraduate medical training programmes: a national cohort study. *BMJ Open* 2018;8:e021329.
24 Rodriguez Santana I, Chalkley M. Getting the right balance? a mixed logit analysis of the relationship between UK training doctors' characteristics and their specialties using the 2013 national training survey. *BMJ Open* 2017;7:e015219.
25 Scrimgeour D, Cleland J, Lee AJ, *et al*. Predictors of success in the Intercollegiate membership of the Royal College of surgeons (MRCS) examination. *Ann R Coll Surg Engl* 2018;100:424–7.
26 McManus IC, Elder AT, de Champlain A, *et al*. Graduates of different UK medical schools show substantial differences in performance on MRCP(UK) Part 1, Part 2 and PACES examinations. *BMC Med* 2008;6:5.
27 Woolf K, Potts HWW, McManus IC. Ethnicity and academic performance in UK trained doctors and medical students: systematic review and meta-analysis. *BMJ* 2011;342:d901.
28 Sim PY. How to pass the part 1 FRCOphth in Foundation training. *Postgrad Med J* 2018;94:608–9.
29 Turner MS. Examination report Part 1 fellowship of the Royal College of ophthalmologists (FRCOphth) examination, 2020. Available: https://www.rcophth.ac.uk/wp-content/uploads/2021/03/October-2020-part-1.docx [Accessed 06 May 2021].
30 McManus IC, Woolf K, Dacre J, *et al*. The Academic Backbone: longitudinal continuities in educational achievement from secondary school and medical school to MRCP(UK) and the specialist register in UK medical students and doctors. *BMC Med* 2013;11:242.
31 Council, G.M. National training surveys reports, 2021. Available: https://www.gmc-uk.org/about/what-we-do-and-why/data-and-research/national-training-surveys-reports [Accessed 20 May 2021].

Figure 1 - Flow of data through the study

All cases in UKMED (defined by started in a UK medical school between 2002 and 2016; listed as eligible for the National Training Survey NTS from 2012 to 2018 Taken the NTS from 2009 to 2011) who had applied to OST from 2012 – 2018 or sat the part 1, part 2 written or part 2 oral, fellowships exam set by The Royal College of Ophthalmologists. N = 2090

1,685 cases who made one or more applications to OST between the 2012 and 2018 application rounds

1,350 graduates of UK medical schools used in analysis

655 cases who had attempted Part 1 Fellowship between 1 August 2013 and 31 July 2018

545 whose exam attempt in the data set was recorded as their first attempt

495 graduates of UK medical schools used in analysis

Supplemental material

BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)

BMJ Open Ophth

Supplementary Table 1: Univariate analysis results for UK OST applicants

Group	Factor	Category	Percent offered place on OST training programme	N doctors in sample – UKMED rounding rules applied.	Bivariate Association. Bonferroni correction applied for 18 tests
Applicant Behaviour	Exam relative to application	FRCOphth_Part_1 NOT taken before OST App	27.1%	760	X² = 62.534
		FRCOphth_Part_1 taken before OST App	56.4%	210	P < 0.0001
	TIME from PMQ to first OST application	2 year	38.7%	955	
		3 year	41.0%	210	X² = 6.597
		4 or more years	29.6%	190	P =0.665
	Only applied to OST	Applied to multiple specialties	30.8%	785	X² = 38.501
		Only applied to OST	47.5%	565	P < 0.001
	ORIEL Year for 1st application	2012	55.8%	215	
		2013	40.0%	165	
		2014	32.3%	190	
		2015	35.7%	195	
		2016	33.9%	220	X² = 39.020
		2017	31.0%	195	
		2018	34.3%	165	P < 0.0001
Demographics	Sex	Man	36.6%	760	X² = 0.925
		Woman	39.3%	590	P= 1
	Ethnicity	No record	55.0%	20	
		Asian or Asian British	35.1%	595	
		Black or Black British	29.2%	70	
		Mixed	36.7%	50	
		Not stated	38.9%	20	
		Other Ethnic Groups	29.1%	110	X² = 17.576
		White	43.7%	485	P= 0.133
	HESA Disability last	No record	52.9%	15	Cells counts too

Supplemental material

BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)

BMJ Open Ophth

Group	Factor	Category	Percent offered place on OST training programme	N doctors in sample – UKMED rounding rules applied.	Bivariate Association. Bonferroni correction applied for 18 tests
		A long-standing illness or health condition	63.6%	10	low to meet expected frequency criterion.
		Another disability, impairment or medical condition	100.0%	0	
		Deaf or a serious hearing impairment	30.8%	15	
		No known disability		0	
		Not known		0	
		Specific learning difficulty	33.3%	5	
		Two or more conditions	38.0%	1200	
	HESA Disability summary	No	33.3%	10	
		Yes	31.2%	95	$X^2 = 1.638$
		Missing	32.8%	265	P= 1
	IMD Quintile	Missing	31.8%	130	
		1 - Most deprived	37.0%	190	
		2	39.3%	180	
		3	38.2%	240	
		4	43.2%	345	$X^2 = 9.378$
		5 - Least deprived	32.8%	265	P= 1
	POLAR quintile	Missing	31.3%	65	
		1 - Lowest rate of participation	36.4%	105	
		2	36.4%	175	
		3	39.1%	255	
		4	41.4%	490	$X^2 = 3.610$
		5 - Highest rate of participation	33.0%	100	P= 1
	SEC Combined	1 semi-routine and routine occupations	35.3%	15	
		2 lower supervisory and technical occupations	26.5%	35	
		3 small employers and own account workers	34.3%	105	
		4 intermediate occupations	39.6%	830	
		5 managerial and professional occupations	36.9%	270	$X^2 = 4.676$
		99 Missing	38.7%	955	P= 1
	Graduate on entry	No HESA record	40.9%	20	$X^2 = 1.905$
		Graduate on entry	33.8%	225	P= 1

Supplemental material

BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)

BMJ Open Ophth

Group	Factor	Category	Percent offered place on OST training programme	N doctors in sample – UKMED rounding rules applied.	Bivariate Association. Bonferroni correction applied for 18 tests
		Not graduate on entry	38.6%	1105	
	Bursary	N	38.2%	1330	$X^2 = 6.082$
		Y	9.5%	20	P= 0.246
	Parental education – cases with HESA data only	No	29.7%	35	
		Yes	31.1%	105	
		Don't know	31.5%	180	$X^2 = 2.767$
		Unknown	37.0%	420	P= 1
	Age on application	Mean age - not offered	27.3853	840	F = 10.989
		Mean age - offered	26.7867	510	P = 0.017
Medical school	Course type grouped	Standard entry	38.6%	1150	
		Graduate entry	35.4%	125	
		Gateway and Preliminary	22.4%	50	$X^2 = 6.486$
		Missing	47.8%	25	P=1
	Intercalation	No record of intercalating	36.2%	995	$X^2 = 2.859$
		Record of intercalating	41.6%	340	P=1
	Final Medical School	Aberdeen	21.1%	20	$X^2 = 83.491$ P=0.001
		Barts	34.2%	80	
		Birmingham	40.3%	65	
		Brighton and Sussex	42.1%	20	
		Bristol	46.3%	40	
		Cambridge	65.9%	40	
		Cardiff	25.6%	40	
		Dundee	29.7%	35	
		Edinburgh	39.5%	40	
		Glasgow	25.0%	40	
		Hull York	15.8%	20	
		Imperial	52.9%	105	London and Lancaster removed due to low Ns
		Keele	23.1%	15	
		King's	36.8%	85	

Supplemental material

BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)

BMJ Open Ophth

Group	Factor	Category	Percent offered place on OST training programme	N doctors in sample – UKMED rounding rules applied.	Bivariate Association. Bonferroni correction applied for 18 tests
		Leeds	43.6%	40	
		Leicester	31.7%	40	
		Liverpool	25.0%	35	
		Manchester	31.1%	75	
		Newcastle	33.3%	50	
		Norwich	30.4%	25	
		Nottingham	40.0%	40	
		Oxford	62.8%	45	
		Peninsula	32.5%	40	
		Queen's	20.7%	30	
		Sheffield	34.4%	30	
		Southampton	23.8%	40	
		St George's	30.3%	90	
		Swansea	14.3%	5	
		UCL	55.6%	100	
		Warwick	23.5%	15	

Supplementary Table 2: Univariate analysis results for UK candidates attempting the Part 1 FRCOphth exam for the 1st time

Group	Factor	Category	Percent passing	N doctors in sample – UKMED rounding rules applied.	Bivariate Association. Bonferroni correction applied for 13 tests
Training factors	Training programme at time exam taken	No training record	30.53%	130	$X^2 = 34.463$ P < 0.001
		Foundation	42.99%	215	
		Other specialty inc. GP	27.27%	10	
		Ophthalmology	64.54%	140	
Demographics	Sex	Man	52.31%	280	$X^2 = 11.575.$ P = 0.009
		Woman	36.57%	215	
	Ethnicity	Asian or Asian British	39.8%	215	$X^2 = 17.281$ P = 0.052
		Black or Black British	23.5%	15	
		Mixed	40.9%	20	
		Other Ethnic Groups	34.2%	40	
		White	56.2%	195	
		No record (missing and Not stated)	50.0%	10	
	HESA Disability last	A long-standing illness or health	66.67%	6	Cells counts too low to meet expected frequency criterion.
		A physical impairment or mobility issues	100.00%	1	
		Another disability, impairment or	25.00%	4	
		No known disability	45.71%	455	
		Specific learning difficulty	40.00%	30	
		Missing	0.00%	1	
	HESA Disability summary	No	45.7%	455	$X^2 = 0.003.$ P = 1
		Yes	43.9%	40	
	IMD Quintile	1 - Most deprived	42.9%	35	$X^2 = 3.942$ P = 1
		2	52.4%	65	
		3	47.4%	75	
		4	45.9%	100	
		5 - Least deprived	47.2%	125	
		Missing	37.8%	100	
	POLAR quintile	1 - Lowest rate of participation	31.58%	20	

Supplemental material

BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)

BMJ Open Ophth

Group	Factor	Category	Percent passing	N doctors in sample – UKMED	Bivariate Association.
		2	42.42%	35	X^2 = 7.582 P = 1
		3	50.85%	60	
		4	54.00%	100	
		5 - Highest rate of participation	45.21%	190	
		Missing	37.8%	100	
	SEC Combined	1 semi-routine and routine occupations	46.15%	40	X^2 = 2.738a P = 1
		2 lower supervisory and technical	50.00%	5	
		3 small employers and own account	33.33%	10	
		4 intermediate occupations	37.50%	30	
		5 managerial and professional	47.58%	330	
		99 Missing	41.25%	80	
	Graduate on entry	Graduate on entry	37.3%	75	X^2 = 5.043 P = 1
		Not graduate on entry	47.3%	420	
	Bursary	N			
		Y			N too low to report
	Parental education – cases with HESA data only	No	28.9%	40	X^2 = 3.521a P= 1
		Yes	41.7%	190	
		Don't know	41.7%	10	
		Unknown	41.3%	75	
	Age at 1st attempt	Mean age – passed	27.3319	225	F =0.0133353068885761 P = 1
		Mean age -failed	27.3616	270	
Medical school	Course type grouped	Standard entry	46.4%	435	X^2 = 4.111a 0.250
		Graduate entry	44.7%	45	
		Gateway and Preliminary	20.0%	15	
		Missing	50.0%	0	
	Intercalation	No record of intercalating	45.0%	360	X^2 = 0.086 P = 1
		Record of intercalating	53.0%	135	
	Final Medical School	Aberdeen	33.3%	6	N too low to test
		Barts	44.0%	25	
		Birmingham	43.5%	23	

Supplemental material

BMJ Publishing Group Limited (BMJ) disclaims all liability and responsibility arising from any reliance placed on this supplemental material which has been supplied by the author(s)

BMJ Open Ophth

Group	Factor	Category	Percent passing	N doctors in sample – UKMED	Bivariate Association.
		Brighton and Sussex	37.5%	8	
		Bristol	35.7%	14	
		Cambridge	84.0%	25	
		Cardiff	50.0%	12	
		Dundee	40.0%	10	
		Edinburgh	70.0%	10	
		Glasgow	41.7%	12	
		Hull York	50.0%	4	
		Imperial	42.6%	47	
		Keele	28.6%	7	
		King's	21.7%	23	
		Lancaster	0%	1	
		Leeds	17.6%	17	
		Leicester	50.0%	10	
		Liverpool	20.0%	10	
		Manchester	25.0%	28	
		Newcastle	57.1%	21	
		Norwich	40.0%	5	
		Nottingham	53.3%	15	
		Oxford	84.6%	26	
		Peninsula	21.1%	19	
		Queen's	33.3%	6	
		Sheffield	42.9%	14	
		Southampton	43.8%	16	
		St George's	37.5%	32	
		Swansea	25.0%	4	
		UCL	69.8%	43	
		Warwick	0.0%	4	