FACTORS AFFECTING THE PROBABILITY OF FIRST-YEAR MEDICAL STUDENT DROPOUT IN THE UK: A LOGISTIC ANALYSIS FOR THE ENTRY COHORTS OF 1980-1992

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Factors affecting the probability of first-year medical student dropout in the UK: a logistic analysis for the entry cohorts of 1980-1992.

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Abstract

Objectives To assess the extent to which various factors influence the probability that an individual medical student will drop out of medical school during their first year of study, focussing on the influence both of prior qualifications, such as A-level subjects taken and scores attained, and of type of school and family background.

Design Individual-level administrative data for entire cohorts of medical students from 1980/81 to 1992/93 (that is, the graduating cohorts of 1985/86 to 1997/98), yielding data on 51,810 students in 20 medical schools in the UK. The nature of the data permits two different approaches to the modelling of medical school dropout. First, by focussing on the determinants of first-year dropout we are able to exploit data for cohorts up to and including the entry cohort of 1992. Second, as an alternative, for any given cohort one can analyse the probability of a student dropping out in any one of the 5 years of their programme: but in this case one is restricted to data on cohorts no more recent than the 1986 entry cohort.[1] In the current paper, we follow the first of these research strategies. Statistical analysis is by logistic regression.

Main outcome measures First-year dropout from medical school *versus* continuation into second year of study. A (first-year) dropout is anyone who left their medical school programme before the end of their first year of study.

Results The probability that a student will drop out of medical school during their first year of study is influenced significantly both by the subjects studied at A-level and by the scores achieved. Among students who took Biology, Chemistry and Physics at A-level, each extra grade achieved reduces the probability of dropping out by about one-third of a percentage point. There is an additional effect for students with the maximum A-level score of 30 points in their best 3 A-levels (that is, three grade As): such a student is almost one percentage point less likely to drop out of medical school, *ceteris paribus*, compared to a student with 28 points. Furthermore, this estimated effect of A-level performance on dropout behaviour is very similar for each of the 13 cohorts. In general, indicators of both the social class and the previous school background of the student are largely insignificant, with the exception that students with a parent who is a medical doctor are significantly less likely to drop out. There are significant differences by gender, with males more likely to drop out. There is also evidence of significant age effects, with a tendency for the dropout probability to fall with age.

Conclusions Policies aimed at increasing the size of the medical student intake in the UK and of widening access to students from non-traditional backgrounds should be informed by evidence that student dropout probabilities are sensitive to measures of A-level attainment such as subject studied and scores achieved. If traditional entry requirements or standards are relaxed, then this is likely to have detrimental effects on medical schools' retention rates unless accompanied by appropriate measures such as targeted admissions and focussed student support.

Introduction

The primary motivation for the analysis presented in this paper derives from key recommendations of the Third Report of the Medical Workforce Standing Advisory Committee[2] to the Secretary of State for Health. In the context of what the Report described as a significant imbalance between demand and the domestic supply of doctors, a main recommendation of the Report was a substantial increase in the UK medical student intake – of about 1,000 per annum – together with policies to minimise student non-completion.

The MWSAC report also called for research into the determinants of medical student dropout behaviour to build on previous work.[3, 4] Previous data have typically relied either on highly aggregated data or on surveys of particular sub-groups of medical students. Recently, however, detailed student-level information on entire cohorts of medical students has become available. In previous work,[1] we have analysed the data for the cohorts of students starting a medical degree in the UK in either 1985 or 1986 and have reported an average dropout rate of 10%, with about half of all dropouts leaving within the first year of study. In the current paper, by focusing on the determinants of first-year dropout behaviour, we are able to extend the analysis to cover all medical students in the UK beginning their studies between 1980 and 1992. A focus on first-year dropouts is also vindicated by the common finding that the determinants of student first-year withdrawal are different from those operating after the first year.[5, 6] Using data for the 1985 and 1986 entry cohorts, we have previously shown[1] that this is also true for UK medical students. In addition, and, of particular relevance for the focus of the current paper, we have shown that prior qualifications influence the dropout probability primarily of first-year students.

In the context of the MWSAC recommendations, the general aim of the analysis is to increase our understanding of the factors associated with the probability that medical students will drop out of their studies. Specifically, we focus on the extent to which prior qualifications influence the dropout probability. This is in part because one of the methods for increasing medical student intake would be to relax the requirements on applicants to have studied specific subjects or to have attained particular standards at A-level. A second reason for focussing on the sensitivity of the dropout probability to prior qualifications and attainment concerns the recent discussions on the desirability of widening access to medical school to students from more diverse backgrounds.[7, 8] Policies of widening access are likely to involve targeted relaxing of traditional admissions offers. Given this relevance of the analysis to the issue of widening access, we also focus specifically on any role of school or family background on medical students' dropout probabilities.

Methods

In this paper, we analyse administrative data on all students beginning a medical degree in the UK between 1980 and 1992. The data come from the Universities' Statistical Record (USR), which was the central depository for individual student-level data collected from the administrative records of all UK universities – and their associated medical schools – over this period. The data contain information on the students' personal characteristics, prior qualifications, previous schooling, family background, and university record, *inter alia*. The individual student-level USR data are not available beyond 1993. By focusing on the determinants of dropout probabilities during the first year only, we are able to exploit information for all those cohorts on whom we have first-year information prior to 1993. This includes all cohorts starting in 1992 or earlier. The last of these cohorts would have been expected to complete their medical programme in 1997 (or 1998 in the case of students taking a six-year programme), and hence the data refer to quite recent cohorts of qualified medical students.

Summary statistics Table 1 presents summary statistics and show an average overall dropout rate for first year students of 3.82%. Of the 51,810 students, 54% of the students were male with the male dropout rate in the first year of study fractionally higher than that for females at 3.9% compared to 3.7%. 85% were aged 19 or less at entry, with the dropout rate tending to fall with age for all but the most mature group of students. 36% of medical students came from a Social Class I (managerial or professional) background and almost three-quarters came form either Social Class I or II (intermediate professional) backgrounds. More than one in seven medical students came from a family in which a parent was a medical doctor. Compared to the overall student population in the UK, medical students tend to be from higher social class groups. In the total (non-medical) university student population over the same period, 19% were from Social Class I and 59% from either Social Class I or II and only one in 50 came from a family with a medical doctor. The dropout rate of medical students varies by family background. Those from Social Class I have an average dropout rate of 3.4%. For those with a medical doctor parent the rate is 3.1%. In contrast, the dropout rate is 4.3% for those from either Social Class IIIM (skilled manual), IV (semi-skilled) or V (unskilled).

From Table 1, we also see that 32% of the medical students had previously attended an Independent school. This compares with a figure of 22% for all (non-medical) students. Table 1 also reveals the extent to which the dropout rate varies by the students' A-level (or Higher) subjects and grades. Almost half the students had A-levels or Higher qualifications in all three of Biology, Chemistry and Physics. On average, the dropout rate of these students is 3.1%. Most of the rest of the students had two of these three A-levels: their average dropout rate being 4.4%. For the minority of students with just one A-level in these three subjects, the dropout rate is 7%. It is also clear from the Table that there is a strong relationship between A-level (or Higher) performance and the medical school dropout rate.

Figure 1 shows how the average dropout rate and the average A-level points of medical students have varied over the period 1980-1992, during which the number of medical students enrolling for a degree rose from 3802 in 1980 to 4227 in 1992. The first-year dropout rate peaked in 1985 at 4.76%, but this figure dropped to 3.48% in 1992. The average A-level points score (in the best 3 subjects) rose over the period from 25.5 to 26.75 points, representing a slight rise in average prior attainment. We note, however,

that this may be a reflection of the widely-discussed phenomenon of grade inflation in A-level results. In view of this possibility, it is important to examine whether the effects of prior qualifications on student dropout behaviour have changed over time.

The USR data were provided by the UK Data Archive at the University of Essex and have been analysed on Stata 7.0. Syntax files are available form the authors on request. The statistical approach pooled together the 13 separate entry cohorts for 1980-1992 and analysed the pooled data set using logistic regression. The dependent variable is the individual's probability of dropping out from the medical degree programme during the first year of study.

Results

Table 2 summarises the results of the logistic analysis of the determinants of the probability of dropping out of medical school during the first year of study for all 13 cohorts. The Table reports the estimated odds ratio and the marginal effect on the dropout probability associated with three sets of potential explanatory variables: personal characteristics, social class background, and prior qualifications and schooling. Binary indicator variables for the cohort year and for the medical school attended were also included in the logistic regression.

Personal characteristics The estimated coefficient on the binary indicator variable for male medical students is significant at the 5% level and implies that, *ceteris paribus*, a male student has a higher probability of dropping out by about 0.3 percentage points, relative to a female student with otherwise sample mean characteristics. The interpretation of this is that a male with otherwise average characteristics has a 3.7% probability of dropping out in their first year compared to 3.4% for a comparable female. Compared to students aged 19 or less at entry, those aged 21 at entry are 1.2 percentage points less likely to drop out. Fees status does not appear to have a significant effect on the dropout probability. Interestingly, the dropout probability for students living off campus is significantly higher than that for students in campus accommodation. This result is consistent with social integration models of withdrawal. [5]

Social Class background Unlike results reported for students on three or four-year degrees,[6] the evidence reported here shows that, typically, family background of medical students is not a significant determinant of the probability of dropping out of the medical school programme, at least in the first year. However, students with a parent employed as a medical doctor were significantly less likely to drop out of medical school: by about three-quarters of a percentage point. This might reflect a greater commitment to the programme among these students or better preparation and information prior to commencement.

Prior qualifications and school background As shown in Table 2, students who had already obtained a degree prior to registering for a medical degree were significantly less likely to drop out of medical school, by about two percentage points relative to students with just A-level (or Higher) qualifications. This is interesting in the context of the recent innovation of post-graduate medical school programmes aimed at students with a previous relevant degree.

Table 2 also shows that among those students who had taken A-levels in Biology, Chemistry and Physics, each extra A-level grade translates into a reduction of 0.39 percentage points in the probability of dropping out. However, the effects of A-level

points on the dropout probability is not linear, as the significant top-score binary indicator effect implies a one percentage point lower dropout probability for students with 30 points compared to those with 28 points. Good performance in Biology, Chemistry and Physics is associated with a relatively low probability of dropping out. This is consistent with results[9] showing that students without A-level Biology are more likely to withdraw. A good performance in other A-level subjects is associated with a higher probability of dropping out. This is likely to reflect the fact that such students are better placed to transfer into non-medical degrees.

The results presented in Table 2 suggest that students' dropout probabilities do not vary by school type. In alternative specifications, we also tested the hypothesis that the effects of prior qualifications on the probability of dropout might vary by school type. This hypothesis stems from evidence that performance at university varies by school background.[10] However, no significant interaction effects between school type and prior qualifications were found.

We have also examined the issue of whether the effects of prior qualifications on dropout behaviour have varied over time, for example due to A-level grade inflation. In further analysis, we have allowed the effects of prior qualifications to vary for each cohort. Surprisingly, our results show no evidence of significant variation over time. Indeed, all of the estimated effects reported in Table 2 are stable over time. However, we note – but, for reasons of anonymity, do not report – evidence both of variation across medical schools and of instability over time in these medical school effects.

Discussion

From our analysis, we draw the following conclusions. First, for the cohorts of students entering a UK university medical school between 1980 and 1992, the probability of dropping out in the first year of study was influenced strongly by the level of prior educational attainment and the prior subjects studied. Students who had scored high grades in Biology, Chemistry and Physics were less likely to drop out of medical school: in particular, students who had achieved the maximum A-level score of 30 points were considerably less likely to drop out. An implication of our results is that any policy of reducing or relaxing the entry requirements for medical school entrants – along either dimension (grades achieved or subjects studied) – risks raising the dropout rate from medical degree programmes. This is not to say that policies of widening participation are inherently problematic. Instead, we suggest that if admissions policies do involve relaxing entry requirements they are not imposed blanket-fashion, but are targeted at schools and/or individuals for whom prior achievement is likely to be a downwardly biased indicator of future potential. It may also be appropriate to design support for students to minimise the risk that wider access policies might have on student retention.

Second, we note that – with the exception of students with a parent who is a doctor – social class background is not a significant influence on a student's likelihood of dropping out of medical school. This suggests that an appropriate support framework for students at risk of non-completion should focus more on academic support than on aspects associated with students' social class background. This does not imply that policies of social integration at university are irrelevant. We note, for example, the evidence that the location of the medical student's accommodation is a significant influence on the probability of progression.

We also identify the limitations of the analysis and suggest directions for further work. The data are for the cohorts of students who would have been expected to complete their medical studies successfully between the years 1985 and 1997 (or 1998 in the case of students on 6-year programmes). We cannot necessarily infer that more recent entry cohorts will possess the same characteristics and exhibit the same behaviour. Data for more recent cohorts are not currently available, however, and in any case our results suggest no evidence that the effects of prior qualifications on dropout behaviour changed for the entry cohorts of 1980/81 through 1992/93. Nonetheless, when equally detailed but more contemporaneous data become available from the Higher Education Statistics Agency, it will be possible to replicate our work for more recent medical student entry cohorts.

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The probability of medical school dropout in the UK

Table 1: Summary statistics for 1980-1992 medical school entry cohorts

Variable	% of full sample	1st year dropout rate
ALL		3.82
Personal characteristics		
Age groups		
≤19	84.96	3.87
20	8.13	3.37
21	1.96	2.46
>21	4.95	4.37
Gender		
Females	45.92	3.69
Males	54.08	3.93
Fee status		
No-fees	94.35	3.83
Non-UK fees	5.65	3.55
Accommodation		
Campus	79.91	3.60
Non-campus	20.09	4.70
Social class background		
Professional (SC I)	36.14	3.41
Parental doctor	14.39	3.10
Intermediate (SC II)	37.84	3.89
Skilled non-manual (SC IIINM)	7.18	4.22
Other (SC IIIM+SC IV+ SC V)	10.58	4.34
Prior qualifications and schooling		
A-levels/Highers in Biology, Chemistry and Physics	49.06	3.09
A-levels/Highers in 2 of Biology, Chemistry and Physics	45.79	4.41
A-levels/Highers in 1 of Biology, Chemistry and Physics	1.48	7.03
A-level/Higher points[*]		
28-30	47.40	2.91
26-27	20.30	3.74
24-25	14.88	4.55
20-23	12.35	4.94
16-19	2.25	4.63
<16	2.17	9.96
School type		
Local Education Authority (LEA)	36.92	3.90
Grammar	16.91	3.28
Independent	32.35	3.81
Further Education College (FE)	7.59	4.10
Other	6.22	4.56
Number	51810	

Notes:
[*] A-levels are classified as A through to E.: A=10 points, B=8 points, C=6 points, D=4 points, and E=2 points. Highers are classified as A through to C: A=3 points, B=2 points and C=1 point. The score relates to the best 3 A-levels (or 5 Highers, this score having been multiplied by 2 to score out of 30 points for this table).

Table 2: Logistic model for first year medical school dropouts (1980-1992)

Variable	Odds ratio	Marginal Effects
Personal characteristics		
Age groups		
≤19 (default)	1.00 (fixed)	-
20	0.89	-0.33
21	0.62 *	-1.17
>21	1.10	0.29
Males	1.12 *	0.33
Non-UK fees	0.92	-0.25
Non-campus	1.45 **	1.25
Social class background		
SC I	0.93	-0.24
Parental doctor	0.77 **	-0.76
SC II (default)	1.00 (fixed)	-
SC IIINM	1.04	0.14
SC IIIM+IV+V	1.08	0.27
Unemployed	1.06	0.19
Prior qualifications and schooling		
Degree already	0.38 **	-2.03
A-levels/Highers		
Topscore (best 3 subjects)	0.70 **	-0.82
A-level score in Biology+Chemistry+Physics	0.94 **	-0.38
Other A-level scores	1.01 *	0.06
Higher score in Biology+Chemistry+Physics	1.01	0.09
Other Higher scores	0.97	-0.18
School type		
LEA (default)	1.00 (fixed)	-
Grammar	1.00	-0.01
Independent	1.09	0.26
FE	1.07	0.22
Other	1.15	0.43

Notes:
The odds ratio is calculated as exp(coefficient estimate). The marginal effects are calculated as the first derivatives evaluated at the mean of the characteristics for continuous variables, and as the difference in dropout probabilities when the binary indicator changes from 0 to 1 for the binary variables. In addition to the variables above the model includes time effects and time varying medical school effects.
** indicates significance at the 1% level, * indicates significance at the 5% level.

Figure 1: First year dropout rates from medical degrees and average A-level score in best 3 subjects for medical students